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Threat of a Perfect Storm—AIDS and a Fresh Food Crisis

By Davison Mudzingwa

CAPE TOWN, Dec 1, 2010 (IPS)―In November, the Food and Agriculture Organisation was just one of many voices warning that food prices have risen to levels last seen at the start of the 2007-2008 crisis. A majority of the countries most exposed to a repeat of that problem are in Africa, where vulnerability to food security is exacerbated by AIDS.

"We are in a situation where generally food prices have gone down... but as the global recovery comes into place, we could as well see prices rise again," said Scott Drimie, a research fellow with IFPRI, the International Food Policy Research Institute.

According to the World Food Program, 22 of the 30 high risk countries in need of external food assistance are in sub-Saharan Africa, many of which struggling with serious AIDS epidemics.

"When food prices are putting nutritious food out of reach of people living with HIV and AIDS, it becomes an immediate crisis," added Drimie.

The AIDS pandemic confronts individuals, households and communities with multiple social, economic, environmental and health stresses that threaten their livelihoods. For ten years, IFPRI’s Regional Network on AIDS, Livelihoods and Food Security (RENEWAL) has been studying the vulnerability of people living with HIV and AIDS in East and Southern Africa.

Sam Bota, RENEWAL coordinator in Malawi, says the first impact of AIDS is a direct loss of labour.

"A national census report (in Malawi) clearly shows that a high percentage of farmers spend a lot of time nursing sick relatives. And after the death, they lose a lot of time—sometimes as long as 20 days for the funeral—all that is a loss of productive time."

Across the region, climatic changes are confronting stressed households with additional uncertainties over the timing and frequency of rain, often reducing yields or pushing farmers to switch to new and initially unfamiliar crops.

AIDS is also claiming key people who could be part of easing these transitions, addressing labour shortages, and maintaining resilience in adverse conditions. Studies in Malawi and neighbouring Zambia have shown how agriculture extension services have been impacted by HIV; cascading to food security.

In Malawi, there is a 46 percent vacancy rate of extension workers due to AIDS-related deaths. The loss of these knowledgeable people has huge implications for farmer productivity, says Bota.

Members of households slipping into food and income insecurity risk entering a dangerous cycle.
"Sudden increases in food insecurity can lead to distress migration as people search for food and work," RENEWAL director Stuart Gillespie wrote during the 2008 food crisis. "Mobility is a marker of enhanced risk of HIV exposure, both for the person moving, and for adults who may remain at home."

Children may be taken out of school to work—at once put at higher risk of exposure to HIV in the work world, and missing out on an education that could lower their chances of eventually contracting AIDS. Food insecurity is also linked to higher levels of unprotected transactional sex for poor women.

The recommended actions call for going beyond short-term food aid for example, to make meaningful connections between the agriculture and health sectors.

"We have people that have no access to resources to produce food," says Robert Ochai of Uganda's AIDS Support Organisation. "Those people should not be left there to suffer. We should access land and financial loans for them make a change in their lives."

"We also need to change land policies which allow people to access land, so there is action for government, development partners and at individual level."

A powerful new technology to identify HIV inhibitors

EASY-HIT** is a new cell-based assay system for simple and reliable testing of HIV inhibitors. This system was developed under the leadership of Professor Ruth Brack-Werner at the Institute of Virology. At the heart of the system are cultured human cells that allow HIV to enter and replicate efficiently and that signal HIV infection by producing a red fluorescent protein. The EASY-HIT technology can be used to identify HIV-inhibitors, measure the potency of their inhibitory activity and to detect the stage of replication targeted by the inhibitor.

The researchers validated their technology with a panel of currently used anti-HIV drugs and then went on to identify 5 new HIV inhibitors. They also showed that this technology can be used to detect anti-HIV activities in raw plant extracts. The researchers are currently using this system to explore numerous biological specimens for anti-HIV activities and have already discovered novel unexpected sources of antiviral activities.

Stephan Kremb, first author of the manuscript, summarizes, "We expect the versatile and robust EASY-HIT system to identify new targets against HIV and new sources of HIV-inhibitors". "Our technology has many applications in HIV research and pharmaceutical drug design", adds Ruth Brack-Werner.

HIV was first discovered in the early 1980s and described as the causative agent of AIDS. As there is no cure for HIV infection as yet, HIV-infected individuals require life-long treatment with antiviral drugs. The problems with currently available therapies include drug side-effects, the emergence of resistant viruses and the cost of long-term treatment. "It is our particularly hope that the EASY-HIT technology will promote the development of new strategies for HIV treatment in areas with limited resources", states Ruth Brack-Werner.

**EASY-HIT: Exploratory Assay SYstem for the discovery of HIV InhibiTors

Original publication

Blame the environment: Why vaccines may be ineffective for some people

New research published in the Journal of Leukocyte Biology suggests that the effectiveness of the bacille Calmette-Guerin vaccine is compromised by environmental bacteria

A new discovery may explain why a tuberculosis vaccine is not as effective for some people as anticipated, and potentially explains why other vaccines do not work as well for some as they do for others. In a research report presented in the December 2010 issue of the Journal of Leukocyte Biology (http://www.jleukbio.org), scientists from Singapore show that Mycobacterium chelonae, a common environmental bacterium found in soil and water, can decrease the effectiveness of the bacille Calmette-Guerin (BCG) vaccine used to prevent tuberculosis, especially in countries outside of the United States.

"Uncovering the reasons why BCG is failing will help researchers in designing new, more effective vaccines against TB," said Geok Teng Seah, Ph.D., a researcher involved in the work from the Department of Microbiology at the National University of Singapore. "This will give us more tools to fight this globally significant infectious disease."
To make this discovery, scientists studied mice with and without prior exposure to M. chelonae. When subsequently given BCG vaccine, the mice with prior exposure to M. chelonae produced higher amounts of suppressive chemical signals; these chemical signals are believed to reduce the level of immunity induced by BCG vaccine in the host mice. Then the researchers extracted certain white blood cells with known suppressive functions from both exposed and unexposed mice. After transferring these cells into separate groups of unexposed mice, they found that recipients of suppressor cells from M. chelonae exposed mice did not respond as strongly to BCG vaccine as recipients of suppressor cells from unexposed donor mice. This indicates that the suppressor cells from M. chelonae exposed mice are functionally different from those of unexposed mice. Ultimately, the data suggest that these suppressor cells, induced in the host when exposed to M. chelonae, dampen the effectiveness of the BCG vaccine.

"This study sheds important light on why many immunological therapies and vaccines look great in the lab, but fall short in the real world," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "Humans are exposed to many more non-disease causing bacteria and viruses compared to relatively clean laboratory animals, and as this study shows with a TB vaccine, environmental exposure to one kind of bacteria can influence the efficacy of immunity to different, more dangerous bugs."


New prion discovery reveals drug target for mad cow disease and related illnesses

New research in the FASEB Journal suggests that plasminogen, which helps break down blood clots, puts rogue prion proteins into overdrive, causing devastating brain diseases

The joy of a juicy hamburger could make a comeback thanks a new discovery by scientists from the University of Kentucky. In a new research report in the December 2010 print issue of The FASEB Journal (http://www.fasebj.org), scientists found that a protein our body uses to break up blood clots speeds up the progress of prion diseases. This substance, called plasminogen, is a new drug target for prion diseases in both humans and animals.

"I hope that our study will aid in developing therapy for prion diseases, which will ultimately improve the quality of life of patients suffering from prion diseases," said Chongsuk Ryou, Ph.D., a researcher involved in the work from the University of Kentucky in Lexington. "Since prion diseases can lay undetected for decades, delaying the ability of the disease-associated prion protein to replicate by targeting the cofactor of the process could be a monumental implication for treatment."

To make this discovery, the researchers used simple test tube reactions to multiply disease-associated prion proteins. The reactions were conducted in the presence or absence of plasminogen. They found that the natural replication of the prions was stimulated by plasminogen in both human and animal cells.

"Rogue prions are one of nature's most interesting, deadly and least understood biological freakshows," said Gerald Weissmann, M.D., Editor-in-Chief of The FASEB Journal. "They are neither virus nor bacteria, but they kill or harm you just the same. By showing how prions hijack our own clot-busting machinery, this work points to a new target for anti-prion therapy."

According to the U.S. National Institute of Allergy and Infectious Diseases, prion diseases are a related group of rare, fatal brain diseases that affect animals and humans. The diseases are characterized by certain misshapen protein molecules that appear in brain tissue. Normal forms of these prion protein molecules reside on the surface of many types of cells, including brain cells, but scientists do not understand what normal prion protein does. On the other hand, scientists believe that abnormal prion protein, which clumps together and accumulates in brain tissue, is the likely cause of the brain damage that occurs. Scientists do not have a good understanding of what causes the normal prion protein to take on the misshapen abnormal form. Prion diseases are also known as transmissible spongiform encephalopathies, and include bovine spongiform encephalopathy ("mad cow" disease) in cattle; Creutzfeldt-Jakob disease in humans; scrapie in sheep; and chronic wasting disease in deer and elk. These proteins may be spread through certain types of contact with infected tissue, body fluids, and possibly, contaminated medical instruments.

Drug-Resistant HIV Patients With Unimpaired Immune Cells

ScienceDaily (Dec. 1, 2010) — Mayo Clinic researchers have shown why, in a minority of HIV patients, immune function improves despite a lack of response to standard anti-retroviral treatment. In these cases, researchers say, the virus has lost its ability to kill immune cells. The findings appear in the online journal PLoS Pathogens.
The goal of current treatments for HIV is to block the virus from reproducing, thereby allowing the immune system to repair itself. These findings show for the first time that not all HIV viruses are equally bad for the immune system. Patients who harbor these viruses do not develop certain complications of the disease because of mutations that render some HIV drugs ineffective—but also impair the ability of the virus to cause disease.

"These findings suggest—in contrast to how these patients have been treated in the past—that changing treatments might not be needed in order to help the immune system," says Andrew Badley, M.D., Mayo infectious disease researcher and senior author of the study.

**Background**

HIV causes disease by progressively killing CD4 T cells, whose function is to orchestrate the immune system. Loss of these cells renders patients susceptible to unusual infections and cancers. Over time, HIV mutates and can become resistant to the drugs used for treatment. Mayo researchers have discovered that viruses with certain mutations that render a component of the drug cocktail used to treat HIV infection ineffective also have an impaired ability to kill CD4 T cells. Even though mutated viruses replicate as well as normal HIV, they fail to cause the infected cells to die. Not all mutant viruses share this effect; only selected mutations cause the impairment in cell killing, without effecting virus replication.

HIV has evolved many ways to cause the death of CD4 T cells, most of which involve HIV accelerating the normal cell death. One kind of cell death that is unique to HIV involves the HIV enzyme protease, whose normal job is to cut up viral proteins so they can be used. This same process also cuts a normal cell protein which creates a novel protein called Casp8p41. This protein is only created during HIV infection. Casp8p41 in turn is responsible for the death of many of the infected cells. Researchers found that cells infected with HIV that also contain the mutations, produced less Casp8p41, and therefore fewer of the infected cells died.

**Significance of the Findings**

The current treatment for HIV involves measuring virus levels in the blood and using drugs to stop that virus from reproducing. When drugs stop working, virus levels in the blood rise and physicians typically respond by changing medications. However, effective drugs may not always be available.

"Results from the current study suggest that if a patient is failing their current treatment, and other effective drugs are not available, then it may be best to take advantage of the virus’ lessened ability to kill CD4 T cells, by staying on the same medication" says Dr. Badley. "We have begun to study whether the best approach might be instead to monitor Casp8p41 levels as opposed to measuring virus levels, and use that to determine whether or not to change treatment."

Researchers have already developed a way to measure Casp8p41 in the blood of patients, and this new knowledge may ultimately lead to a new diagnostic tool for HIV treatment, based upon predicting whether a patient’s virus will deplete CD4 T cells.

**HIV Intervention for Providers Study: A Randomized Controlled Trial of a Clinician-Delivered HIV Risk-Reduction Intervention for HIV-Positive People**

*Journal of Acquired Immune Deficiency Syndromes Vol. 55; No. 5: P. 572-581, (12.15.2010)* Carol Dawson Rose, PhD, RN; Cari Courtenay-Quirk, PhD; Kelly Knight, PhD; Starley B. Shade, PhD; Eric Vittinghoff, PhD; Cynthia Gomez, PhD; Paula J. Lum, MD, MPH; Oliver Bacon, MD; Grant Colfax, MD

“Clinician-delivered prevention interventions offer an opportunity to integrate risk-reduction counseling as a routine part of medical care,” explain the study authors. A randomized, controlled trial, the HIV Intervention for Providers study, developed and tested a provider-based HIV prevention training intervention in four northern California HIV treatment clinics.

Providers were assigned to either the intervention or a control condition (usual care). Participants in the intervention arm received a four-hour training on assessing sexual risk behavior with HIV-positive patients and delivering risk-reduction-oriented messages to patients who reported risk behaviors with partners of unknown or HIV-negative status. Efficacy of the intervention versus control on transmission risk behavior was compared by enrolling 386 patients of the randomized providers.

Over six-month follow-up, patients of the intervention-assigned providers reported a relative increase in provider-patient discussion of safer sex (odds ratio [OR]=1.49; 95 percent confidence interval [CI]=1.06 to 2.09), assessment of sexual activity (OR=1.60; 95 percent CI=1.05 to 2.45) and a significant decline in the number of sex partners (OR=0.49; 95 percent CI=0.26-0.92).
“These findings show that a brief intervention to train HIV providers to identify risk and provide a prevention message results in increased prevention conversations and significantly reduced the mean number of sexual partners reported by HIV-positive patients,” the investigators concluded.

Merck’s HIV Drug Isentress Fails Once-a-Day Study

Reuters, (11.29.2010) Ransdell Pierson
Taking the HIV drug Isentress once a day is not as effective as the standard twice-daily regimen, reported drug manufacturer Merck & Co. Based on these initial results, Merck is suspending the Phase III trial of once-daily dosing.

Isentress is the only HIV drug that works by blocking integrase, an enzyme that allows HIV to insert its genetic material into human DNA. Taken twice a day, Isentress is used among both previously treated and treatment-naive HIV patients.

The trial enrolled 775 patients who were taking other HIV medications in addition to Isentress. One subset received 800 milligrams of Isentress once-daily, another group received the standard 400-milligram dose twice per day.

After 48 weeks, HIV was lowered to undetectable levels in 83.2 percent of patients on the once-daily regimen and 88.9 percent of patients on the twice-daily schedule.

New Findings Detail How a Virus Prepares to Infect Cells

ScienceDaily (Dec. 1, 2010) — Researchers have learned the atomic-scale arrangement of proteins in a structure that enables a virus to invade and fuse with host cells, showing precisely how the structure morphs with changing acidity to initiate infection.

Findings from a team at Purdue University showed the protein structure in an acidic environment, and another team from the Pasteur Institute showed the same structure in a neutral environment. When combined, the two studies illustrate what happens to the structure as a virus enters and then prepares to fuse with a host cell, critical steps leading to infection.

"These findings represent a milestone," said Michael Rossmann, Purdue's Hanley Distinguished Professor of Biological Sciences, who is working with Long Li, a postdoctoral researcher in his lab, and Joyce Jose, a postdoctoral researcher in the laboratory of Richard Kuhn, a professor and head of Purdue's Department of Biological Sciences.

The research is aimed at learning precisely how viruses infect humans and other hosts, knowledge that may lead to better vaccines and antiviral drugs, Rossmann said.

Findings from the Purdue and Pasteur Institute studies are detailed in two papers appearing in the journal Nature on Dec. 2. The Purdue paper was written by Li, Jose, postdoctoral researcher Ye Xiang, Kuhn and Rossmann.

The researchers studied alphaviruses, a family of viruses that includes eastern equine encephalitis and chikungunya viruses, which are transmitted by mosquitoes and sometimes ticks. The work focused on two "envelope proteins" making up 80 spikelike structures protruding from the outer shell of the viruses. "The spikes have all the machinery for infecting a cell," Rossman said.

Researchers have known the structure of envelop protein 1, or E1, for several years. The Purdue researchers have now determined the structure of envelope protein 2 and the precise atomic-scale architecture of the combined E1-E2 complex. Scientists had previously determined general characteristics about E2, such as its location in the protein complex, but they did not know its structure until now.
E2, a receptor-binding protein, enables the virus to initially attach to and enter host cells where the virus encounters an acidic environment that induces changes in the structure of the protein complex. These changes expose a portion of E1 required to fuse the virus with the cell membrane, leading to the formation of a "fusion pore" through which the virus's genetic material is transferred into the host cell. Once infected, the host cell then produces new virus particles.

The researchers learned the shape of E2's three "domains," showing how E2 displaces one of these domains when in an acidic environment, allowing fusion with the cell membrane. The scientists used advanced imaging technologies, including cryoelectron microscopy and X-ray crystallography, to uncover critical structural details about the viruses.

Purdue researchers led by Rossmann and Kuhn have been studying alphaviruses for about 15 years, in work based at Purdue's Markey Center for Structural Biology.

**Journal Reference:**

**Death Certificates Confirm Non-HIV-Attributable Diseases Cause Increase in Deaths of People Living With HIV/AIDS in US**

ScienceDaily (Dec. 1, 2010) — During the decade since the advent of highly active antiretroviral therapy (HAART), or 1996-2006, mortality among people living with HIV/AIDS (PLWHA) sharply decreased in the United States. So, too, did the percentages of PLWHA deaths attributable to AIDS-defining illnesses, just as there was a marked increase in the percentage of deaths attributable to heart, kidney, and liver disease.

These data from a US Centers for Disease Control and Prevention (CDC) review of trends in diseases reported on death certificates in the United States from 1996 to 2006 are published ahead of print in the *Journal of the International Association of Physicians in AIDS Care* (JIAPAC) published by SAGE.

Some specific findings about HIV deaths during the analysis period included:
- Deaths reported with HIV decreased from 35,340 to 13,750
- Deaths reported with AIDS-defining opportunistic infections decreased; and AIDS-defining cancers declined then had stable percentages after 2001
- Deaths reported with all other cancers increased from 2.7% to 7.3%
- Deaths reported with heart, kidney, and liver disease increased from 4.9% to 10.2%, 7.9% to 12.0%, and 5.8% to 13.0%, respectively

"HAART has prolonged the survival of HIV-infected persons by reducing deaths caused by diseases attributable to HIV," write the authors, William K. Adih, MD, DrPH, MPH; Richard M. Selik, MD; and Xiaohong Hu, MS, of the Division of HIV/AIDS Prevention at the CDC's National Center for HIV, Viral Hepatitis, STD, and TB Prevention in Atlanta. "HIV-infected persons and their health care providers should take action to prevent diseases unrelated to HIV that are common in populations at risk of HIV infection, including conditions resulting from smoking and abuse of alcohol and other drugs, as well as chronic diseases common in the general population."

**Journal Reference:**

**UIC researcher unveils new approach to blocking malaria transmission**

University of Illinois at Chicago researcher Dr. John Quigley will describe a promising new approach to blocking malaria transmission during the American Society of Hematology's annual meeting in Orlando, Fla.

Quigley will speak at a press briefing Saturday, Dec. 4, at 8 a.m. at the Orange County Convention Center, 9800 International Drive, Room 208C (West Building). His abstract, "Anopheline Orthologs of the Human Erythroid Heme Exporter, FLVCR, Export Heme: Potential Targets to Inhibit Plasmodium Transmission," will be presented at the plenary session Sunday.

The research focuses on potential targets to inhibit transmission of the parasite Plasmodium that causes malaria.

Female mosquitoes ingest large amounts of hemoglobin that serves as a food source required for mosquito egg development. When a mosquito ingests infected blood, Plasmodium reproduces in the mosquito gut. Plasmodium fertilized egg cells cross the lining of the mosquito gut and develop into
oocysts. After maturing, the oocysts rupture and release thousands of parasites that allow the mosquito to transmit malaria when it bites another human.

Previous studies have shown that mosquitoes with increased oxidative stress in their midgut are resistant to Plasmodium transmission. Quigley and his colleagues hypothesize that if they can disrupt the function of a cell-surface transport protein called FLVCR that pumps heme out of the cell, it will increase the oxidative stress in the mosquito gut and hamper Plasmodium at a crucial point in the parasite's life cycle.

The researchers isolated the FLVCR gene from two common malaria-transmitting mosquitoes and showed that the gene encodes a protein that exports heme and protects cells from oxidative stress. Using gene-silencing techniques, they were able to significantly reduce levels of FLVCR in the mosquito gut.

"If disruption of the function of the protein inhibits parasite transmission, then we can potentially use parts of the protein as an antigen to try to stimulate a vaccine in people," said Quigley, who is assistant professor of medicine at the UIC College of Medicine and senior author of the study. "So the antibody blocks FLVCR and increases oxidative stress, and now the Plasmodium is not able to complete its life cycle, thus preventing the spread of malaria."

Quigley's research is ongoing, and future studies will focus on whether inhibiting FLVCR can block Plasmodium transmission. The research, he says, may be applicable to all blood-eating insects that cause a variety of diseases, such as West Nile Virus, dengue fever and leishmaniasis.

**Interspecies Electron Transfer: Anaerobic Bacteria Found to Cooperate**

ScienceDaily (Dec. 4, 2010) — University of Massachusetts Amherst microbiologists Derek Lovley, Zarath Summers and colleagues report in the Dec. 2 issue of *Science* that they have discovered a new cooperative behavior in anaerobic bacteria, known as interspecies electron transfer, that could have important implications for the global carbon cycle and bioenergy.

The scientists found that microorganisms of different species, in this case two Geobacter species, can form direct electrical connections and pass an electric current from one microbe to the other. By cooperating in this way the two microbes can consume food that neither of them could use on their own.

The cell aggregates or "great balls of evolution" that Summers evolved in the laboratory look very much like those found in nature which are involved in degrading organic matter into the greenhouse gases, carbon dioxide and methane. Conversion of wastes to methane by microbial aggregates is an increasingly popular method for producing natural gas as a renewable energy source.

Others can be found consuming methane from vents at the bottom of the ocean. In both cases, investigators have been puzzled for years about how these aggregates function, because a 40-year-old interspecies hydrogen transfer paradigm did not seem to fit observations. Now, the mystery appears to be solved.

As Lovley, the principal investigator, explains, "We placed the microbes under conditions in which they had to work together in order to survive and grow using the alcohol we gave them as an energy source. They're the ultimate drinking buddies, collaborating to consume ethanol." With support from the Genomic Science Program of the U.S. Department of Energy, his lab has been exploiting the ability of microorganisms to adapt to novel conditions and developing microbes for practical applications.
It's been known since the 1960s that microorganisms can indirectly exchange electrons by the process known as interspecies hydrogen transfer. In it, one microbe produces hydrogen that another microbe then consumes. It was experiments carried out by doctoral candidate Summers to explore this phenomenon further that led to discovery of the new direct transfer process.

To begin, Summers put two species of Geobacter together under conditions expected to favor hydrogen-sharing interactions. At first, the cells did cooperate to consume the alcohol by sharing hydrogen. Over time, they also started clumping together and transforming the culture from one of dispersed microscopic cells, invisible to the naked eye, to a collection of complex multi-cellular structures, millimeters in diameter.

Resisting her lab mates' urgings to shake the cultures and break up the unexpected cell clumps, Summers continued to allow the spheres to grow. Now they were exhibiting a deep red color due to the presence of iron-containing proteins known as cytochromes. When observed with an electron microscope, they had clearly developed an intricate structure with a series of channels, presumably to help nutrients enter. They had also established completely new electric connections that permitted them to directly share electrons.

"The direct electron transfer is much more efficient and they consume alcohol much faster this way," Summers points out. Sequencing the DNA in the big red balls revealed the secret to this electrical connection: a mutation in one of the Geobacter species had caused it to make much more of a cytochrome known as OmcS. Previous studies in Lovely's lab had shown that OmcS lines up along Geobacter's electrically conductive filaments known as microbial nanowires.

"This turn of events suggested that the cytochrome was key to the electrical connection between the cells" says Summers. This was confirmed in subsequent experiments with genetically manipulated microbes. When the researchers deleted genes for the cytochrome or the nanowires, the microbes did not form the red balls and never effectively used their alcohol fuel. Lovley, Summers and colleagues had thus pinpointed the source of the microbes' new behavior.

Further experiments showed that if the mutation was introduced before putting the two Geobacters together, they rapidly formed the balls and consumed alcohol. Deleting a gene that would be necessary for the cells to exchange hydrogen also hastened ball formation, demonstrating that interspecies hydrogen transfer was not an important factor. "This is a clear case of life evolving to function more effectively in a new environment" says Lovley.

"We're guessing that many types of natural aggregates rely on interspecies electron transfer" said Lovley. "We already have some good preliminary evidence for this with some more complex natural systems. With DNA sequencing we can determine how the microbes evolve when challenged to do better. We can learn a lot about the basic mechanisms of the process of interest," he adds.

Journal Reference:

New Prion Discovery Reveals Drug Target for Mad Cow Disease and Related Illnesses
ScienceDaily (Dec. 1, 2010) — In a new research report in the December 2010 print issue of The *FASEB Journal*, scientists found that a protein our body uses to break up blood clots speeds up the progress of prion diseases. This substance, called plasminogen, is a new drug target for prion diseases in both humans and animals.

"I hope that our study will aid in developing therapy for prion diseases, which will ultimately improve the quality of life of patients suffering from prion diseases," said Chongsuk Ryou, Ph.D., a researcher involved in the work from the University of Kentucky in Lexington. "Since prion diseases can lay undetected for decades, delaying the ability of the disease-associated prion protein to replicate by targeting the cofactor of the process could be a monumental implication for treatment."

To make this discovery, the researchers used simple test tube reactions to multiply disease-associated prion proteins. The reactions were conducted in the presence or absence of plasminogen. They found that the natural replication of the prions was stimulated by plasminogen in both human and animal cells.

"Rogue prions are one of nature's most interesting, deadly and least understood biological freakshows," said Gerald Weissmann, M.D., Editor-in-Chief of The *FASEB Journal*. "They are neither virus nor bacteria, but they kill or harm you just the same. By showing how prions hijack our own clot-busting machinery, this work points to a new target for anti-prion therapy."
According to the U.S. National Institute of Allergy and Infectious Diseases, prion diseases are a related group of rare, fatal brain diseases that affect animals and humans. The diseases are characterized by certain misshapen protein molecules that appear in brain tissue. Normal forms of these prion protein molecules reside on the surface of many types of cells, including brain cells, but scientists do not understand what normal prion protein does.

On the other hand, scientists believe that abnormal prion protein, which clumps together and accumulates in brain tissue, is the likely cause of the brain damage that occurs. Scientists do not have a good understanding of what causes the normal prion protein to take on the misshapen abnormal form. Prion diseases are also known as transmissible spongiform encephalopathies, and include bovine spongiform encephalopathy ("mad cow" disease) in cattle; Creutzfeldt-Jakob disease in humans; scrapie in sheep; and chronic wasting disease in deer and elk. These proteins may be spread through certain types of contact with infected tissue, body fluids, and possibly, contaminated medical instruments.

**Journal Reference**


**New Clue in Leukemia Mystery: Researchers Identify 'Poison' Employed by Deadly Enzyme Mutations**

ScienceDaily (Dec. 3, 2010) — There is new hope for people with acute myelogenous leukemia (AML), a fast-growing cancer of the blood and bone marrow. Research led by Weill Cornell Medical College and published December 3 in the online edition of the journal Cancer Cell reveals a surprising and unexpected cancer-causing mechanism. The investigators discovered that newly identified mutant enzymes in AML create a chemical poison to cause leukemia. Their findings should prove useful in treating patients by providing a molecular target against which to develop new drugs against one subset of AML as well as other cancers.

AML is one of the most common types of leukemia among adults, with an estimated 12,300 new cases diagnosed in the United States each year and 8,950 deaths, according to the American Cancer Society. People with AML have abnormal cells inside their bone marrow that quickly multiply, replacing healthy blood cells in the bone marrow and leading to infections, bleeding and severe anemia.

The large-scale, international, collaborative research effort scrutinized the genomes of 750 AML patients from the United States and Europe for chemical clues to better understand how leukemia arises from normal bone marrow cells. Using computational tools to sift through millions of data points, they discovered a unique chemical signature in the genomes of patients with mutations in either of two enzymes called IDH1 and IDH2, which occur frequently in AML.

Dr. Ari Melnick of Weill Cornell Medical College and his principal co-authors—including Dr. Craig B. Thompson, president of Memorial Sloan-Kettering Cancer Center (MSKCC), and Dr. Ross L. Levine, also of MSKCC—discovered this chemical signature: a massive accumulation of DNA methylation that causes genes to function abnormally, leading to AML. They went on to show that IDH1 and IDH2 mutations generate a "poison" that blocks the ability of a protective factor called TET2 to remove the methylation from the genome. Interestingly, the researchers also showed that many AML patients have mutations that inactivate TET2, and this causes the same abnormal DNA methylation effect as IDH1 and IDH2 mutations.

"One of the great surprises of this study was that IDH1 and IDH2, which are normally involved in energy metabolism and located far away from DNA and outside of the cell nucleus, could become subverted to make a substance that poisons the genome," says Dr. Ari Melnick, the study's senior author and associate professor of medicine and director of the Raymond and Beverly Sackler Center for Biomedical and Physical Sciences at Weill Cornell Medical College.

"Our study shows for the first time that metabolic enzymes not only help to fuel tumor growth but when mutated can also directly 'rewrite' the instructions that govern the genome," Dr. Melnick continues. One important implication of this work is that it appears technically feasible to create drugs that can specifically stop mutant IDH1 and IDH2 from making the cancer-causing poison. Such inhibitors have the potential to fundamentally restore normal functioning to the genome and thus help to treat leukemias. IDH1 is also frequently mutated in malignant brain tumors, suggesting that the current study has broad implications for several types of cancer.

"These discoveries were only possible thanks to the collaboration of a large team of scientists with expertise in different disciplines from around the world," emphasizes Dr. Melnick, "and thanks to an unusual alliance between multicenter clinical trials groups from Europe and the United States. This spirit
of cooperation allowed for the collection and analysis of the massive genomic datasets required for these
discoveries to be made. Working together, it will be possible to accelerate the pace of discovery and
development of better treatments."

Journal Reference:
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Thompson, Ross L. Levine, and Ari Melnick. Leukemic IDH1 and IDH2 Mutations Result in a Hypermethylation
Phenotype, Disrupt TET2 Function, and Impair Hematopoietic Differentiation. Cancer Cell, 02 December 2010 DOI:
10.1016/j.ccr.2010.11.015

Propensity for One-Night Stands, Uncommitted Sex Could Be Genetic, Study
Suggests
ScienceDaily (Dec. 2, 2010) — So, he or she has cheated on you for the umpteenth time and their only
excuse is: "I just can't help it." According to researchers at Binghamton University, they may be right. The
propensity for infidelity could very well be in their DNA.

In a first of its kind study, a team of investigators led by Justin Garcia, a SUNY Doctoral Diversity
Fellow in the laboratory of evolutionary anthropology and health at Binghamton University, State
University of New York, has taken a broad look at sexual behavior, matching choices with genes and has
come up with a new theory on what makes humans 'tick' when it comes to sexual activity. The biggest
culprit seems to be the dopamine receptor D4 polymorphism, or DRD4 gene. Already linked to sensation-
seeking behavior such as alcohol use and gambling, DRD4 is known to influence the brain's chemistry and
subsequently, an individual's behavior.

"We already know that while many people experience sexual activity, the circumstances, meaning and
behavior is different for each person," said Garcia. "Some will experience sex with committed romantic
partners, others in uncommitted one-night stands. Many will experience multiple types of sexual
relationships, some even occurring at the same time, while others will exchange sex for resources or
money. What we didn't know was how we are motivated to engage in one form and not another,
particularly when it comes to promiscuity and infidelity."

Gathering a detailed history of the sexual behavior and intimate relationships of 181 young adults
along with samples of their DNA, Garcia and his team of investigators were able to determine that
individual differences in sexual behavior could indeed be influenced by individual genetic variation.

"What we found was that individuals with a certain variant of the DRD4 gene were more likely to have
a history of uncommitted sex, including one-night stands and acts of infidelity," said Garcia. "The
motivation seems to stem from a system of pleasure and reward, which is where the release of dopamine
comes in. In cases of uncommitted sex, the risks are high, the rewards substantial and the motivation
variable—all elements that ensure a dopamine 'rush.'"

According to Garcia, these results provide some of the first biological evidence that at first glance,
seems to be somewhat of a contradiction: that individuals could be looking for a serious committed long-
term relationship, but have a history of one-night stands. At the same time, the data also suggests it is also
reasonable that someone could be wildly in love with their partner, commit infidelity, and yet still be
deeply attached and care for their partner. It all came back to a DRD4 variation in these individuals.
Individual differences in the internal drive for a dopamine 'rush' can function independently from the
drive for commitment.

"The study doesn't let transgressors off the hook," said Garcia. "These relationships are associative,
which means that not everyone with this genotype will have one-night stands or commit infidelity.
Indeed, many people without this genotype still have one-night stands and commit infidelity. The study
merely suggests that a much higher proportion of those with this genetic type are likely to engage in these
behaviors."

Garcia also cautions that the consequences of risky sexual behavior can indeed be extreme.
"One-night stands can be risky, both physically and psychologically," said Garcia. "And betrayal can
be one of the most devastating things to happen to a couple. These genes do not give anyone an excuse,
but they do provide a window into how our biology shapes our propensities for a wide variety of
behaviors."

At this point, very little is known about how genetics and neurobiology influence one's sexuality
propensities and tendencies but Garcia is hopeful that this study will add to the growing base of
knowledge—in particular, how genes might predispose individuals to pursue sensation seeking across all
sorts of domains—from substance use to sexuality. This study also provides further support for the notion
that the biological foundations for sexual desire may often operate independently from, although absolutely linked to, deep feelings of romantic attachment.

As Garcia points out, he and his team of study co-authors have only just begun to explore the issue and plan on conducting a series of follow-up and related studies.

"We want to run a larger sample of men and women to replicate these findings and check for several other possible genetic markers," said Garcia. "We will also be conducting a number of behavioral and biological studies to better understand what kinds of associated factors motivate uncommitted sexual behavior. Most importantly, we want to explore the receiving end of infidelity by looking at how people respond to cases of uncommitted sex and infidelity."

Journal Reference:

New Method for Preventing Oxidative Damage to Cells: Findings Could Lead to Enhanced Health Supplements, Progress on Parkinson's
ScienceDaily (Dec. 2, 2010) — The discovery by UCLA biochemists of a new method for preventing oxidation in the essential fatty acids of cell membranes could lead to a new class of more effective nutritional supplements and potentially help combat neurodegenerative disorders such as Parkinson's disease and perhaps Alzheimer's.

While polyunsaturated fatty acids are essential nutrients for everything from brain function to cell function, they are the most vulnerable components in human cells because of their high sensitivity to oxidative modifications caused by highly reactive oxygen molecules in the body.

The biochemists, led by UCLA chemistry and biochemistry professor Catherine Clarke, have developed a new method for increasing the stability of polyunsaturated fatty acids. They have discovered a way to make these molecules harder to break apart so that oxidation is less likely to occur, rather than relying on antioxidants to repair damage after it occurs.

"These compounds (polyunsaturated fatty acids) are so important, yet so fragile," Clarke said. "In many diseases, cell membrane function deteriorates, and it’s exciting to think an enhanced class of supplements may be able to correct neurodegenerative diseases, and perhaps even oxidative stress-related aging. It would be a new strategy to treat and reinforce the molecule at the place where it is most prone to damage, instead of taking more antioxidants. This could be a new approach to battling diseases resulting from oxidative stress.

"Our research highlights how vulnerable these essential polyunsaturated fatty acids are," she said. "They are so readily damaged. Many neurodegenerative diseases, such as Parkinson's disease and perhaps Alzheimer's disease, are tied to oxidative stress."

Polyunsaturated fatty acids are also used to produce a huge array of fatty acid-derived hormones that mediate pain, inflammation and blood clotting.

The research, federally funded by the National Institutes of Health, is published in the online edition of the journal Free Radical Biology and Medicine, a major source for research on oxidative stress, and is scheduled for publication in a 2011 print edition.

In the research, Clarke and her colleagues show that polyunsaturated fatty acids can be strengthened by replacing their most vulnerable hydrogen atoms, which are easily stripped away, with much more stable deuterium, an isotope of hydrogen with one extra neutron. The result is the creation of a fatty acid that serves the same function as its predecessor, but without the same susceptibility to oxidation.

The biochemists also describe applying this reinforcement process to two essential dietary fatty acids and show that yeast cells treated with the reinforced polyunsaturated fatty acids are much more resistant to oxidative stress than yeast treated with normal polyunsaturated fatty acids.

"You can think about polyunsaturated fatty acids like an oil-based paint," Clarke said. "When you spread the oil-based paint on the wall, it turns into a hard coat of enamel. That happens because of an oxidation reaction. A hard coat of enamel is great for a wall but lousy for a cell membrane. Cells have to deal with damage continually and have to be able to repair the damage that results from the oxidation."

Clarke's research team included four UCLA undergraduates: lead author Shauna Hill, who worked in Clarke's laboratory as many as 70 hours a week and earned a bachelor's degree in biochemistry in June; Bradley Kay; Vincent Tse; and Kathleen Hirano, who graduated from UCLA in 2009 with a bachelor's in biochemistry and is now a graduate student at UC Berkeley.
The researchers conducted experiments with a strain of yeast specially modified to lack antioxidants. They found that colonies treated with normal, naturally occurring polyunsaturated fatty acids died quickly, while those treated with the deuterium-reinforced fatty acids displayed resilience on par with wild, unmodified yeast. The replacement of a few hydrogen atoms with deuterium meant the difference between a rapid death and vigorous life for the yeast samples.

"Shauna, with Kathleen, Bradley and Vincent, tested fatty acids in yeast mutants that lacked the antioxidant coenzyme Q, where we know they are very sensitive to stress," Clarke said. "What they showed is that when the yeast were treated with the isotopically reinforced fatty acids, they were fine, but when the yeast were treated with standard polyunsaturated fatty acids, 99 percent of them died in just four hours."

"We tested the viability of yeast—with the hydrogen atoms—that lacked the antioxidant coenzyme Q, and our test showed that they were not able to survive," Hill said. "However, wild, normal yeast with coenzyme Q were able to grow, and survived."

The researchers then replaced four hydrogen atoms with four heavy deuterium hydrogen isotopes. "The difference was enormous," Hill said. "We were really surprised that the heavy isotopes had such a drastic effect."

"Initially, I did not believe the results were correct," said Beth Marbois, a UCLA research chemist and co-author on the research. "But they were."

Yeast normally do not have these fats but will absorb both the normal and the isotope-reinforced fatty acids without preference when they are presented in solution, Hill and Marbois showed.

Other co-authors of the research included Mikhail Shchepinov, chief scientific officer of Retrotope Inc. in Los Altos Hills, Calif., and Dragoslav Vidovic from the department of chemistry at England's Oxford University.

The human body is unable to make polyunsaturated fatty acids such as omega-3 fatty acids and omega-6 fatty acids. Many people buy supplements such as fish oil, omega-3 fatty acids or flaxseed oil to get and preserve these nutrients. However, when a polyunsaturated fatty acid is oxidized, a hydrogen atom is stripped away from the molecule, causing it to form a new compound with the oxygen in the blood stream that impairs the function of the cell membrane.

Olive oil, walnut oil and flaxseed oil have some of the essential fats that we need for brain function, retina function and other critical body functions. Neurons in the brain and heart and in muscle cells have large amounts of these essential fats. Salmon has them because the fish eat microorganisms in the ocean that generate these fats.

Fish oil has 10 hydrogen atoms that are vulnerable and could be reinforced to be made less likely to degrade, Clarke noted.

Reinforced polyunsaturated fatty acids potentially could create membranes that are at least somewhat resilient to oxidative damage, Clarke said.

After one polyunsaturated fatty acid molecule is damaged, a chain reaction ensues as the adjacent fatty acids throughout the membrane become similarly degraded. What was once a semi-permeable barrier that regulated cell function becomes a rigid lattice of cross-linked fatty acids that prevents the cell from achieving its purpose—which could be anything from synthesizing a protein to sending a signal to the nervous system.

Antioxidants, found naturally in many types of berries and available in supplements such as vitamin E, target the gaps left in molecules when a hydrogen atom is removed through oxidation. The antioxidants quench the reactive oxidized lipids, forming a new compound that prevents the molecular degradation from spreading to its neighbors.

The start of the oxidation chain reaction in a cell membrane is like a house on fire, where the antioxidants are the firefighters that work to extinguish the blaze before it spreads to nearby homes. Because a deuterium atom has twice the mass of a hydrogen atom, the carbon-to-deuterium bond in the modified fatty acid is much stronger than the carbon-to-hydrogen bond in the naturally occurring version. Thus, a fatty acid reinforced with deuterium acts like a home with fire-retardant materials that make it difficult for the first spark to ignite. Ideally, no firefighters—or antioxidants—are needed.

Antioxidants are like a mop-up crew, Clarke said. After the hydrogen atoms are pulled off, antioxidants stop the harmful chain reaction. Using another analogy, Clarke said, "Instead of taking an antioxidant to jump in front of a bullet, you place bullet-proof vests on the hydrogen atoms."

While wild yeast are resistant to oxidation at room temperature, they do begin to experience stress as the temperature rises. At high temperatures, wild yeast colonies treated with deuterium-reinforced polyunsaturated fatty acids show much greater resilience than those treated with unmodified fatty acids.
acids—a result that indicates that even cells with integrated antioxidant mechanisms can benefit from the addition of deuterium-enhanced fatty acids, Clarke said.

**Eat fish and stay physically active**

UCLA's Marbois recommends eating fish frequently, especially fatty fish such as salmon, and staying physically active.

"Scientists who conduct aging research know that the one critical characteristic of people who live very long lives is not taking nutritional supplements but staying physically active," she said. If you take fish oil, Marbois advises, keep the container in the refrigerator. "At room temperature, they will oxidize and degrade at a faster rate than in the refrigerator," she said.

Both Clarke and Marbois praised the student researchers.

"It's a real privilege to work with these students," Marbois said. "The undergraduates here constantly amaze me.

Clarke described working with the students as "fantastic, so much fun." The students returned the praise of their mentors.

"Working in Professor Clarke's laboratory has been a life-changing experience for me," said Hill, who is applying to graduate schools in biochemistry and cellular and molecular biology. "If it weren't for this lab, I don't know if I would be applying for grad schools right now."

"Conducting research in Professor Clarke's laboratory is an amazing opportunity," Tse said. "Friends at other universities have a hard time working in laboratories, but at UCLA, the opportunities are here for us, and I feel privileged to be able to do this research."

"I wish I got involved in research earlier; it's so interesting and rewarding," Kay said.

**Journal Reference:**


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**Atlas of the atmosphere**

The air is teeming with microbes, and scientists are finally starting to understand how they influence everything from meteorology to epidemiology

Published 1st December 2010 03:21 PM GMT]

Every cubic meter of air holds up to 100 million microorganisms, but the diversity and behavior of these microbes remains masked to microbiologists — until recently, that is.

Thanks to next-generation sequencing techniques, scientists are finally uncovering the details of the biodiversity and biogeography of this largely unknown ecosystem. They are discovering airborne microbes do much more than just ride the wind transmitting disease — microbes also help create the intricately beautiful designs in snowflakes and facilitate the formation of clouds, for example. Studying them, researchers say, could give insight into how to better monitor global climate change, as well as predict and track weather cycles and disease and allergen outbreaks.

"There's going to be an explosion of studies using these new techniques," said Jessica Green, microbial ecologist at the University of Oregon.

Recent research published in *PNAS* suggests that the diversity of microbial life in the air is on par with the soil, at least in urban areas, yet the air remains vastly understudied in comparison.

"Just seven or ten years ago we didn't realize bacteria existed in clouds," said Anne-Marie Delort, professor of microbiology and organic chemistry at Université Blaise Pascal in France. Now researchers know microbes act as a surface for the condensation of water vapor in the atmosphere, thus forming clouds. Recent research publish in *Science* shows microbes also play the same role during snowflake formation and other types of precipitation. The next step, Delort said, is to uncover their metabolic activity in clouds and influence on atmospheric processes. If they are metabolically active, she added, microbes could not only be acting as cloud condensers, but affecting the carbon and nitrogen cycles as well.

Airborne microbes could even play a role in the impact of climate change. According to Christine Rogers, aerobiologist at the University of Massachusetts, the increase of carbon dioxide in the atmosphere could be creating more and larger plants which are food for microscopic fungi. More airborne fungi could affect people with allergies and asthma — plus, added Green, create a feedback loop by providing more surface area for cloud condensation, helping to create more clouds. The number of clouds in the air affects how much heat is trapped in the atmosphere as well as how much heat is reflected from the sun, said
Delort. However, researchers aren’t sure whether more clouds in the sky will heat or cool the atmosphere, but they are positive it will affect climate change one way or the other.

One issue that has set aerobiology behind its sister fields of soil and water microbiology is that it needs an intimate integration of both the physical and biological sciences to progress — two fields that often don’t consider each other. "Physicists don’t think about the possibility of life [in the air]," said Delort. "They study the particles, but ignore the biology."

Aerobiologists, on the other hand, often ignore the important physical and chemical characteristics of microbes, said Jordan Peccia, environmental engineer at Yale University. In order for the field of air microbiology to blossom, the two disciplines need to work together.

Quantifying the diversity of microbes in the air has also proven difficult until relatively recently, said Noah Fierer, microbial ecologist at the University of Colorado, Boulder. After the development of high-throughput pyrosequencing in 2005, however, researchers began to infiltrate the secret lives of airborne microbes. Now, scientists can "describe the spatial and temporal variability in these communities without relying on culture-based techniques that miss the majority of bacteria living in the atmosphere," he said.

Fierer has a simple, yet ambitious plan to uncloak the microorganisms of the atmosphere around the globe: map them. Starting with the continental United States, he intends to survey every state in more than 200 different urban and rural locations by developing a low-cost sampling device that can be sent to volunteers to sample the airborne bacteria outside their homes.

Fierer said he believes that the map will help determine the effects of land-use (e.g. agricultural, urban, suburban) and season on bacterial proliferation and distribution. It will also help decipher the influence of airborne bacteria on weather, climate change, and plant and human health.

Fierer’s team also plans to collect samples of fungi and viruses in the air, and is currently working out the techniques for analyzing viral communities.

Researchers also need to pin down how different types of microbes get into the atmosphere in the first place. One hypothesis is that some microbes are released into the atmosphere from the popping bubbles of crashing ocean waves. In most cases, however, wind is the likely culprit for spreading microbes from solid surfaces like leaves and soil into the air. Wind can be a powerful transporter for microbes — microbes riding on airborne desert dust travel freely between Africa, Europe, and the Caribbean.

Many researchers still view the atmosphere solely as a conduit for the transportation of microbes by wind, but not a habitat in and of itself. Green, however, said she believes that the atmosphere has everything a microbe would need to survive: tolerable temperatures, reasonable pH levels, and sources of organic carbon that are on par with soil and water. It’s just a matter of surveying the air to discover whether the microbes are metabolically active for extended periods of time while suspended in cloud water and in the air, she said, which would suggest that they are inhabitants of the atmosphere rather than passengers on the wind. The microbes could potentially sustain populations through 50 generations, said Green. Assuming a four-day generation time, microbes could be suspended in the atmosphere for up to 200 days.

"If the atmosphere is a habitat where microbes live, this will fundamentally change our conceptions of atmospheric processes," Green added.

Scientists studying the life of the air agree: They aren't going to get bored studying airborne microbes for a long while. "We don't need to travel to deep sea vents [to study microbes]," said Fierer. "The air right outside our door is teeming with things to explore."


Some questions
by anonymous poster, [Comment posted 2010-12-03 11:04:48]

Is there any reason to believe that bioparticulates have a special role in nucleation processes like cloud and snowflake formation, different from the long established role of inanimate atmospheric particulates? Are we really talking about something new here?

Also, care must be taken in interpreting biome sequencing data. E.O. Wilson famously pointed out that the DNA diversity in a single cubic centimeter of soil corresponds to the total genomic content of something like 4000 species of bacteria, of which only a
few percent are known to microbiologists—ignoring the possibility that the same sequence complexity could be produced by as few as a dozen species of eucaryotes.  

by Donald Duck, [Comment posted 2010-12-02 22:14:11]

Every single darn place we look hard enough, there is life. No matter how big or small, above ground or underground, we find out things exist once we look for them. I wouldn’t at all be surprised to see not just bacteria but bacteria much smaller than we would expect in the clouds.

Yes, I know nanobacteria are not yet thought to be alive, but we have proven rather adept at underestimating nature.

by Cheryl Scott, [Comment posted 2010-12-01 12:47:22]

Wow, I had no idea... I wonder how high the "aerobiosphere" extends... Might there be even more fascinating extremophiles we have yet to discover?

By Jef Akst

**Arsenic supports life?**

**The toxic element might be able to replace phosphorus to support microbial growth, casting doubt on the belief phosphorus is essential to life**

[Published 2nd December 2010 05:22 PM GMT]

A strain of bacteria isolated from a salt lake in California can grow on arsenic, seemingly in lieu of phosphorus in its DNA and other major biomolecules.

The finding, published today (December 2) on the *Science* Express Web site, throws into doubt the long-held belief that phosphorus is absolutely essential to life, and broadens the range of environments in which scientists might expect to find extraterrestrial organisms.

"This is a surprise," said biochemist Barry Rosen of Florida International University, who was not involved in the research. "Not just for bacteria but for life in general, arsenic is one of the few elements that is considered to be only toxic and has no role in metabolism."

It's "pretty damn surprising," agreed ecologist James Elser of the Arizona State University, who also did not participate in the study. "I've spent my career studying phosphorus limitation, and how organisms use phosphorus, and how nucleic acids always have phosphorus in them, and now there's this exception. That's what's really weird."

Arsenic falls directly below phosphorus on the period table, and thus has many similar chemical properties. In contrast to relatively stable phosphorus-based molecules, however, arsenic compounds are extremely unstable. While phosphorus compounds take years, decades, or even millennia to break down, the rate of hydrolysis of arsenic compounds is usually measured in seconds or minutes.

In fact, its similarity to phosphorus and its instability partly explains why arsenic is so toxic. The body may not be able to distinguish between phosphate—the most common form of phosphorus in organisms—and its arsenic equivalent, arsenate. As a result, scientists suspect that arsenate can be incorporated into molecules and pathways that normally use phosphate, causing downstream processes to fail if the arsenate molecules are quick to break down or otherwise don't work properly.

But at least one organism seems to have tackled this problem. Sampling the sediment of Mono Lake in California, a salt lake with high dissolved arsenic concentrations, NASA astrobiologist Felisa Wolfe-Simon of the US Geological Survey and her colleagues identified a bacterium that can grow when cultured with arsenic, but only trace amounts of phosphorus. Under conditions of high arsenic, the bacteria didn’t grow as well as when phosphorus was abundantly available, but they grew significantly more than when neither arsenic nor phosphorus was provided.

"That says, to me, that they really are using the arsenic," Rosen said.

To determine how the bacteria used the normally toxic element, the researchers provided the cultures with radiolabeled arsenic, and found it in parts of the cell containing proteins, metabolites, lipids and nucleic acids. Further analysis of the DNA suggested that the arsenic might simply be replacing the phosphorus in the backbone of the molecule atom-for-atom.
"The challenge then is to explain how it is conceivable that an organism is able to use [arsenic] in its genetic molecules," given that they fall apart so quickly, said astrobiologist Steven Benner of the Westheimer Institute at the Foundation for Applied Molecular Evolution, who was not involved in the research. One possibility, he suggested, is that interacting, as-yet unknown molecules stabilize the arsenic-based compounds, but first more research is needed to confirm how the arsenic is being incorporated into DNA and other molecules.

"They show that arsenic is in the DNA, but they don't show that it is participating in the backbone, replacing phosphate," Rosen said. "To be truly convincing, I'd like to see an actual molecule that has arsenic that is active and functional."

If arsenic is indeed serving as a surrogate for phosphorus under certain conditions, however, "the result will have sweeping consequences," said Benner, who served on a discussion panel today at a NASA news conference about the study. "It will overturn a century of information about the comparative behavior of phosphates and arsenates."

Another open question is whether or not these bacteria are using arsenic in their natural habitat of Mono Lake, said Elser, also a member of today's discussion panel. The experiments demonstrate that the microbes are capable of growing on arsenic, but these are contrived laboratory experiments. "The only way to answer that question is to get in a field situation and [use] radiolabeled arsenic under more realistic field conditions," he said.

The results raise some obvious questions about the chemical environments that might be able to support life, and expand the search for environments that contain extraterrestrial life. Additionally, the bizarre bacteria may provide some creative solutions to some critical problems. Because arsenic is a toxic and quite prevalent contaminant, for example, scientists are always looking for ways to remove it from the environment, Rosen said. "If we could devise organisms that could capture and accumulate the arsenic, it might be possible to use those for bioremediation."

Another potential application for an arsenic-loving microbe is in phosphorus recycling, Elser said. "Phosphorus for agriculture is going to start running out in a few decades," he said, and bacteria that use arsenic instead could help keep vital ecosystems running. (Click here to read last month's feature about Elser's work on the potential effects of a worldwide phosphorus shortage.)

"Those are just science fiction applications that now pop into mind now that we think there is an organism that might not really need phosphorus," Elser added, "which is just shocking for me to say."

Interesting
by RON HANSING, [Comment posted 2010-12-06 09:47:45]
First, why do you publish anonymous letters. If you have a grip be the mensch and use your name.

I do think the article deserved publishing in a peer review journal; albeit, it preliminary data and of course more research is needed but there is a spark that just might be relevant. And that is important. I get the feeling from reading some of the letters that there is a hint of jealousy if the research pans out, it will be a Nobel Prize consideration.

Second, I do not agree that the research is PR and Hype. Yes, there is a lot that can be criticized, but that's why we publish, to gather feedback and ponder future research.

Show me any solitary scientific article and I can with not too much effort rip it apart. That's why Science needs to be independently collaborated, and future research substantiates or modifies the original claims. We have to start somewhere and this article is a good worthy beginning
Ron Hansing 12.6.10

shameful science
by anonymous poster, [Comment posted 2010-12-05 19:26:29]
This article has been completely debunked. Microbiology critique, LINK, chemistry critique, LINK

Multiple enzyme naturally resistant to arsenate?
by Greg Pahel, [Comment posted 2010-12-04 08:25:50]
This is one that needs very careful vetting. Back in the old days of doing heavy element labeling it took slow adaptation to get bacteria to grow on heavy nitrogen and even then the growth rate was severely slowed. This is just adding one mass unit to the nitrogen. If these bacteria truly have this capability then I would expect that in their natural environment they would have some arsenic incorporated. Is resistance to arsenate in their native environment based on keeping the arsenate out, or converting it to a non-toxic derivative or is every one of the myriad enzymes that utilize phosphate and phosphate derivatives already resistant to what is normally a very potent competitive inhibitor. Adenosine tri-arsenate as the basis of energy transfer? I very much doubt it.

Exciting news but long way to go.
by Nitin Gandhi, [Comment posted 2010-12-03 22:10:40]
This news was exciting, however to prove that As has replaced P is far fetched. With the improved technique in purification and analysis, I fail to understand why was there so much hurry to publish the immature results one can work for few more months and make the solid claims on either side.

Secondly, is there any experiments to show that the more length and breadth of microorganisms are NOT incorporating As? and resist the toxicity? has any one proved that?

Thirdly: if the isolated organism is evolved to take (and replace As) into its cellular components including the DNA, then my common sense tells that no matter what it will NOT revert back to taking P even if there is absence of As and excess of P, (even if Lion gets too old to hunt it will NOT start eating grass!)

Lastly I hope that the claims made are found to be true, it will give the moral boosting to the entire field of (biomedical) science in general and NASA astrobloogy program in particular.

Otherwise (American) science will suffer more, which is already loosing the glory, output and reputation.

Not at all Surprising...!!!!!
by Dr HP Pandey, [Comment posted 2010-12-03 20:22:32]

Arsenic supports life...is not at all surprising, because in Homeopathic System of medications Arsenic is widely used as a Life Saving Drug to cure several chronic diseases. This finding is an indication, rather testimony for the homeopathic use of Arsenic in different dilutions. The scientists who surprise should go through Materia Medica of Homeopathic medicines for more information.

Very Doubtful...but hopeful new chemistry might be revealed
by null null, [Comment posted 2010-12-03 14:03:25]

Doubtful!

Arsenate esters are well known to form spontaneously and reversibly in aqueous media. This fact is used by organic chemists to circumvent the need of synthesizing phosphorylated substrates required by many enzymes like D-fructose-1,6-bisphosphate aldolase. This enzyme requires dihydroxycetone phosphate (DHAP) as the donor reactant. However, if you simply mix dihydroxycetone with arsenate/wHAMMO, you get spontaneous and reversible formation of dihydroxycetone arsenate that can then be utilized by the enzyme. Perhaps the organism is using arsenate in a role such as this but I really don't see how it could make stable DNA wherein phosphate is replaced with arsenate. If it is used in the organisms DNA, then there is certainly some fascinating counter intuitive chemistry to be learned. Until a few simple and telling experiments are performed, I'll remain doubtful. Not sure how this article was published without these telling and obvious experiments. Would be cool if I were wrong here.

Carlos F. Barbas, The Scripps Research Institute

For a few of the many examples where spontaneous arsenate ester formation is used to produce unstable yet useful pheno-mimics see:


another cold fusion?

by anonymous poster, [Comment posted 2010-12-03 13:30:51]

The various claims authors make in this paper are based on indirect measurements and/or numerous convoluted assumptions. For example, the size of the genome for the isolated bacterial strain is unknown. The authors use in their calculations the average size of genomes of several known bacterial species (for which the individual values differ probably by an order of magnitude). Even more importantly, the chemical structures in which the detected arsenic is presumably engaged remain unknown. Moreover, no attempt was made to further fractionate nucleic acids and determine As levels separately in DNA and RNA. Yet, the authors make their farfetched conjectures about As substituting P in the genome.

Some aspects of arsenic chemistry that are critical to the interpretation of the results are ignored. Extensive literature exists on the binding of arsenic compounds to cellular protein (through protein sulfhydryls). Such a binding can be expected in any organism exposed to As. It remains unclear what portion of the detected As was in such conjugates (and should be subtracted from all the estimates of the putative P to As substitutions).

It is surprising that some obvious controls are omitted. For example, the efficiency of the cleanup/fractionation procedures to remove merely occluded $^{75}$As should be verified. This could be done, e.g., by spiking a lysate from cells without radiolabeled As with appropriate amount of $^{75}$As before fractionation/cleanup. Similarly, if arsenic were indeed to substitute phosphorus in the macromolecules, a standard approach would be to do a competition experiment—a control culture with medium containing both $^{75}$As and phosphate. Phosphate in the medium should attenuate any specific arsenium incorporation as a phosphorus substitute but would be unlikely to affect the background levels of non-specific radioactivity as well as direct arsenic binding to biomolecules (without substituting for phosphorus).

Perhaps the authors (as well as the manuscript reviewers) were somewhat too eager to get these preliminary observations published quickly.

Why we interview people who are "not involved" in the research
by Alison McCook, [Comment posted 2010-12-03 12:51:06]

Thanks for your question—we always speak to experts who were not involved in the current research, to get their take on the findings. This is why you often see us quote people who were "not involved in the current study."

Thanks
Alison McCook, News Editor

An Insult to Well-Trained Scientists
by eve barak, [Comment posted 2010-12-03 12:36:31]

I am pleased to see that some of the commentators are drawing attention to the devastatingly complete lack of scientific rigor underpinning this "discovery."

It is really frightening to think that:
1—A reputable "peer reviewed" journal would publish the work without adequate supporting data.
2—The Scientist would report on it with only a minimal nod to the inadequacy of the supporting data (i.e., the quote from Barry Rosen).
3—Madison-Avenue-style PR determines what kind of "science" the American people learn.
4—Nobody in the communications media seems to have adequate general understanding of the process of science, nor do any of them seem to care—so long as they can sell newspapers and TV ads.
by Roger Rowlett, [Comment posted 2010-12-03 12:13:01]

Unfortunately, the data as reported, while "consistent", is not "sufficient" to convincingly prove the incorporation of As into biological molecules. Too much press, too little science. The X-ray data really only show the presence of As(V), which is consistent with arsenate ion as well as arsenate-labeled biomolecules. Furthermore, the rationalization that the arsenates are stabilized in the cell by the *hypothesized* presence of poly-beta-hydroxybutyrate is not sufficiently supported in the paper by hard data or by chemical precedent. Can the activity of water really be lowered enough to slow the hydrolysis of arsenate esters to that comparable to phosphate?

Want to be convincing? Isolate and purify an actual biomolecule (aresenoprotein, arseno-nucleotide or nucleic acid, arsenolipid) and characterize it with an method capable of distinguishing arsenate from an arseno-compound. NMR, XRD, MS, something else conclusive. Please.

Convincing data was collected (XRD, EXAFS on purified protein) to demonstrate the presence of cadmium in the first known cadmium metalloenzyme. A similar approach should be done here, if arseno-biomolecules are really as stable as hypothesized.

**Skeptical as well**

by anonymous poster, [Comment posted 2010-12-03 11:56:32]

There must be some massive politics involved in this article's publication. Science is really going down the tubes.

Look at the data in Table 2. Where's the negative control showing that 11% radiolabel recovered in the "DNA fraction" won't also happen with phosphorus-fed bugs? Also, "DNA fraction" is in quotations because if you look Figure 2a shows massively different profiles of nucleic acid isolation results between As+ and As- bacteria. You can't possible compare those. For some reason it seems As inhibits recovery of RNA. Anyway, I agree with others that this bacterium is surviving in the arsenic and likely sequestering it in the giant vacuole found in this treatment; but we're still far off from seeing arsenic's actual incorporation into biomolecules.

**Show me the molecule**

by anonymous poster, [Comment posted 2010-12-03 11:32:55]

I also am skeptical. Extraordinary conclusions call for extraordinarily thorough documentation.

**Too Much Hype**

by anonymous poster, [Comment posted 2010-12-03 11:20:36]

I agree with Mavi Gozler. The News People are getting ahead of the science. This interesting observation of bacteria who live in the presence of arsenic needs more testing to understand what is really happening. Using Occam's razor, it is more likely that the bacteria is able to protect itself from arsenic's toxicity. Otherwise, the bacteria would need to have created a whole new set of enzymes & stabilizing proteins to allow the substitution of Arsenic for phosphorus in biomolecules. Given the known instability of arsenic organic compounds, this would be quite an evolutionary feat.

**Or This Might Be Biochemistry's "Cold Fusion" Moment**

by Mavi Gozler, [Comment posted 2010-12-03 10:29:39]

I am bit surprised that no commenter has expressed monumental skepticism.

Allow me to be the skeptic until all the analyses are complete. I think we all remember how incredulous we were when the "cold fusion breakthrough" was announced a couple of decades ago.

Principles of physics and chemistry cannot be defied so long as those principles have been firmly tested countless times and rooted in our understanding. If arsenate can indeed replace phosphate in the fundamental biomolecules to form a viable organism with humming-along homeostasis, this is the discovery of a generation, maybe two generations.

I missed the link to the peer-reviewed article in which the "DNA" (if it is that) was isolated and characterized as to whether it possesses cytosine, guanine, adenine, and thymine...and even if they are on ribose. We are led to believe there is no phosphate! And what about proteins: are they the 20 amino acids we know of...? And clearly kinases of these proteins arsenylate rather than phosphorylate?

I am inclined to believe that this organism lives in spite of the presence of arsenate, and not because of it, and it finds a way to sequester it, perhaps to exploit it in limited ways.

**Not Involved**

by Robert Spencer, [Comment posted 2010-12-03 10:10:39]

Can someone explain why you always interview someone "who was not involved" in the study? NASA

by Joe Greig, [Comment posted 2010-12-03 08:44:39]

Though not a professional scientist, I am in agreement with John Collins. I saw the NASA report on TV and it seemed that the science was subordinated to PR for looking for extra terrestrial life.

**Too surprising**

by JOHN COLLINS, [Comment posted 2010-12-03 06:15:28]

Considering the rare evolutionary events that have allowed selenium or molybdenum to be incorporated into a handful of rare enzymes to carry out extreme oxido-reduction reactions it is completely amazing, should we say unbelievable, to suggest that arsenic has replaced phosphate and its functionality in a living cell. Coping with toxicity by special sequestering of arsenic is another matter. I am surprised more by the fact that these flimsy findings are touted under the heading of support for theories of life forms based on arsenic instead of phosphorus.

**Not too surprising**

by Santosh Bhaskaran, [Comment posted 2010-12-02 22:01:26]

It is not too surprising or shocking by this discovery.

Forgetting philosophy, life is just a set of chemical reactions (not completely known) which can multiply under certain physical conditions. Hence life based on arsenic or any other element in the periodic table is possible. Carbon can be replaced by silicon, oxygen by sulphur, etc. since they share the same place in the periodic table and therefore have similar properties.
Same is the case for life in any physical or chemical environments. It is just that the chemicals (and hence set of chemical reactions) could be different.

**Clean up water**

by HIMADRI SAMANTA, [Comment posted 2010-12-02 14:45:34]

I was wondering if one take advantage of the bacteria to clean up the arsenic contaminated ground water in Bangladesh and eastern part of India

**Is this a new finding?**

by HAO BO GUO, [Comment posted 2010-12-02 13:33:09]

At least 9 years ago there had been a publication in Nature (Ma et al. 2001, 409, 579) indicated that a fern bioaccumulates arsenic. It is not surprising that As behaves as P, since both elements are closely related. In their book The Biological Chemistry of the Elements, Frausto da Silva and Williams also pointed out that As is a possibly essential elements for some species, e.g., Brown agae, Ferns and P. vittata in plants, or coelenterates in animals.

**In Europe, seven in ten HIV diagnoses are in men**

Roger Pebody

Published: 06 December 2010

Just under 26,000 people were diagnosed with HIV in the European Union in 2009 and 72% of those diagnosed were men, researchers report in the December 2 issue of *Eurosurveillance*. Rates of infection in gay and bisexual men are on the rise, but are falling in heterosexuals.

The report comes from the European Centre for Disease Prevention and Control, which collates data from national public health bodies. There are some inconsistencies in the ways in which these bodies collect information, there are reporting delays and some data are missing. Nonetheless there is some information from all of the 27 European Union countries except Austria, and the two non-EU countries of Norway and Iceland are also included in the analysis.

Across Europe, the average is for there to be 5.7 new diagnoses per year for every 100,000 people in the population. However this rate is far higher for men (8.3 per 100,000) than for women (3.2 per 100,000). Moreover some countries have diagnosis rates significantly above the average—Estonia (30.7), Latvia (12.2), the United Kingdom (10.7) and Belgium (10.3).

Looking at trends since 2004, the overall diagnosis rate in the proportion is broadly stable. However, the proportion of men diagnosed has risen (from 64% to 72%). This rise reflects a 24% increase in diagnoses in gay and bisexual men (from 7263 men in 2004 to 8974 in 2009), occurring at the same time as a 24% fall in diagnoses in heterosexual men and women (from 13,148 to 9975).

The number of diagnoses in injecting drug users has fallen by 40%—from 1952 to 1171 cases. However in several East European countries, injecting drug use remains the predominant mode of transmission.

Over this five year period, HIV diagnoses have tripled in Bulgaria, Iceland and Slovakia, and doubled in Hungary and Slovenia. They have decreased by more than 20% in Denmark, Estonia, Italy, Luxembourg and Romania.

Returning to the 2009 figures, only eleven countries supplied enough information on CD4 counts to provide estimates of the proportion of people who were diagnosed late (with a CD4 cell count below 350 cells/mm³). However in ten of these countries the results were very consistent—between 40% and 52% were diagnosed late. The one honourable exception is Luxembourg, where only 24% were diagnosed late. Individuals whose country of origin is outside Europe are more likely to be diagnosed late than Europeans.

The authors say that the figures on late diagnosis, whilst incomplete, “suggest that access to testing and treatment needs to be improved among those at risk”. Accordingly, the European Centre for Disease Prevention and Control has issued *guidance on increasing the uptake of HIV testing*. Among this document’s core principles are that political commitment is required, HIV stigma must be tackled and legal obstacles removed. HIV testing should be normalised and treatment made available for all, including undocumented migrants. Moreover, each country needs its own national HIV testing strategy, developed with the involvement of a wide range of stakeholders.

**References**

2. The European Centre for Disease Prevention and Control, in collaboration with WHO, have published a longer report with more detailed data and information on all countries in the WHO European region: *HIV/AIDS surveillance in Europe 2009*.
HIV Reservoir in the Brain Doesn’t Respond to Treatment Intensification

Adding a new antiretroviral (ARV) drug with the ability to penetrate into the brain to an existing regimen doesn’t reduce residual HIV in the brain or brain inflammation in people who have good suppression of HIV elsewhere in the body, according to a study published in the December 15 issue of the Journal of Acquired Immune Deficiency Syndromes. These data suggest that the brain does serve as a protected reservoir of HIV infected cells, and that simply adding ARVs that penetrate into the central nervous system (CNS) may not shut down residual virus or reduce brain cell inflammation.

In 1996, researchers dramatically pronounced that they believed they could eradicate HIV in a person’s body within two to three years with combination ARV therapy including protease inhibitors (PIs). That same year, the first batch of PIs was approved.

Within a few years, however, this optimistic eradication hypothesis was laid to rest because researchers discovered that reservoirs of virus go unscathed by ARV therapy. And in recent years, these reservoirs have been tied to ongoing cellular inflammation, responsible for all kinds of harmful effects, including cardiovascular disease, cognitive problems and certain cancers.

This has led to the question of whether the virus is actively replicating within the reservoir or if the cells are simply releasing virus that is trapped within the cells. Answering this question is important. If ongoing replication is occurring, then simply adding more potent drugs could shut it down. If there is no active replication, and infected cells are simply releasing intact virus, then the only way to get rid of it will be to purge these infected cells entirely.

One of the suspected reservoirs is the CNS, where virus has been found despite undetectable levels in the blood. To better understand what is happening in the brain, Aylin Yilmaz, MD, PhD, from the University of Gothenburg in Sweden, and his colleagues tested the strategy of treatment intensification in 20 people living with HIV who had undetectable levels of HIV in the blood, but detectable levels in their brains.

The study involved adding one of two types of intensified ARV drugs for six weeks, and then switching over to the other type for an additional six weeks. One type of ARV, Fuzeon (enfuvirtide), doesn’t penetrate well into the brain. It’s chemical structure is too large. The other type of ARV—in this case either Selzentry (maraviroc) or Kaletra (lopinavir plus ritonavir)—does penetrate well into the brain.

The research team’s theory was that if active replication were occurring in the brain, then intensifying treatment would shut it down. If intensification didn’t work, then the experiment would prove that active reproduction was not the cause of residual virus.

Yilmaz’s team found that the latter was true. Intensifying treatment did not reduce the level of HIV present in the brain, nor did it reduce the level of cellular inflammation. The use of a drug for six weeks that did not cross over into the brain was necessary to ensure that whatever effect they found was not a result of virus reduction in other parts of the body, but what was actually occurring only in the CNS.

The authors argue that their results have two implications. First, the data indicate that the tiny bit of detectable HIV in the brain is not due to active reproduction, and that new strategies will be needed to get rid of it. Further, the data suggest that a trend toward seeking and using ARV regimens with good brain penetration might not have the intended effect of lowering HIV and reducing cellular inflammation there.

Guardian Examines Difficulty Of Delivering Polio Vaccines In War-Torn Parts Of Africa, Like DRC

UNICEF is calling for an immediate ceasefire in the Democratic Republic of Congo (DRC) so that polio vaccinators can access millions of children in an effort to beat back the re-emergence of the disease in several African nations, the Guardian reports. "We are calling on all parties to the conflict to respect the vaccination days and cease fighting," said Pierrette Vu Thi, UNICEF's representative in the DRC. "All children have the same right to health," Vu Thi said.

"The aggressive return of the contagious paralysing virus comes just five years after it was declared eradicated in most of the world. It marks a major setback in the race to make polio only the third disease, after smallpox and the cattle virus rinderpest, to be eradicated," the publication writes. A vaccination campaign last month aimed to reach 72 million children in 15 African countries, but "vaccination teams have struggled to reach children in war zones, such as eastern DRC, where government forces, the Rwandan army and militias are fighting," according to the Guardian.

Over the past six months, up to 800 suspected cases of polio have been identified in 12 African countries, according to Rotary International. The WHO puts the number of confirmed polio cases at
"Determining numbers is complex," said WHO spokesperson Rod Curtis. "Multiple factors, such as the Republic of Congo not having seen polio for 10 years, or adults dying before being able to provide stool samples, mean that a significant number of early cases in the outbreak did not provide diagnostic specimens," he said.

"As soon as we have one case of polio, we consider that we are dealing with an epidemic," said Andre Kasogo, a UNICEF immunisation officer in the DRC. "Polio is highly contagious. One person can pass the virus to 200 others and each of those can infect 200 people," Kasogo said. He also discussed why the disease might have returned to the DRC. "If polio has returned, it is firstly because of the failure of our health system. While I was at the ministry [of health] we managed to set up a line of credit for childhood vaccination but because of fears of corruption and inefficiency we never succeeded in getting the civil servants to disburse the money," he said. Kasogo also noted the re-emergence of polio in Angola, which borders the DRC. "There have been recent, large-scale population movements from our neighbour Angola, which is infected," he said (Smith, 12/5).

The DRC has launched a second round of polio immunizations, which has been organized by the government of the DRC and partners, including the WHO, UNICEF and others, PANA/Afrique en ligne reports (12/3).

Health Minister Georges Moyen "said the first round of the campaign in September had been a success, reaching 105 percent of targeted people. 'This rate is explained by the fact that we aimed to vaccinate 4,135,000 people and in the end it was 4,300,000 who were vaccinated,' he said," Agence-France Presse reports. The final round of the vaccination campaign is scheduled for the end of December. According to UNICEF, the DRC has received 18 million doses of the polio vaccine (12/4).

Species Extinction Could Lead Humans To Become More Vulnerable To Infectious Diseases

"[T]he loss of biodiversity may make humans more vulnerable to infectious diseases," according to a review article published Thursday in the journal Nature, VOA News reports (DeCapua, 12/6). "The review analyses studies of 12 diseases, including West Nile fever and Lyme disease, in ecosystems around the world," Nature News reports. "In every study, the diseases became more prevalent as biodiversity was lost. For example, three studies showed that a decreased diversity of small mammals in an area causes the prevalence of hantaviruses – which induce fatal lung infections in humans – in host animals to rise, thereby increasing the risk to humans," the news service writes (Gilbert, 12/1). "Why this is the case remains a mystery, the authors added. What isn’t a mystery is the need to counter the extinction scenario by working to closely monitor the potential spread of infectious disease while preserving natural habitats," HealthDay News/BusinessWeek reports (Mozes, 12/1).

Surprising AIDS-Treatment Benefits, Prevention Strategy in Epidemic Regions of Africa; Anti-Retroviral Therapy Yields 'Lazarus Effect'

ScienceDaily (Dec. 6, 2010) — Two teams of researchers at UC San Diego and other U.S. and African universities and the World Bank have documented significant spillover benefits of a drug therapy to combat AIDS symptoms and a novel prevention strategy that focuses on girls in Sub-Saharan Africa, an area with two-thirds of the world's HIV infections.

A recently published paper in Public Economics documents a dramatic "Lazarus effect" in AIDS-affected households in rural Kenya when infirmed members received anti-retroviral therapy (ART). The study found that not only did the health of those treated improve, but the households also began to accumulate livestock and other assets and they increased their investments in the education of their children.

"Most successful AIDS relief initiatives have been lopsided in their focus on anti-retroviral therapy, but behavioral dimensions of the epidemic are equally significant," said Joshua Graff-Zivin, co-author of the study and associate professor of economics at UC San Diego’s School of International Relations and Pacific Studies (IR/PS). "Anti-retroviral therapy may be achieving much more far-reaching impacts than just the medical benefits, and anti-retroviral therapy may help the continent escape a much broader set of behavioral poverty traps that would otherwise arise from stratospheric HIV-prevalence rates."

The study was supported by a partnership of the U.S. Agency for International Development. Graff-Zivin worked with Harsha Thirumurthy, assistant professor of health economics at the University of North Carolina, and Markus Goldstein, a senior economist at the World Bank. The team showed that when affected members of rural Kenyan households received the drug therapy, a range of household...
investment indicators suddenly improved. In addition, children's nutritional status went up and their school attendance increased more than 20 percent within six months after treatment was initiated for the adult patient.

"This Lazarus effect, whereby those who had expected a swift decline and death are granted a new lease on life by treatment, suggests that without effective anti-retroviral treatment, the epidemic may be having pervasive negative effects on people's willingness to think long-term and to invest for the future," Graff-Zivin said. "This study shows that effective treatment yields significant economic dividends such as improved capital investment. Based on our latest field research we also think anti-retroviral therapy enhances environmental stewardship and a host of other positive effects as households switch from a sense of hopelessness to planning for their long-term futures."

In a separate study conducted in the southern African nation of Malawi and recently published in *Health Economics*, researchers found that providing small monthly cash payments to girls significantly reduced sexual activity, teen pregnancy and marriage. New results from a series of working papers report that the prevalence of HIV and Herpes is also significantly reduced by the intervention. In order to continue receiving the money as part of the study, the girls were required to remain in school as part of a "conditional cash transfer" program.

Two dramatically positive results were measured:

- About 18 months after the program began, HIV prevalence among the participating schoolgirls was 60 percent lower than the control group (1.2 percent vs. 3.0 percent).
- The prevalence of Herpes Simplex Virus type 2, the common cause of genital herpes, was more than 75 percent lower among the girls participating in the study compared to a control group (0.7 percent vs. 3.0 percent).

"This study was the first rigorously estimated evidence that a behavioral intervention may have meaningful effects on the trajectory of the HIV epidemic," said Craig McIntosh, a co-author of the study and associate professor of economics at IR/PS. "Similar programs in Mexico, Brazil and Nicaragua have demonstrated efficacy in improving school enrollment, learning or labor-market outcomes, but we suspected that the conditional-cash-transfer approach could also have a strong impact on the health of girls living in an epicenter of HIV infections."

The conditional-cash-transfer program virtually eliminated sexual relationships between teen-age girls and men over 25. "This is very important because this approach greatly reduces HIV transmission from an older demographic group to a younger one, which could lead to the epidemic burning itself out," McIntosh said. "This study shows how the lives of girls can be improved, vulnerable households can be protected, and spread of the HIV epidemic can be significantly slowed."

**Journal References:**


**Over-Reactive Immune System Kills Young Adults During Pandemic Flu**

ScienceDaily (Dec. 5, 2010) — A hallmark of pandemic flu throughout history, including the 2009 H1N1 pandemic, has been its ability to make healthy young and middle-aged adults seriously ill and even kill this population in disproportionate numbers. In a paper published Dec. 5 in Nature Medicine, Vanderbilt University Medical Center researchers provide a possible explanation for this alarming phenomenon of pandemic flu. The study's findings suggest people are made critically ill, or even killed, by their own immune response.

On November 19, Jason Martin returned to the Medical Intensive Care Unit (MICU) at Vanderbilt University Medical Center for the first time since he nearly died there during last year's H1N1 flu pandemic. The tall and burly Warren County, TN, ambulance worker—a 30-year-old, father of three young children—broke down and hugged some of the nurses he recognized.

"I got sick on September 12 and didn't come out of it for the next 20 days. I am just so grateful I came through," Martin said, wiping his eyes.

Martin was among the first wave of critically ill middle Tennesseans, hit hard by the H1N1 flu pandemic in late 2009. A hallmark of pandemic flu throughout history, including the H1N1 pandemic, has
been its ability to make healthy young and middle-aged adults seriously ill and even kill this population in disproportionate numbers.

"Every time there is an influenza pandemic there is a large proportion of younger, or middle-aged adults who die. We have always explained these deaths, based on presumed virulence of virus, or getting bacterial infection at the same time. We now have vaccines and antibiotics, but still we see middle-aged individuals who die," Polack said.

Polack directs the INFANT Foundation, a research and clinical institute based in Buenos Aires, in close cooperation with Vanderbilt’s Vaccine Center. In Argentina, he had a front row seat for the emergence of the H1N1 flu pandemic, which began in April 2009.

As the H1N1 virus burned its way northward through the southern hemisphere, Polack and his team went to work looking for evidence of a biomarker he had used before. A biomarker is a protein that can be measured in blood or tissue whose concentration reflects the severity or presence of some disease state. "We have seen this before. Where non-protective antibody responses are associated with an immune-based disease in the lung," Polack said.

Polack has previously published evidence that a first-line immune response, primed by an imperfect antibody, can overreact in a violent and uncontrolled fashion. Patients die from lung damage inflicted by their own immune system. A molecule called C4d, a product of this biochemical cascade (the complement system), is a marker for the strength of the response.

In adults who died during the 2009 H1N1 pandemic, high levels of C4d in lung tissues suggest a massive, potentially fatal activation of the complement system.

Pulmonary and critical care physician, Todd Rice, M.D., assistant professor of Medicine at VUMC, has seen people killed by the "exuberant" and uncontrolled response of the immune system in other diseases—like sepsis.

"This looked every bit like that," Rice recalled about H1N1 patients, including Jason Martin, who piled into his intensive care unit in mid-September, 2009. "It was impressive. These were as sick as any patients I had ever seen. We tried all sorts of things," Rice said.

Ultimately, Vanderbilt’s ICU saw 49 adults with H1N1, most ages 25 to 45. Jason Martin was one of 40 who survived.

But Polack wanted evidence beyond what he saw in patients in 2009. He asked Joyce Johnson, M.D., professor of Pathology with VUMC, to look for evidence this phenomenon may have happened during past flu pandemics. Johnson scanned Vanderbilt’s hand-penned autopsy ledgers, dating back to 1925. She was able to locate tissue samples in Vanderbilt’s tissue archive and extract half a dozen slices of lung tissue from Nashville patients who died during the 1957 Hong Kong flu pandemic.

Pediatric infectious diseases expert, John Williams, M.D., assistant professor of Pediatrics, Microbiology & Immunology, and his lab found the signature for an influenza infection in 4 of the 53-year-old samples, and were able to confirm the lung tissues had high levels of C4d. These patients too had died from an over-reactive immune response.

"C4d is part of the inflammatory cascade, and while it’s really good at killing organisms and protecting us, it’s sort of the slash and burn approach, capable of causing lots of tissue damage," Johnson said.

But why did infants and the frail elderly escape this mechanism of death in the H1N1 pandemic?

"We found in 2009, the elderly had good immunity because they had seen a very similar virus sometime before 1957. Babies hadn’t seen many viruses at all so there was no trigger. It came down to the young adults—primed with an ineffective response. Their bodies already had defenses against previous influenza viruses that look like this one but weren’t close enough," Polack said.

While the patient sample in the current study is relatively small: 75 patients, including 23 who died in 2009, and 4 from 1957, investigators were able to show that other theories, like dampening of interferon, or the triggering of an inflammatory response called a "cytokine storm," were not supported by the evidence. Even the number of viruses present in a flu patient did not seem to correlate with the severity of illness.

"It suggests this (immune over-reaction) is what happens with pandemic to make young healthy adults seriously ill. There are other things that contribute to threat, but this is one of the main things for this age group," Polack said.

While many questions remain, one thing is clear: the H1N1 vaccine offers protection. Patients who died were overwhelmingly unvaccinated. Many fell ill before a vaccine was even available.
A study of genetics will be among the next steps to explain responses experienced by people like Jason Martin. It may be possible to find out who is susceptible to this over-reactive response so they can actively avoid exposure, or receive a specific regimen of treatment. But until then, vaccination is the best idea.

**Journal Reference:**

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**Early Detection Is Possible for Prion Diseases, Study Suggests**

ScienceDaily (Dec. 5, 2010) — A fast test to diagnose fatal brain conditions such as mad cow disease in cattle and Creutzfeldt-Jakob disease in humans could be on the horizon, according to a new study from National Institutes of Health scientists. Researchers at NIH’s National Institute of Allergy and Infectious Diseases (NIAID) have developed a highly sensitive and rapid new method to detect and measure infectious agents called prions that cause these diseases.

"Although relatively rare in humans and other animals, prion diseases are devastating to those infected and can have huge economic impacts," says Anthony S. Fauci, M.D., director of NIAID. "Scientists have promising concepts for developing therapies for people infected with prion diseases, but treatments only are helpful if it is known who needs them. This detection model could eventually bridge that gap."

Prion diseases are primarily brain-damaging conditions also known as transmissible spongiform encephalopathies. They are difficult to diagnose, untreatable and ultimately fatal. A key physical characteristic of these diseases is dead tissue that leaves sponge-like holes in the brain. Prion diseases include mad cow disease, or bovine spongiform encephalopathy in cattle; scrapie in sheep; Creutzfeldt-Jakob disease in humans; and chronic wasting disease in deer, elk and moose. For more information about NIAID research on prion diseases, visit the NIAID Prion Diseases portal.

Currently available diagnostic tests lack the sensitivity, speed or quantitative capabilities required for many important applications in medicine, agriculture, wildlife biology and research. Because prion infections can be present for decades before disease symptoms appear, a better test might create the possibility for early treatment to stop the spread of disease and prevent death.

Now, a blending of previous test concepts by the NIAID group has led to the development of a new prion detection method, called real time quaking induced conversion assay, or RT-QuIC. This approach is described in a paper now online in the open-access journal *PLoS Pathogens*. Byron Caughey, Ph.D., led the study at NIAID's Rocky Mountain Laboratories in Hamilton, Mont.

Scientists believe disease-causing prions are abnormal infectious clusters of prion protein molecules. Normally, prion protein molecules are unclustered, harmless and found in every mammal. In a process not fully understood, abnormal infectious clusters develop and can convert normal prion protein molecules into the infectious prion form; these clusters tend to gather in the brain. Ongoing replication allows the disease to spread and damage the brain.

Infectious prions also are found outside the brain, in saliva, blood, breast milk, urine and the nasal and cerebral spinal fluids used in the study. But the concentrations of infectious prions in these bodily fluids are so low that scientists, clinicians and wildlife biologists have not been able to measure them for routine purposes.

The new assay can detect when miniscule amounts of infectious prions initiate the conversion of large amounts of normal prion protein into an abnormal form in test-tube reactions. By comparing the extent to which different samples can be diluted and still initiate conversion, scientists can estimate the relative infectious concentrations in the original samples. In their study, the NIAID scientists used RT-QuIC to detect prion infections in deer known to have chronic wasting disease and sheep known to have scrapie.
In scrapie-infected hamsters, they found surprisingly high levels of prions in nasal fluids, pointing to such fluids as possible sources of contagion in various prion diseases.

Along with optimizing their existing applications in the laboratory, Dr. Caughey and his colleagues are teaming up with a number of other laboratories around the world to extend the practical and scientific applications of RT-QuIC. Related testing approaches might also aid the diagnoses of similar neurodegenerative protein diseases, such as Alzheimer’s, Huntington’s and Parkinson’s diseases.

Journal Reference:

Blame the Environment: Why Vaccines May Be Ineffective for Some People
ScienceDaily (Dec. 4, 2010) — A new discovery may explain why a tuberculosis vaccine is not as effective for some people as anticipated, and potentially explains why other vaccines do not work as well for some as they do for others. In a research report presented in the December 2010 issue of the Journal of Leukocyte Biology, scientists from Singapore show that Mycobacterium chelonae, a common environmental bacterium found in soil and water, can decrease the effectiveness of the bacille Calmette-Guerin (BCG) vaccine used to prevent tuberculosis, especially in countries outside of the United States.

"Uncovering the reasons why BCG is failing will help researchers in designing new, more effective vaccines against TB," said Geok Teng Seah, Ph.D., a researcher involved in the work from the Department of Microbiology at the National University of Singapore. "This will give us more tools to fight this globally significant infectious disease."

To make this discovery, scientists studied mice with and without prior exposure to M. chelonae. When subsequently given BCG vaccine, the mice with prior exposure to M. chelonae produced higher amounts of suppressive chemical signals; these chemical signals are believed to reduce the level of immunity induced by BCG vaccine in the host mice. Then the researchers extracted certain white blood cells with known suppressive functions from both exposed and unexposed mice. After transferring these cells into separate groups of unexposed mice, they found that recipients of suppressor cells from M. chelonae exposed mice did not respond as strongly to BCG vaccine as recipients of suppressor cells from unexposed donor mice. This indicates that the suppressor cells from M. chelonae exposed mice are functionally different from those of unexposed mice. Ultimately, the data suggest that these suppressor cells, induced in the host when exposed to M. chelonae, dampen the effectiveness of the BCG vaccine.

"This study sheds important light on why many immunological therapies and vaccines look great in the lab, but fall short in the real world," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "Humans are exposed to many more non-disease causing bacteria and viruses compared to relatively clean laboratory animals, and as this study shows with a TB vaccine, environmental exposure to one kind of bacteria can influence the efficacy of immunity to different, more dangerous bugs."

Journal Reference:

'Dangerous Complacency' on HIV
Australian Associated Press, (12.01.2010) Danny Rose
Rising rates of STDs seen in Australia’s youth are prompting fears among public health officials of a future spike in HIV diagnoses.

"If their attitude to unsafe sex continues, it will only be a matter of time before HIV infections increase, too,” said Levinia Crooks, CEO of the Australian Society of HIV Medicine.

Australia reported 62,600 cases of chlamydia in 2009, 80 percent of them in individuals aged 15 to 29. In a 2009 survey, only 52 percent of that age group said they had used a condom during their most recent sexual experience.

Public health officials are concerned this kind of inattention to safe sex could exacerbate Australia’s expanding HIV epidemic. The number of Australians newly diagnosed with HIV in 2009 reached 1,050, the highest number in almost two decades and well above the approximately 700 cases per year diagnosed during the late 1990s.
“High rates of sexually transmitted infections among young people indicate that they are not adopting
safe sex as a norm, and it is perhaps luck, rather than good planning, that has prevented an outbreak of
HIV already,” Crooks said.

In remarks marking World AIDS Day, Crooks suggested that underscoring the problem was youth’s
“dangerous complacency” toward HIV, “a quiet sense that if you are not gay, an injecting drug user or a
sex worker, HIV is not a risk for you.”

**Ex-Official Implicates Two Chinese Leaders in AIDS Scandal**

*Agence France Presse*, (12.01.2010)

In an open letter to President Hu Jintao, the former head of China’s Institute of Health Education accused
two of the country’s most powerful leaders of “gross negligence” in the blood-selling scandal that left tens
of thousands of Henan province residents infected with HIV. Chen Bingzhong, 78, who has advanced liver
cancer, noted that the men have still not been punished.

Chen leveled his accusations against Vice Premier Li Keqiang, who was head of the central China
province from 2002 to 2004 and is widely expected to succeed Premier Wen Jiabao. Chen also named Li
Changchun, the Communist Party’s propaganda chief, who served in that position in Henan from 1992 to
1998. “They have to take responsibility. They must apologize,” said Chen, whose letter was published on
the website of the activist group Aizhixing.

The two currently are part of the nine-member politburo standing committee, China’s highest and
most powerful decision-making body, along with Hu and Wen.

In the 1990s, entire villages in Henan were devastated after residents who repeatedly sold blood to
collection stations were infected with HIV when the blood was pooled and then re-injected after plasma
was removed. Local officials initially covered up the scandal. But activists, including Aizhixing founder
Wan Yanhai, eventually made it public.

In 2001, the government said that 30,000 to 50,000 people may have been infected this way.
However, Chen said the number is closer to 100,000, adding that at least 10,000 already have died.
Chen said in an interview he is frightened about the consequences of his accusations, “but if I don’t
disclose this, I will not have a peaceful conscience. I’m doing this to plead for the victims, to speak on their
behalf.”

**Parents Protest Condom Distribution**

*Albuquerque Journal*, (12.02.2010)

More than 50 parents protested condom distribution on school campuses at a recent Albuquerque Public
Schools (APS) subcommittee meeting.

However, the School Health Advisory Council (SHAC) has not proposed such a recommendation,
does not have the authority to create policy, and is not a voting body.

At the Dec. 1 meeting, a man walked up to where SHAC members were sitting, and placed a
cucumber, a banana, and a condom on the table. “These are for the sex educators,” said the man, who also
held a Bible. “This is how they teach it.”

The controversy can be traced to last month’s SHAC meeting, at which one member suggested
condoms be distributed at school-based health clinics. Members discussed whether to make a
recommendation to the school board about the distribution of condoms and birth control. SHAC, which
operates by consensus, did not reach agreement.

In the meantime, the APS board voted to maintain its current policy forbidding condom distribution
on campus but allowing birth control to be prescribed at school-based health clinics.

Jeanne Forrester, who heads SHAC, said members were unaware of the policy vote and its passage.
She pledged better communication with APS.

Some parents noted that SHAC’s meetings are not well-publicized and called on the group to be more
open to community input.

**One in Four Bali Prostitutes HIV-Positive**


One in four prostitutes on the resort island of Bali are HIV-positive, according to a new report from
Indonesia’s National AIDS Commission. “Many people are reluctant to go for medical check-ups, as
there’s still stigma and discrimination against people living with HIV/AIDS,” said Nyoman Mangku
Karmaya, NAC spokesperson. The report says Bali logged a 19 percent increase in HIV cases this year,
with the total now at 3,778. “The figure is only the tip of the iceberg ... we estimate the actual number of cases to hover around 7,000, as many cases were unreported,” he said. Twenty-five percent of Bali’s estimated 8,800 sex workers are believed to be HIV-infected, up from 23 percent last year. More than 1 million tourists visit Bali each year, and Karmaya acknowledged, “There might be some who get acquainted with sex workers, but they’re aware about using condoms. We will increase our efforts to provide more information and educate the sex workers as well as the public,” he said. “We’ll also intensify campaigns promoting condom use.”

Philippines Reports Rise in HIV/AIDS Infections

Agence France Presse, (11.25.2010)
The Philippines health ministry has reported a spike in new HIV infections, with young gay men at highest risk. “From 2007 there has been a shift in the predominant trend of sexual transmission from heterosexual contact to males having sex with males,” says a ministry report. The Philippines recorded 1,305 new HIV infections in the first 10 months of 2010, compared with 835 for all of 2009. Almost 80 percent of this year’s cases are linked to sex between men; more than half of those infected are ages 20 to 29. Teresita Marie Bagasao, UNAIDS’ country coordinator, said the Philippines and Bangladesh are the only Asian countries continuing to see HIV cases rise. Philippine authorities, she said, “need to actually address the factors which lead to infections. Providing treatment can only be sustainable if there is a very strong and comprehensive program of preventing further infections.” Bagasao called on the government to educate high-risk individuals and to provide them with condoms. Eleven percent of new HIV cases in the Philippines were blamed on needle-sharing among drug users, and 1 percent resulted from mother-to-baby transmission.

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Historical Review
Mortality Risk Factors for Pandemic Influenza on New Zealand Troop Ship, 1918
Jennifer A. Summers, Nick Wilson, Michael G. Baker, and G. Dennis Shanks

Author affiliations: University of Otago, Wellington, New Zealand (J.A. Summers, N. Wilson, M.G. Baker); and Australian Army Malaria Institute, Enoggera, Queensland, Australia (G.D. Shanks)

Abstract
We describe the epidemiology and risk factors for death in an outbreak of pandemic influenza on a troop ship. Mortality and descriptive data for military personnel on His Majesty’s New Zealand Transport troop ship Tahiti in July 1918 were analyzed, along with archival information. Mortality risk was increased among persons 25–34 years of age. Accommodations in cabins rather than sleeping in hammocks in other areas were also associated with increased mortality risk (rate ratio 4.28, 95% confidence interval 2.69–6.81). Assignment to a particular military unit, the field artillery (probably housed in cabins), also made a significant difference (adjusted odds ratio in logistic regression 3.04, 95% confidence interval 1.59–5.82). There were no significant differences by assigned rurality (rural residence) or socioeconomic status. Results suggest that the virulent nature of the 1918 influenza strain, a crowded environment, and inadequate isolation measures contributed to the high influenza mortality rate onboard this ship.

To plan and prepare appropriately for future influenza pandemics, public health authorities need to better understand the epidemiology of previous pandemics. Much remains obscure about the epidemiology of the influenza pandemic of 1918–19, the spread of which depended on the transportation of large numbers of troops during World War I.

Pandemic influenza outbreaks among closed military populations are problematic and sometimes show high mortality rates. Reports on this topic have been published. These include descriptions of 1918 pandemic outbreaks in U.S. and Australian troop and civilian ships in 1918–19 (1–5), descriptions of 1918 pandemic outbreaks in military camps in the United States, the United Kingdom, and New Zealand (2,3,6–8), and more recent influenza outbreaks onboard naval and civilian ships (9–12).

Some studies have investigated specific risk factors for death from the 1918 pandemic. Evidence has shown that lower socioeconomic status increased mortality risk (13,14) and that young adults, for as-yet-unexplained reasons, had disproportionately higher mortality rates (13–16). Rural living versus urban living is another risk factor that has been investigated and has showed conflicting results (17–20). Lower mortality rates were observed among seasoned troops (>6 months experience) compared with newly recruited troops, possibly because of previous exposure to respiratory pathogens in seasoned troops (8,21,22).
The purpose of this study was to examine the 1918 outbreak on His Majesty’s New Zealand Transport (HMNZT) Tahiti (Figure 1) and to identify mortality risk factors among persons onboard. During and after World War I, HMNZT Tahiti made numerous trips, transporting reinforcements and supplies from New Zealand to Europe, and bringing home New Zealand troops (Figure 2). On July 10, 1918, HMNZT Tahiti departed New Zealand with the 40th Reinforcements, a unit that consisted largely of infantry replacements. The voyage across the Indian Ocean and around the Cape of Good Hope was uneventful. HMNZT Tahiti was to join a convoy in Freetown, Sierra Leone, before heading to England. Upon reaching Freetown, reports of disease ashore resulted in all ships in the convoy being quarantined at port (7,25). However, a conference was attended by captains and wireless operators from every ship in the convoy onboard the His Majesty’s Ship Mantua. The Mantua had experienced an influenza outbreak onboard 2 days after leaving the United Kingdom on August 1, 1918, and is thought to have been responsible for bringing the second wave of the 1918 pandemic to western Africa from England (5,26).

HMNZT Tahiti left Freetown on August 26, 1918, as part of the convoy after being resupplied by local workers (who were another possible source of infection with the new pandemic influenza strain). On the day of sailing, influenza case-patients began to be admitted to the onboard hospital. Over the next few weeks of the voyage, influenza developed in >1,000 of the 1,217 persons onboard (25). By the time HMNZT Tahiti reached Plymouth, England, on September 10, 1918, a total of 68 men had died onboard the ship (23,27). Eight other men and 1 nurse who had been on the ship died of influenza in England. HMNZT Tahiti, the worst affected ship in the convoy, was referred to as the death ship, and a Court of Inquiry was held to investigate this outbreak.

**Historical Context and Mortality Data**

Historical information was obtained from the official report of the outbreak held in Wellington from Archives New Zealand (27), the Inquiry Report from the Transport Epidemic Committee to the House of Representatives of New Zealand, dated December 9, 1918, and the written account of Colonel E.J. O’Neill as officer commanding the 40th Reinforcements (25). Individualized data on all military personnel on the July 1918 sailing of HMNZT Tahiti recorded in the Cenotaph database were obtained from the Auckland War Memorial Museum (28). An electronic dataset (Roll-of-Honor) covering all deaths among New Zealand military personnel during World War I was obtained from Peter Dennis (Australian Defence Force Academy, University of New South Wales, Canberra, Australian Capital Territory). The Roll-of-Honor and Cenotaph databases were matched to identify persons onboard HMNZT Tahiti whose death from the disease had been listed. The precise cause of death was only reported in the Cenotaph database for 3 of 77 case-patients and was recorded as influenza or pneumonia. One death recorded as a drowning was included because a recently published study showed that the drowning occurred when a febrile soldier aboard HMNZT Tahiti threw himself into the sea (29).

**Demographic Data**

Few records in the Cenotaph database included age data (n = 16). Therefore, the age of those persons aboard HMNZT Tahiti during the voyage was determined for 864 persons (77.4%) on the basis of the soldier’s date of birth from the Roll of Casualties held at Archives New Zealand (30) and an online database for births, deaths, and marriages in New Zealand (21).

Preenlistment occupations were coded for occupational class as per a New Zealand–specific system for historical classification of occupational class (32) by using 1919 codes and a website (http://caversham.otago.ac.nz/electors/erform.php). This classification provided results such as laborer
(code 9) and company manager (code 1). If an occupation was not listed, the classification for a different census year (e.g., 1924) or the closest match (e.g., orchardist to gardener) was used. Only 13 (1.16%) records had no occupation or could not be coded.

All records with an enlistment address (n = 15) or next-of-kin address (n = 1,088) were given a rurality score on the basis of the rural/urban classification in a previous study (17). Because some (n = 167) of these addresses could not be readily classified, further work to assign a rurality score was conducted by using an estimate of likely population levels in 1918 and Google Maps (33). A scoring system for grading rurality was developed on the basis of occupation and address. All occupations were ranked for likelihood of being a rural-based job: definitely rural = 4 (e.g., farmer); probably rural = 2 (e.g., a fence builder or other occupations); and 0 (e.g., accountant). The final rurality index ranged from 0 (urban) to 8 (rural), which is the combined score of the address rurality score and the occupation rurality score.

**Military Data**

Military rank was divided into categories on the basis of a key military text (34) and other available information regarding the New Zealand Expeditionary Force. These categories were officers, noncommissioned officers, healthcare workers, and others. The Cenotaph database information was used to classify persons by their military units. Most persons onboard HMINZT Tahiti belonged to specific companies within the 40th Reinforcements. All military personnel (n = 30) with embarkation dates before HMINZT Tahiti sailed on July 10, 1918, were identified as persons with previous military experience >1 month of service. The first embarkation date was used to estimate months in military service.

**Statistical Analyses**

The association of demographic, socioeconomic, and other variables with mortality risk was analyzed by using univariate and multivariate analyses. In multivariate logistic regression analyses, 1 model considered the demographic and sociodemographic factors, and the more fully adjusted model also included military unit. All analyses used Stata version 10 (StataCorp LP, College Station, TX, USA).

**Total Number of Cases**

The total number of persons onboard HMINZT Tahiti at the time of the outbreak was 1,117 military personnel plus 100 crew (total 1,217 persons). This total included 6 deserters (who embarked in New Zealand but left the ship before the outbreak) but it was not possible to identify these persons and remove them from the dataset. The outbreak onboard reached its illness peak on August 29, 1918, and the peak number of deaths (20) occurred on September 4 (Figure 3). The Inquiry Report showed that the military commander estimated that 800 were sick on the peak day (on the basis of those who did not have breakfast and those who had duties caring for the sick) of the outbreak, and the overall mortality rate was 68.9 persons/1,000 population (25).

**Age Patterns and Mortality Rates**

The average age of those onboard HMINZT Tahiti was 26.7 years. Those >40 years of age (the smallest age group) had the highest mortality rate (140 persons/1,000 population (Figure 4). Ages were grouped into larger groups than shown in Figure 4 for further analysis. The mortality rate for persons 25–34 years of age was 108.1 persons/1,000 population, which was higher than that for persons 20–24 years of age (70 persons/1,000 population) and was higher than that for all other age groups combined (crude rate ratio [RR] 1.80, 95% confidence interval [CI] 1.08–2.92).

**Military Rank**

Officers had the highest mortality rate among military personnel (83.3 persons/1,000 population). However, because only 1 officer died, this result was not significant when compared with the rates for noncommissioned officers and also the rate for all other ranks combined.

**Occupation and Rurality**

No variations in the mortality rates were found for different occupational classes, rural occupations, and rurality of address. Additionally, no differences in mortality rates could be attributed to rurality scores (Table 1).

**Crowding and Military Unit**

On the basis of postoutbreak data in archival sources (25,27), the mortality rate by types of accommodation could be analyzed. This comparison showed a higher mortality rate for persons in cabins with bunks (39/267, 146.1 persons/1,000 population) than for persons in other areas in which hammocks were used (28/820, 34.1 persons/1,000 population) (25). This difference was significant (crude RR 4.28, 95% CI 2.69–6.81).

The 8 military units onboard HMINZT Tahiti (40th A, B, C, and E companies, 40th Field Artillery, 40th all groups, Medical Corps and Nursing, and all other groups) were housed separately. Only the 40th Field Artillery, which had a mortality rate of 152.4 persons/1,000 population, had a significantly increased
mortality rate (crude RR 2.72, 95% CI 1.16–6.36). Anecdotal evidence in the Inquiry Report suggests that this unit was housed in cabins.

**Military Experience**

No significant difference in mortality rates was found between persons with military experience and those without experience. Numbers were too small to assess whether the number of months in military service was associated with mortality risk in this outbreak.

**Multivariate Analyses**

Two logistic regression models were used to analyze risk for death among those onboard HMNZT Tahiti (Table 2). In the more fully adjusted model (model 2), age was independently associated with increased mortality risk. Being in the Field Artillery (versus all other military units) was also independently associated with increased mortality risk (adjusted odds ratio 3.04, 95% CI 1.59–5.82). Military rank, occupational class, and rurality were not associated with mortality risk in either model.

**Conclusions**

A shipboard epidemic of influenza resulted when persons onboard HMNZT Tahiti were infected in Sierra Leone. The Inquiry Report states that "The disease appeared in severe and epidemic form on August 26." (25). The date coincides with the outbreak of the more severe second wave of the pandemic in western Africa (26). During the earlier stages of the voyage, the report states that "the number of sick has been remarkably low" (25).

The estimated cumulative incidence of pandemic influenza (90%) on HMNZT Tahiti was similar to the highest levels on other ships from Australia, such as the Ooma (88%) (14), and much higher than the estimated cumulative incidence of one of the worst affected US troop ships, USS Leviathan, which had a cumulative incidence of 20% (2,3). One of the highest reported mortality rates on any ship during the pandemic was that of the Atua, which sailed November 2, 1918 (98.2 persons/1,000 population) (1), which was similar to that observed for HMNZT Tahiti, although the Atua was a much smaller ship that was carrying 163 persons.

The nature of the sleeping area (cabins with bunks rather than hammocks) was associated with increased mortality risk in this outbreak. The Court of Inquiry stated that one of the main reasons for the high mortality rate in this outbreak was poor ventilation systems onboard HMNZT Tahiti (25). The system of closing port holes at night and during danger periods (bad weather and U-boats in the water) and ineffective wind sails resulted in insufficient ventilation to sleeping areas. It was recommended that some form of artificial ventilation be introduced in the future. Anecdotal evidence from troops interviewed after the outbreak reported that the cabins had poorer ventilation than other accommodations (25). This situation may have been caused by makeshift conversions of cabins on HMNZT Tahiti, which potentially blocked ventilation, even though the space allotted to each person was approximately equivalent in both types of accommodation (=110 ft³ of airspace/person). Good ventilation may play a role in preventing or limiting spread of viral influenza by airborne transmission. One study of an isolated influenza outbreak onboard a commercial airliner suggested that an inoperative ventilation system was the cause of the high attack rate (35). Additionally, 1 study reported that open-air treatment was associated with reduced mortality rates during the 1918 pandemic (36). However, more recent analysis of viral influenza transmission suggests that the infection is transmitted primarily by contact, followed by droplets, and to a lesser extent by airborne transmission (37,38).

Military personnel assigned to the 40th Reinforcements Field Artillery had a higher risk of dying from pandemic influenza than any other military unit on HMNZT Tahiti. Evidence from the inquiry suggests that all Field Artillery personnel were lodged in cabins (25). However, the Field Artillery personnel were unlikely to be the only unit placed in the cabins, given the numbers in the inquiry.

Although the inquiry found that HMNZT Tahiti was no more crowded than other similar troop ships, it was originally fitted for ~650 passengers and crew (39), noticeably fewer than the 1,217 persons onboard during the July 1918 sailing. This crowding was caused by shipping shortages during World War I, which led to placing as many troops onboard a ship as possible. Isolation measures onboard HMNZT Tahiti, such as clearing deck space for temporary hospitals, were insufficient because the number of patients exceeded the capacity of the onboard hospital (25). A crowded environment and inadequate isolation appear to have exacerbated the influenza outbreak, enabling transmission of influenza virus through contact and droplets. These findings serve as a reminder to healthcare planners that the effects of an influenza outbreak within an institutionalized population, such as in hospitals, prisons, and ships, can be devastating without proper preparation beforehand to deal with the variety of potential transmission routes.
Older age was independently associated with increased mortality risk (by logistic regression). This finding was largely reflected in increased risk among persons 25–34 years of age than in persons <25 years of age. This finding is consistent with those of previous research (13–15) and with the total New Zealand population, in which the worst affected group was 30–34 years of age, which had a mortality rate of 15.5 persons/1,000 population (7). This rate is less than one fourth of the rate on HMNZT Tahiti. This difference may have been caused by crowding, with those onboard HMNZT Tahiti being exposed to higher infective doses of influenza virus or bacterial infections (e.g., Streptococcus pneumoniae). Persons onboard HMNZT Tahiti may also have not been exposed to the first wave of the pandemic, and therefore had no immunity to the new pandemic strain (8) because there is no evidence of a first pandemic wave in New Zealand before the July 1918 sailing of HMNZT Tahiti (7).

The medical and nursing personnel were overwhelmed by the mass casualty event caused by the influenza outbreak; many of them were incapacitated by illness when they were most needed. The use of strychnine, digitalis, and alcohol as stimulants for treating sick personnel onboard may have adversely affected mortality rates, but it is unlikely that any of the medications available in 1918 would have changed the outcome for most soldiers. Injections of an unspecific mixed catarrhal vaccine were given in the weeks before the outbreak (27), but what affect, if any, this vaccine may have had is unknown. Nevertheless, another study during this period found that a possibly similar vaccine, also described as a mixed catarrhal vaccine, could have had a favorable affect on influenza-related mortality rates (40).

Socioeconomic status and military rank did not appear to affect mortality rates. Additionally, lower occupational status was not related to higher mortality rates, which suggested that any potential differences in nutritional or health status before embarkation or during the voyage did not play any major role in mortality risk. Classifications of rurality by using preenlistment occupation, address, and rurality score did not show any differences in mortality rates. New recruits (first embarkation) were just as likely to die during the outbreak as seasoned troops, which is not consistent with results of previous research (8,21,22). However, the numbers of experienced soldiers were small in this particular outbreak.

There are many limitations in studying past events because of transcription and other recording errors. Military data were, understandably, never designed to capture detailed epidemiologic information. The lack of a proper case definition and only approximate estimates of case numbers in this outbreak limit their value for estimating epidemiologic parameters such as reproduction number. Use of preenlistment address and next-of-kin address as proxies for rurality may not give an accurate estimate of the geographic exposure of a person. The use of preenlistment occupation as a measure of socioeconomic status is also problematic because many persons may have been assigned to particular reserved occupations for the war effort, which did not reflect their prewar occupation. Conscripted men aboard HMNZT Tahiti may not have been representative of those remaining in New Zealand but they would have had to pass minimum medical standards to be in the military.

The outbreak on HMNZT Tahiti likely represents a worst-case scenario in which nonimmune soldiers were intensively exposed to a highly pathogenic virus while experiencing crowding and ineffective isolation measures. Perhaps the best use of the tragic story of HMNZT Tahiti is as a reminder that although the influenza pandemic that began in 2009 was relatively mild, influenza is capable of causing devastating mass casualties, especially in closed and crowded populations.

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References
Secrets and lies: Tackling HIV among sex workers in India

Protecting the rights of women who work as prostitutes is one of the best ways to prevent the spread of HIV. And in Orissa, India, that approach is working – even amid deep-rooted taboos.

Damanjodi is a small mining town nestled in the verdant hills of Orissa, in the east of India. The skyline is dominated by a sprawling network of mines, refineries and factory buildings. They are owned and run by Nalco, Asia's largest aluminium producer. Men come from all over the country to seek employment, creating a large migrant workforce with money to spend and time on their hands. In their wake, women come too, seeking work of a different kind. There are more than 500 women engaged in prostitution in Damanjodi and its satellite towns. Their poverty drives them to sex work out of desperation and in the terrible knowledge that the risk of contracting HIV goes with the territory.

The slums in the centre of town are clean, orderly and vibrant with colour. Ambica Das, an energetic woman with a commanding presence, is hosting a women's meeting. The meetings are an open forum, and today the women are discussing how to find a boarding school for a girl who has been recently orphaned. They do not—and cannot—discuss openly the main reason why Das organises these meetings. Das is employed as a peer educator by a targeted intervention programme funded by the Orissa state Aids Control Society and run by Ekta, a local non-governmental organisation (NGO).

Although not all of the women present are sex workers, many are. Das's job is to distribute condoms and educate the women about safe sex practices, but in reality she does much more – from arranging safe places where they can find some refuge from harassment, to suggesting alternative ways of earning a living. In a world without social workers and where the police can cause as much trouble as the customers, she is often the only friend the women can turn to.

Away from the public meetings, Das visits the women who are most at risk each week. It has taken a long time, but she has earned their trust. The stories she tells me are as harrowing as they are commonplace – a girl of 15, the daughter of a sex worker, recently came to her after being persuaded to work as a prostitute. Her mother had not known of their shared profession until the girl became pregnant. They do not know who the father is.

Her mother disowned her, and the girl faces raising her baby alone with no other means of income except returning to prostitution. Other women come to Das after contracting HIV from unprotected sex. Despite her best efforts to promote condom use, the offer of a little extra money is often enough to persuade the women to go without. By western standards, it really is a little extra money. Das says that women receive 200 to 500 rupees (£3 to £7) for sex, but encounters can cost as little as 50 rupees (70p). In the local context, these are significant sums. A month's wage for a woman working as a maid is just 300 to 400 rupees (£4 to £5).

Although India remains a stratified society in many ways, caste is no bar to sex work. In a country where women are rarely in control of their own finances, all classes can find themselves forced to turn to prostitution. Many of the women have been widowed or divorced and find themselves barred from other forms of employment. Others may be single or married, but work in secret to supplement their family's meagre income.

Nirmala (not her real name) explains: "I see four to five men each week, so I can earn up to 2,500 rupees. My husband doesn't know what I do. A couple of the other women have husbands who know, and it is them who contact customers for them, but most of our husbands don't know what we do. The men go out to find work so they are not always at home. When men have 10 rupees in their pocket, they have 10 other entertainments for themselves. They need to chew betel nuts, they need to eat paan, they need to play cards, they need to drink, so there is always less money for us."

She adds: "I want to pay for my children's education. The school run by the government is not a quality school. Once I have a better income I can try to put them in a quality school, where they can learn English. That is one of my aspirations. I want them to get a quality education so that they can gain merit and get selected for a good job.

"Our forefathers were illiterate. They never went to school. But now we have started sending our children to school so they don't need to work like us, they are smart now."

Money for marriage

Raising money for a dowry, either for themselves or for their daughters, is a common reason for entering the industry and marriage represents one of the few realistic escape routes.
As Shila (not her real name) says: "I want to get married, but my family has no money for a dowry. Here, your most important priority is to get married and then to produce children, not getting educated and standing on your own feet."

The risk of **HIV infection** is ever-present. There are more than 18,000 people living with HIV in Orissa. Some 88% of new infections are a result of sexual contact, and a further 7% are a result of mother-to-child transmission. Marriage is no safeguard. According to Unifem, the United Nations Development Fund for Women, within Indian marriages condom use is extremely rare, wives have little negotiating power about sexual matters and conversely men who suggest using protection are usually accused of infidelity. A Unifem study at a clinic in Pune found that of 400 women, 93% of whom were married, 25% had sexually transmitted infections and 14% were HIV positive. More than 90% of them had never had sex with anyone but their husbands.

Near to Damanjodi, the Indian health department runs an integrated counselling and testing centre (ICT). Das says that referring people is one of the hardest parts of her job. "Sometimes we are put in embarrassing situations," she says. "People are scared to be referred to ICT and take offence if they think that we are accusing them of being HIV positive."

Despite the hardships that Das encounters on a daily basis, the good news is that targeted interventions such as these are working. In Orissa, the HIV infection rate for sex workers remains below 1%. The contrast with other areas is marked. In neighbouring Andhra Pradesh, nearly 10% of sex workers have HIV positive. In much of the country, and much of the world, stigma and an institutional squeamishness about dealing directly with sex workers puts lives at risk. According to **UNAids**, globally fewer than one in five sex workers receive adequate HIV prevention services and less than 1% of HIV funding is spent on sex work.

The reason why targeted interventions work is because people such as Das treat sex workers as human beings. UNAids' own case studies of sex workers conclude that "one of the clearest public health lessons emerging from the HIV pandemic is that protecting the human rights of sex workers is one of the best ways to protect the rest of society from HIV".

Likewise, the **Global Network of Sex Work Projects** is calling for a number of reforms – including the decriminalisation of sex work and universal access to HIV testing and other health services – all of which the organisation identify as falling under the umbrella of better protection for the human rights of sex workers.

At the root of the problem is poverty. Arguably the best way to protect sex workers from contracting HIV would be to give them alternative employment options in the first place.

However, for those women who do end up in this riskiest of trades, Das's work is evidence that taking the time to build a connection can have a lasting impact far beyond simply keeping them free from HIV.

"Earlier the women were ignorant," she says, "but now they are learning. At first it was difficult for them to interact, to talk about their issues, but now they approach us. They know about the importance of condoms and they are open with me about their problems. They want to be healthy."

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**FDA Approves New 60 Second HIV Antibody Test**

**SUMMARY:** The U.S. Food and Drug Administration (FDA) last week approved a new instant HIV antibody test that produces results in just 1 minute, compared to 10 to 20 minutes using previous rapid antibody assays. Shortening the wait for results could be particularly useful for tests done outside medical facilities, for example by outreach workers. The new test requires a blood draw or finger-stick, however, unlike some of the slower tests that use oral fluid. As with previous antibody assays, a positive result on the new INSTI test must be confirmed by a second, different test.

**Approval of Rapid INSTI HIV-1 Antibody Test**

December 2, 2010—On November 29, 2010, the Food and Drug Administration (FDA) announced the approval of the INSTI HIV-1 Antibody Test, a new, single use rapid test for the detection of antibodies to Human Immunodeficiency Virus Type 1 (HIV-1) in human venipuncture whole blood, fingerstick blood, or plasma specimens. The newly approved test provides results in as little as 60 seconds, in contrast to the six previously approved rapid HIV tests, which typically deliver results in about 10-20 minutes.

Rapid HIV tests allow people to learn their HIV status in a single visit to a testing site, instead of returning days later for results, dramatically increasing the number of people who ultimately learn...
their serostatus after taking an HIV test.

Rapid testing also helps increase access to HIV testing because testing can be performed outside of the traditional laboratory setting. Individuals who undergo testing can be counseled immediately concerning their HIV status and, if they are positive, given the opportunity to enter medical care.

The INSTI HIV-1 Antibody Test can be used in clinical laboratories, in public health laboratories and in point-of-care settings. The test is classified as Moderate Complexity under CLIA (Clinical Laboratory Improvements Amendments).

It is highly sensitive [The overall sensitivity for the different sample types: 99.8% (95% CI = 99.3%—99.9%) in fingerstick whole blood, 99.9% (95% CI = 99.5%—100%) in venipuncture whole blood, 99.9% (95% CI = 99.5%—100%) in plasma] and specific [The overall specificity for the different samples types: 99.5% (95% CI = 99.0%—99.8) in fingerstick whole blood, 100% (95% CI = 99.7%—100%) in venipuncture whole blood, 100% (95% CI = 99.7%—100%) in plasma] for the detection of antibodies to HIV-1.

The assay is not intended to be used for screening of blood donors.

The INSTI HIV-1 Antibody Test is manufactured by bioLytical Laboratories Inc., Richmond, BC, Canada. 12/7/10

Sources

HIV Can Lose Ability to Kill CD4 Cells

SUMMARY: HIV can sometimes mutate in such a way that it is unable to infect new cells even though it continues to replicate, according to a laboratory study published in the November 24, 2010 issue of the open-access online journal PLoS Pathogens. The presence of the I54V and V82A mutations in the HIV protease gene helps explain why some individuals do not experience significant CD4 T-cell loss even while their viral load remains detectable. Thus, HIV protease influences CD4 cell depletion as well as viral replication, the study authors concluded.

Mayo Researchers Find Drug-Resistant HIV Patients With Unimpaired Immune Cells

Rochester, Minn.—November 30, 2010—Mayo Clinic researchers have shown why, in a minority of HIV patients, immune function improves despite a lack of response to standard antiretroviral treatment. In these cases, researchers say, the virus has lost its ability to kill immune cells. The findings appear in the online journal PLoS Pathogens.

The goal of current treatments for HIV is to block the virus from reproducing, thereby allowing the immune system to repair itself. These findings show for the first time that not all HIV viruses are equally bad for the immune system. Patients who harbor these viruses do not develop certain complications of the disease because of mutations that render some HIV drugs ineffective—but also impair the ability of the virus to cause disease.

"These findings suggest—in contrast to how these patients have been treated in the past—that changing treatments might not be needed in order to help the immune system," says Andrew Badley, MD, Mayo infectious disease researcher and senior author of the study.

Background

HIV causes disease by progressively killing CD4 T-cells, whose function is to orchestrate the immune system. Loss of these cells renders patients susceptible to unusual infections and cancers. Over time, HIV mutates and can become resistant to the drugs used for treatment. Mayo researchers have discovered that viruses with certain mutations that render a component of the drug cocktail used to treat HIV infection ineffective also have an impaired ability to kill CD4 T-cells. Even though mutated viruses replicate as well as normal HIV, they fail to cause the infected cells to die. Not all mutant viruses share this effect; only selected mutations cause the impairment in cell killing, without effecting virus replication.

HIV has evolved many ways to cause the death of CD4 T-cells, most of which involve HIV accelerating the normal cell death. One kind of cell death that is unique to HIV involves the HIV enzyme protease, whose normal job is to cut up viral proteins so they can be used. This same process also cuts a normal cell protein which creates a novel protein called Casp8p41. This protein is only created during HIV infection. Casp8p41 in turn is responsible for the death of many of the infected cells. Researchers found that cells infected with HIV that also contain the mutations, produced less Casp8p41, and therefore fewer of the infected cells died.
Significance of the Findings

The current treatment for HIV involves measuring virus levels in the blood and using drugs to stop that virus from reproducing. When drugs stop working, virus levels in the blood rise and physicians typically respond by changing medications. However, effective drugs may not always be available.

"Results from the current study suggest that if a patient is failing their current treatment, and other effective drugs are not available, then it may be best to take advantage of the virus’ lessened ability to kill CD4 T cells, by staying on the same medication" says Dr. Badley. "We have begun to study whether the best approach might be instead to monitor Casp8p41 levels as opposed to measuring virus levels, and use that to determine whether or not to change treatment."

Researchers have already developed a way to measure Casp8p41 in the blood of patients, and this new knowledge may ultimately lead to a new diagnostic tool for HIV treatment, based upon predicting whether a patient’s virus will deplete CD4 T-cells. 12/7/10

Reference


Prevalence and Correlates of Sexual Behavior and Risk Management Among HIV-Positive Adults over 50

Sexually Transmitted Diseases Vol. 37; No. 10: P. 615-620, (10..2010) Sarit A. Golub; Julia C. Tomassilli; David W. Pantalone; Mark Brennan; Stephen E. Karpiak; Jeffrey T. Parsons

The study authors “examined the prevalence and correlates of sexual behavior, sexual risk and behavioral risk reduction strategies among a diverse sample of HIV-positive adults over age 50.”

A total of 914 HIV-positive adults age 50 and older (640 males, 264 females, 10 transgender) living in New York City completed individually conducted surveys.

Study results showed more than half of participants reported sexual activity in the previous three months, and one-third of sexually active participants reported unprotected vaginal or anal sex in that time period. Though there was no difference by physical health status, sexually active participants were more likely to be younger and male. A range of risk-management strategies was reported, including 100 percent condom use (49 percent of sexually active participants), serosorting (17 percent) and strategic positioning (4 percent). Strategy prevalence differed by gender/sexual identity subgroups. Multivariate modeling found unprotected sex was significantly associated with recent substance use and loneliness.

“Older HIV-positive adults are sexually active, and engage in both high-risk and risk-management behaviors,” the investigators concluded. “Loneliness emerged as the dominant risk factor in this sample. Findings provide meaningful implications for HIV prevention interventions targeting this population.”
Sex Becomes Main Source of AIDS Spread in Drugs-Plagued China Province

*Xinhua News Agency*, (11.29.2010)

Although Yunnan borders Asia’s infamous opium-producing “Golden Triangle” region, health authorities in the southwestern Chinese province say sex has overtaken drug use as the leading cause of HIV transmission there. During the first 10 months of 2010, 71 percent of new HIV infections were linked to sexual contact, said Xu Heping, vice director of the provincial health bureau. The proportion of infections transmitted through drug use has declined steadily since 2005, and the level of infection among sex workers has remained largely unchanged. However, one-fifth of new HIV patients contracted the virus from a spouse. "The epidemic’s spread among spouses is alarming," Xu said. During the past two decades, AIDS has killed 11,609 people in Yunnan; more than 2,000 AIDS-related deaths were recorded from January through October.

Influenza virus strains show increasing drug resistance and ability to spread

Studies highlight need for new antiviral treatment options and strategies

Two new studies raise public health concerns about increasing antiviral resistance among certain influenza viruses, their ability to spread, and a lack of alternative antiviral treatment options. The findings are published in the January 1 issue of *The Journal of Infectious Diseases*. (Please see below for links to these articles online.)

Influenza viruses are treated with two classes of drugs: M2 blockers (adamantanes) and neuraminidase inhibitors (NAIs), including oseltamivir and zanamivir. While the spread of influenza strains with resistance to one class of drugs has been well documented in recent years, a new report from Larisa Gubareva, MD, PhD and colleagues at the Centers for Disease Control and Prevention (CDC) and at health agencies in West Virginia, Texas, and Canada, confirms that dual resistance can emerge in several ways and has been on the rise during the past three years.

The study analyzed 28 seasonal H1N1 viruses with dual resistance from 2008 to 2010 from five countries, revealing that additional antiviral resistance could rapidly develop in a previously single-resistant strain as a result of mutation, drug response, or gene exchange with another virus.

Although dual resistant viruses are still rare, the investigators noted an increase in the number of tested viruses with this resistance, from 0.06 percent (2007-2008) to 1.5 percent (2008-2009) to 28 percent (2009-2010); however, during the 2009-2010 season the number of circulating seasonal H1N1 viruses was low, and only 25 viruses were tested. "Because only two classes of antiviral agents are approved, the detection of viruses with resistance to drugs in both classes is concerning," said Dr. Gubareva. "If circulation of viruses with dual resistance becomes more widespread among any of the predominant circulating influenza A viruses, treatment options will be extremely limited. New antiviral agents and strategies for antiviral therapy are likely to be necessary in the future."

A second study, conducted by Catherine Moore and colleagues in the United Kingdom, examined an outbreak of oseltamivir resistant (OR) pandemic H1N1 infection in a hematology unit in the UK. The study is the first to confirm person-to-person transmission of this dually resistant strain through molecular epidemiologic methods. The 2009 pandemic H1N1 virus was inherently resistant to adamantane, but was susceptible to and treated with oseltamivir. However, by October 2009, emergence of OR H1N1 had been documented in rare patients on oseltamivir therapy.

In the hematology unit that Moore and colleagues studied, eight of the 11 pandemic H1N1 virus infections were resistant to oseltamivir, with half of those cases resulting from direct transmission of the resistant virus. Immunocompromised patients were more susceptible to the emergence of OR H1N1 virus on treatment and also transmitted the virus to others, despite often having no influenza symptoms or having completed antiviral therapy. As a result, the screening of patients for OR H1N1 viruses became particularly important, and treatment guidelines were altered to include treatment with zanamivir, to which the viruses remained susceptible.

"These findings suggest that oseltamivir may not be the frontline drug of choice in hematology patients, and zanamivir may prove to be more beneficial," the study authors wrote. "Guidelines may need to be changed to include active screening for the [OR] mutation in hematology patients diagnosed with H1N1 and other patients who are immunocompromised when oseltamivir is used." If high risk groups are more actively monitored, early diagnosis will help prevent the spread of H1N1 viruses, and proper screening for infection and resistance will aid in making proper therapeutic decisions.

In an accompanying editorial, Frederick G. Hayden, MD, of the University of Virginia School of Medicine, and Menno D. de Jong, MD, of the University of Amsterdam in the Netherlands, agreed that
increasingly detailed monitoring and creative preventive and therapeutic choices will be required as unpredictable and antiviral-resistant influenza viruses continue to appear. This is especially true "given our current paucity of therapeutic choices," according to the authors. With only two drug classes approved in the U.S. and most countries for treating influenza virus, future research should focus on the effectiveness of zanamivir and combination antiviral therapy and the need to develop new antivirals with unique mechanisms of action.

"Such information will ensure rapid development and testing of alternative antiviral strategies for use in immunocompromised hosts and seriously ill hospitalized patients to address their unmet medical needs and the associated public health concerns, particularly the continuing threat of antiviral resistance," the authors conclude.


Virginia Tech engineer identifies new concerns for antibiotic resistance, pollution

When an antibiotic is consumed, researchers have learned that up to 90 percent passes through a body without metabolizing. This means the drugs can leave the body almost intact through normal bodily functions.

In the case of agricultural areas, excreted antibiotics can then enter stream and river environments through a variety of ways, including discharges from animal feeding operations, fish hatcheries, and nonpoint sources such as the flow from fields where manure or biosolids have been applied. Water filtered through wastewater treatment plants may also contain used antibiotics.

Consequently, these discharges become "potential sources of antibiotic resistance genes," says Amy Pruden, a National Science Foundation CAREER Award recipient, and an assistant professor of civil and environmental engineering at Virginia Tech.

http://www.cee.vt.edu/index.php?do=view&content=0&apps=2&level=2&id=17&pid=ea764b3d7ce4e619692fc864f6a5d6a28

"The presence of antibiotics, even at sub-inhibitory concentrations, can stimulate bacterial metabolism and thus contribute to the selection and maintenance of antibiotic resistance genes," Pruden explains. "Once they are present in rivers, antibiotic resistance genes are capable of being transferred among bacteria, including pathogens, through horizontal gene transfer."

The World Health Organization and the Center for Disease Control recognize antibiotic resistance "as a critical health challenge of our time," Pruden writes in a paper published in a 2010 issue of Environmental Science and Technology.

Pruden says reducing the spread of antibiotic resistance is a critical measure needed to prolong the effectiveness of currently available antibiotics. This is important since "new drug discovery can no longer keep pace with emerging antibiotic-resistant infections," Pruden says.

Pruden who has developed the concept of antibiotic resistance genes as environmental pollutants has an international reputation in applied microbial ecology, environmental remediation, and environmental reservoirs of antimicrobial resistance.

In her work outlined in the Environmental Science and Technology article, she and her co-authors, H. Storteboom, M. Arabi and J.G. Davis, all of Colorado State University, and B. Crimi of Delft University in The Netherlands, identified specific patterns of antibiotic resistance gene occurrence in a Colorado watershed. Identification of these patterns represents a major step in being able to discriminate between agricultural and wastewater treatment plant sources of these genes in river environments.

They assert that such unique patterns of antibiotic resistance gene occurrence represent promising molecular signatures that may then be used as tracers of specific manmade sources.

In their study they identified three wastewater treatment plant sites, six animal feeding operation locations, and three additional locations along a pristine region of the Poudre River, in an upstream section located in the Rocky Mountains. They compared the frequency of detection of 11 sulfonamide and tetracycline antibiotic resistance genes.

Their findings showed detection of one particular antibiotic resistance gene in 100 percent of the treatment plant and animal feeding operations, but only once in the clean section of the Poudre River.

As they are able to differentiate between human and animal sources of the antibiotic resistance genes, Pruden and her colleagues believe they can "shed light on areas where intervention can be most effective
in helping to reduce the spread of these contaminants through environmental matrixes such as soils, groundwater, surface water and sediments.

"This study advances the recognition of antibiotic resistance genes as sources to impacted environments, taking an important step in the identification of the dominant processes of the spreading and transport of antibiotic resistance genes."

**Gay men change their sexual behaviour following diagnosis with HIV—at least in the short term**

Michael Carter
Published: 08 December 2010

Diagnosis with HIV leads to changes in the sexual and drug-use behaviours of gay men, US investigators report in the online edition of the *Journal of Acquired Immune Deficiency Syndromes*.

There was a reduction in the number of reported sex partners, and in the first few months after diagnosis there was a reduction in unprotected sex with HIV-negative partners or men of unknown HIV status.

Rates of reported methamphetamine use fell, but still remained high. There was no evidence that individuals were using viral load to guide their decisions about unprotected sex.

“Our findings demonstrate how sexual behaviours, partnership status, substance abuse and partner choices of MSM [men who have sex with men] with recent HIV infection changed during the first year following diagnosis,” write the investigators.

Gay and other men who have sex with men continue to be a main focus of the HIV epidemic in industrialised countries such as the US. Recent research suggests that between 25 and 50% of all new infections originate in individuals who have been recently infected with the virus.

These individuals are an increasing focus of HIV prevention efforts, and to gain a better understanding of the risk behaviours of these patients, investigators in southern California designed a study involving 193 gay men who had recently been infected with HIV.

At the time of their diagnosis and at regular intervals over the following twelve months, they were interviewed about the type of sex they were having and their drug use.

The men had an average age of 35, and 71% were white. They were highly educated and 88% had attended college.

At baseline, the men reported a mean of nine sex partners in the previous three months. This fell to a mean of seven partners in the three months after their diagnosis, and there was a further slight fall at twelve months (mean, six partners).

The proportion of men who reported a main partner increased from 20% at baseline to 48% at the end of the study. This increase was significant (p < 0.001).

Almost half (46%) of men reported unprotected sex with a recent partner at the beginning of the study. This fell to 39% after nine months, but then increased sharply to 57% at the end of the study.

There was some evidence that men were serosorting. At baseline, 14% reported having a partner who was HIV-positive, and this increased to 33% at month three and 39% at the end of the study. The proportion of men reporting recent unprotected sex with an HIV-negative partner, or man of unknown status, fell from 42% at baseline to 23% at month nine. However, the proportion increased to 50% at month twelve.

Methamphetamine use was widespread. At baseline, 30% reported using the drug during their last sexual encounter. This fell to 11% at month three and remained steady for the rest of the study. However, over the twelve months of the study, the proportion of methamphetamine users reporting risky sex increased significantly (p = 0.05).

“The methamphetamine use reported in this sample is of great concern,” comment the investigators. In their statistical analysis unprotected anal sex was associated with the use of methamphetamine at baseline (adjusted odds ratio [AOR], 7.65; 95% CI, 1.87-31.30), as well as use of methamphetamine during the study (AOR, 14.4; 95% CI, 2.02-103.0).

There was no evidence that sexual behaviour was guided by viral load. Unprotected sex was reported by 44% of men with an undetectable viral load and 48% of those with detectable HIV.

“In this cohort, men with recent HIV infection reduced their total number of partners over the first year of infection; with the greatest decrease in the first six months,” comment the investigators.
Rates of unprotected sex with men who were negative or of unknown status initially fell, but then increased, leading the investigators to believe “there is the potential for HIV transmission occurring to many different men”.

Behaviour change was most likely to occur in the six months after diagnosis, and the researchers believe a priority should be “programs to support the maintenance of such changes...particularly after nine months.”

Reference

New Health Department Media Campaign Shows How HIV Can Compromise Health and Well Being, Even when Treatment Controls the Infection

Video spots promote condom use and partner reduction among gay men and other men who have sex with men

When you get HIV, it’s never just HIV. Treatment can control the virus and save your life, but the infection still has lifelong consequences that can range from dementia to bone loss and cancer. That is the message of a new Health Department educational campaign that debuts this week on television and the Internet. The campaign speaks directly to the city’s most heavily affected population – gay men and other men who have sex with men – in an effort to combat complacency about HIV.

HIV infection is no longer the death sentence it once was. By starting medication early and adhering to it carefully, HIV-positive people can live long lives and reduce the risk of infecting others. But as the spots make clear, living with HIV is still no picnic. Treatment can suppress the virus and prevent the destruction of the immune system, but growing evidence suggests that the damage done at the beginning of the infection can have lasting effects – even in people who get treatment. The conditions depicted in the new video – bone loss, dementia and anal cancer – are just three of many that HIV can lead to. “Stay HIV Free,” the spot urges. “Always Use a Condom.”

The video will run on cable and broadcast television for the next two weeks and will reappear for two weeks in January. It will also appear on YouTube. The Health Department will distribute a related educational brochure through community groups and service organizations. The brochure is available at nyc.gov (keyword “Never Just HIV”) or by calling 311.

“I hope all New Yorkers will heed the stark message of this campaign and take personal responsibility for their health and that of their partners,” said Dr. Thomas Farley, New York City Health Commissioner. “We have made tremendous progress in the fight against HIV/AIDS, but this is no time for complacency. HIV continues to take a major toll on men who have sex with men – regardless of whether they identify as gay – and the virus is spreading more each year in those under 30. This spot should serve as a wake-up call. Unprotected sex is still dangerous, and more partners means more risk.”
Gay men and other men who have sex with men (MSM) account for about 44% of newly diagnosed HIV infections in New York City each year – more than any group – and they experience more than half of new diagnoses (56%) among men. The proportion is even higher (82%) among men whose risk factors are known. The picture is particularly alarming for black and Latino men, who together account for nearly seven out of 10 new diagnoses among MSM in New York City. Though new diagnoses have declined among older MSM over the past decade (from 1,190 in 2001 to 830 in 2009), the number has increased among those under 30 – from 489 in 2001 to 747 last year.

Unprotected sex holds special risks for MSM, and the reasons are partly biological. Rectal tissue tears more easily than vaginal tissue, enabling HIV to pass readily between partners if one is infected. Rectal tissue also is more permeable than vaginal tissue, meaning that HIV can be absorbed into the body even when the tissue is intact. To make matters riskier, HIV is more prevalent in the MSM community than in other parts of the population – meaning that any given encounter is more likely to result in exposure.

Though new diagnoses have declined among older MSM over the past decade (from 1,190 in 2001 to 830 in 2009), the number has increased among those under 30 – from 489 in 2001 to 747 last year.

Among men who have sex with men in NYC, blacks and Latinos experience the most HIV diagnoses

Condoms effectively counter these hazards when used correctly and consistently. But recent findings suggest that unprotected sex is still common. When Health Department researchers surveyed 685 MSM who said they’d had at least two sexual encounters during the previous six months, 40% of them reported unprotected anal sex. The figure was 56% among those who were HIV-positive, 36% among those who were still negative.

“For the most part, staying HIV-free is a conscious choice,” said Dr. Monica Sweeney, assistant commissioner for the

Bureau of HIV/AIDS Prevention and Control. “We all need to step up and do what is necessary to stay healthy and protect ourselves. Having fewer partners is the surest way to limit your exposure. And by using a condom every time you have sex, you can greatly reduce the chances that exposure will mean infection.”
How to protect yourself and others
If you’re having sex, the safest relationship is a faithful one with one partner who is HIV-negative. If your partner is HIV-positive – or either of you has other sex partners – here are some ways to reduce your risk:

- Never have sex without a condom. Use only latex or polyurethane condoms, with lubrication.
- Reduce your number of sexual partners. The more partners you have, the greater your risk.
- Avoid alcohol and drugs when you have sex. You’re less likely to use a condom if your judgment is impaired.
- Know your sex partners. Get tested together for HIV and other STDs before you have sex.

Know your HIV status – get tested!
If you have ever had sex or have ever injected drugs, even once, you should get tested for HIV. Men who have sex with men should get tested at least every six months if you’re at continued risk. Just remember that taking an HIV test does not protect you from HIV.

- Your regular health care provider can give you an HIV test. In fact, New York State law now requires primary care providers to offer voluntary HIV tests to any patient between 13 and 64 years of age, even during routine visits. If you are not offered an HIV test, ask for it.
- Free and confidential HIV tests also are available at Health Department STD clinics in all five boroughs. For clinic locations and hours, call 311 or visit nyc.gov (keyword HIV testing). The clinics will serve you regardless of your immigration or insurance status.

Get tested for other STDs
If a sexually transmitted disease causes breaks or sores in your skin, it can increase your risk of getting or spreading HIV. STDs can also weaken your immune system, making you more likely to become infected with HIV if you’re exposed to it.

Condoms: Still the Best Protection
Using a condom every time you have anal, oral or vaginal sex protects you and your partners from getting HIV and other STDs, such as syphilis, gonorrhea, chlamydia, genital herpes and hepatitis B.

The Health Department offers free latex condoms at thousands of venues around New York City. Call 311 or go to nyc.gov (keyword condoms) for more information. The City also provides free lubricant, female condoms, and male condoms in different sizes.

Wednesday, 8 December 2010
Switzerland: Government ignores expert recommendation to decriminalise non-intentional HIV exposure and transmission
The Swiss Government has ignored expert recommendations to decriminalise everything but intentional HIV exposure or transmission following a consultation on changing Article 231 of the Swiss Penal Code, according to a strongly worded press release from Groupe sida Genève issued yesterday.

At the International AIDS Conference in Vienna earlier this year, the Swiss Federal Commission for AIDS-related issues – the Swiss statement people – described how they have been working behind the scenes to modify Article 231 of the Swiss Penal Code which allows for the prosecution by the police of anyone who allegedly spreads “intentionally or by neglect a dangerous transmissible human disease” without the need of a complainant. (Download the pdf here)

The law has only ever been used to prosecute people with HIV. Disclosure of HIV-positive status and/or consent to unprotected sex does not preclude this being an offence, in effect criminalising all unprotected sex by people with HIV. Since 1989, there have been 39 prosecutions and 26 convictions under this law.

The Swiss Federal Commission for AIDS-related issues issued a statement in September 2010 (available in English here) that stated:

[Current Swiss] legal practice is in blatant contradiction to the tried and tested Swiss Aids policy held by broad social consensus. Accordingly, the FCAI calls for the following requirements from the lawmakers and the practitioners of criminal law (public prosecution and judicial authorities):

1. Public prosecution and judicial authorities have to take into account the scientific findings on the infectiousness of HIV-positive persons under successful therapy (FCAI statement 2008). Persons, who are not considered to be infectious according to the FCAI criteria, shall not be punished. Any processes are to be stopped and previous sentences, when needed, are to be revised.

2. Also for HIV-positive persons, whose virus count is not yet under the detection limit, the risk of transmission is very low. The courts are therefore advised not to undertake hastily a possible
deliberate action. The highest court of law of the Netherlands, in a leading decision in 2005, made
an exemplary judgement in this regard.

3. The legislative body has to amend Art. 231 SPC such that amicable unprotected sexual contact
may no longer be subsumed under this code. An opportunity for this is offered by the current

The draft of the proposed new Law on Epidemics removed much of the draconian provisions of
Article 231, leaving only intentional exposure or transmission a criminal offence.

However, according to Groupe sida Genève:
The present version put before the assembly maintains simple intention and negligence as well as
malicious intent despite the broad acceptance that the consultation’s version found amongst all
stakeholders.

Furthermore, the bill introduces a new paragraph creating an absolute defence in favour of the
accused only in the event he made a full disclosure of the risk the HIV negative partner was exposing him
or herself to.

The consequence is that Switzerland will move from having one of the most draconian and
discriminatory laws on HIV exposure in the world to one that is similar to Canada’s—making disclosure of
HIV-positive status a defence to alleged exposure or transmission, in effect mandating disclosure before
any kind of unprotected sex by someone aware they are living with HIV. This is a lost opportunity for
Switzerland to lead the world in decriminalisation of non-disclosure, alleged exposure and non-
intentional transmission (following the lead of The Netherlands in 2005).

Although a previous Geneva Court of Justice acquittal (and the upholding of the subsequent Federal
Court appeal) now suggests that someone with an undetectable viral load would not be found guilty of
HIV exposure (with or without disclosure), this is not the case in Switzerland’s 25 other cantons.

As Groupe sida Genève point out this latest development "not only maintains the criminalisation of
HIV-positive persons, but also spells out rules of disclosure that will only lead to more stigma and
discrimination."

I’ll be posting more on this once I’ve digested all of the documents linked to in the press release below,
and spoken with some insiders in Switzerland. But I join Groupe sida Genève in condemning "the
backwards attitude" of the Swiss authorities.

Full press release below:
Groupe sida Genève denounces the proposed changes to art. 231 of the Swiss Penal Code. Exposure and
transmission of HIV will remain a criminal offense despite best evidence that criminalisation is
incompatible with the aims of successful general prevention programmes.

The executive branch of the Swiss government, the Federal Council, has introduced a bill in the
federal assembly to revise the Federal Law on fighting infectious human diseases. (See the Federal
Department of the Interior’s press release of Friday December the 3rd)

Included in the new provisions was one, article 86 (80 in the consultation version), to amend article
231 of the Swiss Penal Code incriminating the propagation of an infectious human disease.

The bill as it came out of the consultation process proposed to abrogate the paragraphs dealing with
intentional and negligent exposure and transmission of HIV. Only the qualified form of malicious intent
would have been indictable, the others would not have been considered offenses.

However, the bill, in the present version put before the assembly, maintains simple intention and
negligence as well as malicious intent despite the broad acceptance that the consultation’s version found
amongst all stakeholders.

Furthermore, the bill introduces a new paragraph creating an absolute defence in favour of the
accused only in the event he made a full disclosure of the risk the HIV negative partner was exposing him
or herself to.

Groupe sida Genève is convinced this amendment represents the complete opposite of the position
taken by the Swiss Federal Commission for AIDS-related issues (FCAI) in its most recent Declaration on
the criminality of HIV transmission. It not only maintains the criminalisation of HIV positive persons, but
also spells out rules of disclosure that will only lead to more stigma and discrimination.

Groupe sida Genève is dismayed by this proposal and would like to encourage all to join in our
condemnation of the backwards attitude of the Swiss Authorities. Please give this information the widest
possible distribution in your networks.
Background
All Swiss federal legislation goes through a consultation procedure where all concerned stakeholders can give their views on proposed legislation. Bills traditionally include the results of the consultation procedure as this ensures the bill achieves the greatest possible consensus.

Article 231, incriminating propagation of a human disease, is one of two provisions in the Penal Code under which persons accused of transmission and exposure to HIV are customarily indicted, the other being article 122 concerning grievous bodily harm.

Under article 231 the intentional transmission of a human disease is punished by a custodial sentence of not more than 5 years whilst the negligent transmission or exposure by a sentence of not more than 3 years. In both cases the minimum sentence is 30 day-fines (jour-amende).

Approximately 39 HIV positive persons have been sentenced under one or the other or a combination of both provisions. In 2009, the criminal chamber of the Geneva Cantonal Court dismissed a case of exposure based on the 2008 declaration by the Swiss Federal Commission for AIDS-related issues (FCAI) on infectiousness of HIV under effective ART and the expert testimony of Professor Bernard Hirschel. To date it remains unclear whether the decision will be make jurisprudence.

References and further reading
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Summary of the declaration by the Swiss Federal Commission for AIDS-related issues (FCAI) on the infectiousness of HIV on effective ART treatment (Swiss statement). 30.01.2008 (PDF in French) (Canadian HIV/AIDS Legal Network's English translation PDF) The full text of the declaration was published in: Schweizerische Ärztezeitung / Bulletin des médecins suisses / Bollettino dei medici svizzeri / 2008; 89:5)
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latimes.com
LA porn actor who tested positive for HIV calls for mandatory condom use in adult films
SHAYA TAYEFE MOHAJER
Associated Press
6:06 PM PST, December 8, 2010
LOS ANGELES (AP) — A clinic frequented by porn stars stood by findings that an adult film actor contracted HIV through personal sexual activity, contradicting his claims that he was infected through work.

Adult Industry Medical Healthcare Foundation spokeswoman Jennifer Miller said Wednesday that the San Fernando Valley clinic stands by its testing, which resulted in the quarantine of an unknown number of actors and found no other cases of the disease.

"It's going to come down to 'he said, she said,'" said Miller.

At a news conference Wednesday, Derrick Burts came forward for the first time since news of his illness rattled the multibillion dollar adult film industry and shut down a handful of productions for several weeks earlier this year.

Burts, previously known as Patient Zeta, said he was identifying himself after reading last month that Miller said his illness was contracted outside the porn industry "through private, personal activity."

Productions resumed after Miller's announcement.

Burts said that he was faithful to his HIV-negative girlfriend except for his work, and that he believes he was infected during a shoot in Florida. He said he used condoms for intercourse, but they aren't foolproof and he may have contracted the disease through other on-camera sexual contact.

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The boyishly handsome 24-year-old, who performed in straight films as Cameron Reid and gay films as Derek Chambers, broke down in tears while recalling the frustration he felt after his diagnosis. The clinic failed to return calls, e-mails and text messages for weeks, Burts said, adding: "I felt neglected. AIM wasn’t there to protect me."

Burts said instead of providing the follow-up he needed, Miller, who is also the clinic's HIV/STD counselor, advised him to avoid media, change his phone number and leave town. In a statement, lawyers for AIM said Patient Zeta was offered counseling, test results and information on how to get treatment.

"Any statements made by Patient Zeta which portray AIM as not providing appropriate and proper services are not truthful and are self-serving," the clinic's statement said.

When he first began working in the industry in June, Burts said agents "loved my look and said I had money written all over me."

He said he began to have doubts about the business after contracting chlamydia, gonorrhea and herpes in his first month of work, but was convinced to keep working.

"I wasn't stupid or oblivious, I knew what was out there. But it's not something you think about when they fill your head" with lucrative offers and promises that the work is safe, he said.

Burts said after his initial diagnosis Oct. 9, the clinic conducted a follow-up test and began testing performers he’d worked with since he lasted tested negative for HIV on Sept. 3.

On Oct. 23, the positive diagnosis was confirmed, and he said the clinic had traced his infection to an HIV-positive performer with whom he had worked.

After weeks of no response from the clinic, on Nov. 24 Burts said he visited an AIDS Healthcare Foundation center in Los Angeles but didn't identify himself as Patient Zeta.

Burts contacted the head of the organization last week and identified himself as Patient Zeta, as first reported by The Los Angeles Times. He said he wanted to speak out in favor of enforcing mandatory condom use in porn productions.

"I don't want this to happen to anyone else," said Burts. "We need to come up with a system that works."

Study examines effect of water-based and silicon-based lubricant

BLOOMINGTON, Ind.—A new study by sexual health researchers at Indiana University found that women who used lubricant during sex reported significantly higher levels of satisfaction and pleasure.

The study, involving 2,453 women, is the largest systematic study of this kind, despite the widespread commercial availability of lubricant and the gaps in knowledge concerning its role in alleviating pain or contributing to other health issues.

"In spite of the widespread availability of lubricants in stores and on the Internet, it is striking how little research addresses basic questions of how personal lubricants contribute to the sexual experience," said Debby Herbenick, associate director of the Center for Sexual Health Promotion. "These data clearly show that use of the lubricants in our study was associated with higher ratings of sexual pleasure and satisfaction and low rates of genital symptoms."

While these findings, reported in the November issue of the "Journal of Sexual Medicine," involve the use of water-based and silicone-based lubricant, researchers also found that study participants reported fewer genital symptoms—and, in particular, fewer reports of genital pain—when they used a water-based lubricant.

Michael Reece, director of the Center for Sexual Health Promotion and co-author of the study, said public health professionals have long recommended the use of lubricants as an important safer sex tool, particularly when used with latex condoms.

"These findings help us to reinforce to sexually active individuals that not only are lubricants important to safer sex but that they also contribute to the overall quality of one's sexual experiences," he said.

Here are some of the findings:

- More than 70 percent of the time that lubricant was used for vaginal or anal intercourse, study participants indicated that they did so in order to make sex more pleasurable; more than 60 percent of women indicated this was the case during masturbation.
- More than one third of the time that lubricant was used for vaginal sex, anal sex or masturbation, women indicated that they used lubricant because it was fun to do so.
• Sizable proportions of women also indicated that they chose to use lubricant in order to reduce the risk of tearing, particularly for anal intercourse.

For the study, "Association of Lubricant Use with Women's Sexual Pleasure, Sexual Satisfaction, and Genital Symptoms: A Prospective Daily Diary Study," 2,453 women ages 18-68 participated in an Internet-based, double-blind assessment of the use of six lubricants during solo masturbation and partnered sexual activities. Women were randomly assigned to use one of six lubricants, four of which were water-based lubricants and two of which were silicone-based lubricants, during two weeks of a five-week study period.

Analyses of more than 10,000 acts of penile-vaginal intercourse, and more than 3,000 masturbation experiences, showed that participants' ratings of sexual pleasure and sexual satisfaction were significantly higher when a water-based lubricant or silicone-based lubricant was used compared to sex without a lubricant. Far fewer penile-anal intercourse events occurred; however, ratings of sexual pleasure and satisfaction were significantly higher when water-based lubricant was used during anal intercourse as compared to sex without a lubricant.

For all types of sex, genital symptoms were rarely reported and were generally less likely to occur when lubricant was used. More than half of the time that women used lubricant, they applied it to their own or their partner's genitals, or directly to their fingers and in about 10 percent of instances of vaginal intercourse, lubricant was applied directly to a sex toy.

"These findings demonstrate how lubricant can be used during foreplay or sex play with a partner, and incorporated into a couple's sexual experience," Herbenick said.

The water-based lubricants were, in alphabetical order, Astroglide® (Biolm, Inc.), Just Like Me® (Pure Romance), K-Y Liquid® (Johnson & Johnson) and Sweet Seduction® (Pure Romance). The silicone-based lubricants were Pure Pleasure® (Pure Romance) and Wet Platinum® (Trigg Laboratories).

WHO Says Cepheid Rapid Test Will Transform TB Care

Reuter, (12.08.2010) Kate Kelland

On Wednesday, the World Health Organization said it is endorsing a new molecular TB test made by Cepheid, calling it a "major milestone" in the treatment of the bacterial infection. WHO said the test could “revolutionize” TB control by allowing general health workers to accurately diagnose patients in about 100 minutes. The current diagnostic tool can take up to three months to give results.

The Xpert MTB/RIF test was developed by Cepheid; the Foundation for Innovative and New Diagnostics (FIND), a Bill & Melinda Gates Foundation-funded non-profit; the European Union and other donors. Cepheid said it would give a 75 percent price discount on the system for poorer countries, offering the test at $16.86 and the table-top computer system to process it at approximately $17,000. John Bishop, the company’s CEO, said this preferential price would be honored for the 116 low- and middle-income countries where TB is endemic. The cost would be discounted further in coming years as demand dictated, he said. Cepheid will sell the test to wealthy nations at full price.

“For the first time in TB control, we are enabling access to state-of-the-art technology simultaneously in low-, middle-, and high-income countries,” said Giorgio Roscigno, FIND’s CEO.

Most countries rely primarily on sputum smears for TB testing, technology developed a century ago. Xpert MTB/RIF produces “while-you-wait” results that identify 98 percent of cases of regular and rifampicin-resistant TB, according to study results.

WHO believes the test could help triple the number of TB patients found to have drug-resistant TB and double the number of HIV-TB co-infections found in areas hard-hit by both diseases.

The Xpert test also can diagnose STDs, flu, leukemia, and MRSA (methicillin-resistant Staphylococcus aureus).

South Africa Halts Rollout of Circumcision Device

Associated Press, (12.08.2010) Jenny Gross

South Africa’s government has halted the distribution of a male circumcision device that critics called dangerous and painful. The plastic apparatus, Tara Klamps, has been used on 9,000 South African men since April. Properly performed male circumcision has been shown to reduce the risk of female-to-male HIV transmission, but the device causes excessive swelling and severe pain, said Lihle Dlamini, deputy secretary-general of Treatment Action Campaign. However, KwaZulu-Natal’s government bought 22,500 Tara Klamps in October and will continue purchasing them, said Sandile Tshabalala, director of the province’s male medical circumcision division.
Cutting out old practices to tackle HIV

10 Dec 2010 | Namhla Tshisela | 62 comments

NOZINTOMBI Mbokane (not her real name) broke years of tradition when she took her 13-year-old son to hospital to be circumcised.

"None of the men in my family had ever done it. It was simply not done in our culture," said the 42-year-old siSwati-speaking mother.

A caregiver, Mbokane looks after HIV infected patients in their homes.

Mbokane, of Nhlazatshe in Mpumalanga, said she had heard about the benefits of male medical circumcision through her work.

Studies have shown that male medical circumcision (the removal of the foreskin) cuts the chances of infection by 60 percent.

The foreskin contains cells that are highly receptive to HIV and removing it in some instances reduced the risk of infection.

This, however, excludes traditional circumcision for ritual initiation because only part of the foreskin is removed.

Mbokane said she would explain the benefits to her younger son, now three, when he is older.

"I want him to do it when he is older and is able to withstand the pain. My son missed a few days of school when he had the procedure, but I am glad he did," she said.

Faced with a burden of HIV-Aids, the people of Elukwatini, which is part of Mpumalanga's Gert Sibande District Municipality, are considering male medical circumcision as a means to circumvent the spread of the virus.

At a community health day at Elukwatini Stadium hosted by the MTN Foundation, chief executive of Embhuleni Hospital Mothepana Ralefe encouraged men to be circumcised.

The foundation provided HIV counselling and testing, dental screening and check-ups for lifestyle diseases such as diabetes and hypertension.

Ralefe said the hospital had the capacity to perform 10 operations per week but the uptake was slow.

"Since July we haven't reached 50 operations. Last month only eight people came forward to be circumcised and five of them were children under the age of 12," Ralefe said.

Ralefe said male medical circumcision was still foreign to the community.

"It is something that people here are not used to. We need to mobilise traditional leaders to encourage more men to be circumcised."

She said the district had the fourth highest number of HIV prevalence out of 46 district municipalities in South Africa.

Pensioner Maseko Mdanyelwa, 66, said young men should be encouraged to undergo circumcision.

"I would encourage my grandsons to do it if it meant protecting them from HIV. We must be willing to try new things to protect ourselves from HIV and to prevent more people from getting it," he said.

Many HIV Positive Women on Antiretroviral Therapy Have Detectable Virus in Genital Tract

**SUMMARY:** As many as half of HIV positive women on effective antiretroviral therapy (ART) still have measurable levels of HIV RNA in the genital tract despite undetectable blood plasma viral load, according to research reported in the October 23, 2010 issue of AIDS. This finding underscores that while treatment can dramatically reduce the likelihood of sexual transmission of HIV, the risk is not eliminated.

*By Liz Highleyman*

Susan Cu-Uvin from Brown University and colleagues looked at patterns of HIV "shedding" in the genital tract over time among women on antiretroviral therapy with suppressed plasma viral load.

The analysis included 59 HIV positive women who had plasma viral load below 75 copies/mL at least 6 months before study screening. The researchers measured HIV RNA levels in paired plasma and genital tract samples collected every 4 weeks over the course of 1 year.

Participants were classified based on how often they had HIV RNA > 3300 copies/mL in 3 "compartments": the outer cervix (endocervix), the inner cervix (ectocervix), and the vagina.

Persistent shedders had at least 2 consecutive measurements of detectable genital tract viral load paired with undetectable plasma HIV, intermittent shedders had a detectable genital viral load between 2 undetectable tests, and non-shedders never had detectable genital viral load paired with undetectable plasma viral load.
Results

- At study entry, 95% of the women had plasma viral load below the level of detection and 98% had undetectable genital tract viral load.
- 32 women (54%) had detectable HIV RNA in their genital tracts at least once.
- 22 women (37%) women detectable genital tract HIV RNA during a study visit when their plasma viral load was undetectable.
- Observed over time, 7% of the women were persistent shedders, 31% were intermittent shedders, and 46% were non-shedders.
- Sampling all 3 genital compartments increased the likelihood of detecting HIV, compared with a single area.
- Overall, among women without hysterectomies, HIV shedding in any area of the genital tract was observed during about 13% of study visits.
- In this group shedding in at least 1 area was observed during 9% of visits when plasma viral load was undetectable.
- Women who had undergone hysterectomies (19%) were less likely to have detectable genital tract viral load.
- Genital viral load reached high levels in some women, with a maximum of 456,000 copies/mL in the outer cervix, 648,000 copies/mL in the inner cervix, and 480,000 copies/mL in the vagina.

Based on these findings, the researchers concluded, "Women with below-detectable plasma viral load may have less risk of HIV sexual transmission on a population level, but may continue to be infectious on an individual level."

Other investigators have reported a similar phenomenon in men, detectable HIV RNA in the semen even when plasma viral load is undetectable. 12/10/10

Reference


Cholera Strain Evolves New Mechanism for Causing Disease

ScienceDaily (Dec. 9, 2010) — New clinical strains of cholera appear to have evolved a distinctly different mechanism to cause the same disease, according to research published in the current issue of the online journal mBio®.

*Vibrio cholerae* is the causative agent for the diarrheal disease cholera. While there are more than 200 different serogroups only the O1 and the O139 strains have been known to cause epidemic and pandemic outbreaks of disease, using a toxin-coregulated pilus (TCP) and cholera toxin (CT), which other strains lack.

"While non-O1, non-O139 strains have caused sporadic disease globally, the virulence mechanisms are not fully understood, since most of these strains lack TCP and CT," say the researchers from Harvard Medical School and the International Center for Diarrheal Research in Dhaka, Bangladesh.

The researchers studied a newly identified non-O1, non-O139 strain of the bacteria called AM-19226. Using comparative genomics, they investigated how this new strain causes diarrhea.

Many pathogenic bacteria require something called a type III secretion system (T3SS) in order to cause disease. In previous studies, the researchers discovered a T3SS and identified a protein (vopF) that they believe could be involved in causing disease.

In the current study they identified an additional protein (vopE) and using mouse models show that AM-19226 requires T3SS to cause diarrhea and that both vopE and vopF contribute to the disease.

"With the discovery of the T3SS in V. cholerae and its role in the virulence of non-O1 and non-O139 strains, it is astonishing to observe how this bacterium has evolved two independent pathogenic mechanisms to cause similar disease," say the researchers.

Journal Reference:

Breast Milk Sharing Is a Trend Despite Government Warning


For the first time, Food and Drug Administration advisers met Dec. 6 to collect information and seek public comment on formal human milk banking. Though casual milk sharing among mothers was not on the meeting agenda, it is a concern to FDA.

On its website last week, FDA warned “against feeding your baby breast milk acquired directly from individuals or through the Internet” due to the risk of infectious diseases like HIV and contaminants, including illegal drugs.

And last month Health Canada, FDA’s Canadian counterpart, released a statement urging that “unprocessed human milk should not be shared.”

The warnings come just weeks after a Montreal mother, Emma Kwasnica, launched a worldwide network via Facebook to facilitate local milk-sharing “in a safe and ethical manner.” “Eats on Feets” now has chapters in all 50 states and has coordinated roughly 100 matches.

Calling agencies like Health Canada and FDA “old-school,” Kwasnica said, “They don’t understand how we use social media. We forge friendships online, then meet."

Experts say there are risks. According FDA data, the chances of transmitting hepatitis B or C through breast milk are “negligible.” However, there is a 42 percent risk of transmitting HIV and a 76 percent chance of passing along cytomegalovirus. “Flash pasteurization”—heating milk at 144 degrees Fahrenheit (62 degrees Celsius) for 30 minutes—kills most germs.

Lisa Broderick-Cohen, a Moorestown-based lactation consultant and La Leche League leader, said every hospital should have a milk bank, so infants in need can safely benefit from mother’s milk. But procuring breast milk online is “dangerous,” she said.

FDA said the information gathered Monday will be used for future deliberations.

Kenyan Rally Against EU-India Deal on AIDS Drugs

Reuters, (12.09.2010)  Katy Migiro

On Thursday, protesters in Kenya rallied against a free-trade agreement between India and the European Union, claiming it would undercut access to antiretroviral drugs (ARVs). EU and Indian trade negotiators were scheduled to discuss the proposal in Brussels on Friday.

Outside the EU’s Nairobi offices, hundreds gathered and waved signs of protest against the proposed deal, which a UN study suggests could make generic drugs more expensive. Under the deal, drug patent rights would be extended beyond 20 years, and data-exclusivity provisions would force Indian generic-drug makers to conduct their own clinical trials, rather than rely on existing data. Registration of generic ARVs could be delayed several years, the UN said.

“Unless the attacks by the European Commission on the future of generic production in India are stopped, costs will rise, ARV access will be rationed, and patients will die,” said Hussein Kerrow of Doctors Without Borders.

Worldwide, just one-third of people who need ARVs are receiving them. In developing nations, more than 80 percent of those using ARVs get them from India, advocates say.

“We depend on these drugs from India because they are cheap and they are very good,” said demonstrator Tom Osongo.

The protestors presented a petition to the head of EU’s delegation in Kenya, Eric van der Linden, who said he would pass on the message but made no promises. “I am not a magician,” he said.

Circumcision May Not Curb Gay HIV Transmission

Reuters Health, (12.07.2010)

Male circumcision does not confer significant protection against HIV infection among men who have sex with men, a new study has found. However, circumcision may reduce HIV risk for MSM who mostly practice insertive anal sex, and study authors recommend continuing to assess male circumcision’s effect for this subgroup “across diverse cohorts of MSM.”

Researchers evaluated circumcision, insertive anal sex practices, and HIV acquisition among 1,824 herpes simplex virus type 2-infected, HIV-negative MSM from Peru and the United States. The men were screened for HIV every three months for up to 18 months, and partner-specific sex practices were analyzed for up to the last three partners.

Over the period of 18 months, 5 percent of the 1,365 uncircumcised MSM had seroconverted, as did 4 percent of the 457 circumcised men. Among MSM who practiced insertive anal sex for at least 60 percent
or more of the time with recent partners, circumcision was associated with a 69 percent reduction in HIV acquisition (relative risk=0.31, 95 percent confidence interval 0.06-1.51); but the difference was not statistically significant. Generally, the data “indicate no overall protective benefit from male circumcision” for the MSM, wrote Dr. Jorge Sanchez, of Impacta Peru in Lima, and colleagues.

The results for MSM stand in contrast to several studies among heterosexual men in Africa finding male circumcision reduces the risk of female-to-male HIV infection by up to 60 percent. In countries and regions experiencing heterosexual HIV epidemics, the World Health Organization recommends male circumcision by well-trained health professionals.

One reason circumcision is apparently ineffective among MSM could be that it would have no impact for receptive anal sex. In wealthier countries, the effect of antiretroviral therapy might overshadow any protective effect of circumcision, some experts say.

Especially for MSM, public health messages should “reinforce the importance of condom use for HIV prevention,” Sanchez and colleagues wrote.

The study, “Male Circumcision and Risk of HIV Acquisition Among Men Who Have Sex with Men,” was published online ahead of print by the journal AIDS (2010; doi:10.1097/QAD.0b013e328340fd81).

By Jef Akst

Mom's blood carries fetus genome
A complete copy of the fetal genome exists in the mother's blood, suggesting many prenatal diagnoses could be performed noninvasively

[Published 8th December 2010 07:00 PM GMT]
Circulating in the blood of pregnant women is the full genome of their unborn child, according to a study published online today (December 8) in Science Translational Medicine.

The results suggest that whole genome sequencing of fetuses may be possible without invasive procedures, and hold implications for the prenatal diagnoses of every genetic disease.

This study provides "a window into the fetal genome," said reproductive geneticist Diana W. Bianchi of the Mother Infant Research Institute at the Tufts University School of Medicine, who was not involved in the research. "In principle, that means that you could noninvasively prenatally diagnose anything because the sequence is going to be there."

In 1997, chemical pathologist Dennis Lo of The Chinese University of Hong Kong and his colleagues discovered the presence of fetal DNA in maternal blood. Scientists have since developed noninvasive procedures to prenatally diagnose certain diseases. Down syndrome, for example, results from an abnormal number of chromosomes, and can be detected by searching mother’s blood for disproportionate amounts of DNA from different chromosomes. And genetic diseases inherited from the father may also be detected by searching the mother's blood for the paternal mutation.

It was unclear, however, if the entire fetal genome was present in the maternal plasma, which would give clinicians more confidence in the tests currently available by limiting the rate of false-negative results. Additionally, it might make it possible to screen for genetic diseases that are caused by genetic mutations inherited from the mother, as well as sequence the entire genome of the unborn child, without subjecting the mother to invasive procedures that carry a small risk of miscarriage.

Current procedures for diagnosing such subtle genetic diseases, such as chorionic villus sampling (CVS) and amniocentesis, involve putting a catheter up through the woman's cervix or a needle through her belly, to collect fetal tissue, and pose a 1 percent risk of miscarriage.

Now, Lo's group has demonstrated that it really is all there—in a low, but constant proportion to the maternal DNA. The team gathered the DNA from a couple visiting an obstetrics clinic for the CVS procedure that could prenatally diagnosis their baby with B-thalassemia, a recessive blood disorder. Each parent was a carrier, giving the fetus a 25 percent chance of inheriting both mutations and developing the disease. With DNA from the mother, father, and fetus, Lo and his colleagues were able to demonstrate that the entire fetal genome was present in the mother's blood and construct a fetal genomic map that could be scanned for disease-causing mutations. Using this approach, the team determined that the baby had inherited the father's mutation, but not the mother's, and was thus a carrier for B-thalassemia.

"This new technique has opened up the possibility that one can screen for multiple genetic disorders" without using invasive procedures, Lo told The Scientist in an email.

But it's not so easy, Bianchi warned. "Only about 10-11 percent of the total cell free DNA is fetal in origin," she said—while CVS, which removes a small piece of placenta, retrieves only fetal tissue. In addition to being much more cost effective, "[these procedures] allow you to be highly accurate and
diagnostic [because] you don’t have to deal with the technical challenge of the fact that there's mixed genomes there."

In fact, to construct the fetal genomic map, Lo and his colleagues had to use genetic information about the mother and father. Furthermore, to decipher which DNA was of fetal origin, the group had to use the fetal DNA obtained from the CVS procedure the couple had gotten to diagnosis the baby's risk of Β-thalassemia, which would normally not be available for prenatal diagnoses attempting to avoid invasive procedures.

Plus, to separate the baby’s DNA from the mother’s, it’s not enough to simply sequence the mother’s nucleotide sequence. The researchers also have to know the maternal haplotype—the genetic segments that are passed down to the child as cohesive units, which contain critical information about linked polymorphisms. Under normal clinical circumstances, this would require looking at the genetic information of other family members, or haplotype information about entire populations.

This adds additional cost—perhaps around $1,500 to determine the maternal haplotype, Lo said—to an already expensive procedure, which currently would cost some $200,000 per case. Lo and his team are currently working to develop more targeted tests, however, that focus in on disease-causing genes and could be 50 to 100 times cheaper, he said.

There’s the also added complication of getting other people involved, Bianchi said. "You're getting that much farther away from the fetus," she said. "It's so much easier to look at pure fetal DNA, and make the diagnosis on the fetus." But this option, of course, holds that 1 percent risk of miscarriage.

Eventually what’s needed is a risk-benefits analysis, Bianchi added. For parents, such as the couple in this study, who are both carriers for a particular disease and thus have a 25 percent risk of having an affected child, the miniscule risk of miscarriage may be worth the greater certainty that comes with the invasive procedures, she said. On the other hand, "if you were a 45 year old woman who had taken 5 years to conceive with IVF, any risk of a miscarriage is going to be intolerable."

The techniques developed in this study may also have implications beyond prenatal diagnoses, Lo said. "The approach described in our paper might also have [an] application in the analysis of other medically important species of DNA in plasma, e.g. tumor DNA in the plasma of cancer patients," which may aid in cancer diagnosis.


Comments

Extrapolating from older prenatal karyotyping with maternal blood
by JOHN COLLINS, [Comment posted 2010-12-09 10:23:23]
It has been known for over fifteen years that foetal cells can be enriched from the maternal blood and used for prenatal diagnosis of irregular numbers of chromosomes(e.g. trisomy 21 or 19). The placenta is foetal tissue in contact with the mothers blood and some cells are released and circulate in the maternal blood. The enrichment has long been done with immobilized antibodies to placental specific antigens. The problem has always been the very low number of such cells. DNA amplification methods may alleviate this problem but complicate for example copy number variation analysis.

Nostradamus diagnosis
by anonymous poster, [Comment posted 2010-12-08 17:43:01]
It’s not a test if you know the answer in advance (which they did in this case from the prior CVS). It’s like predicting events that have already happened.

By Cristina Luiggi

Still Ticking

Paul Ehrlich on why unchecked population growth continues to be a time bomb. The human population is set to hit the seven billion mark next year. Paul Ehrlich, entomologist, conservationist, and author, in 1968, of the seminal book on human overpopulation, The Population Bomb, discusses a recent article by ecologists Charles Hall and John Day that reconsiders a perennial question: is there a limit to our growth? (American Scientist, 97:230-37, 2009).

The Scientist: It’s hard to dispute that resources will become scarcer if the human population continues to grow. But there’s a pervasive optimism that ingenuity and technology will result in more efficient ways to use, recycle, or find replacements for these resources.

Paul Ehrlich: They’ve been saying that ever since I’ve been in this game, which is now 60 years, roughly. In 1968 they were saying we could easily support five billion people. Well, we’ve got seven billion now,
and we’re not supporting them. What I’ve always said in response to “technology will take care of it” is: why don’t we see technology take care of the people we have today, before we talk about how easy it will be to take care of more people?

No person who can count up to 20 without taking off their shoes doubts the basic premise that a population can outgrow its resources. If you continue growth at today’s rate, there will be more people than elementary particles in a few thousand years. There’s no question at all that there are limits to growth. The issue is: what are they? The Hall and Day paper basically revisits some of the earlier data and suggests, as does everything in the world that is happening today, that not only are we reaching the limits, but we’re already past the long-term carrying capacity of the planet.

**TS:** Scientists have been sounding this alarm since the mid-20th century when the human population size was half what it is today. You predicted that overpopulation would cause large-scale famines, wars, and death by the end of that century. Those doomsday scenarios did not come to pass, and some people called that “crying wolf.”

**PE:** Most of the arguments about how bad the predictions were are made by people who never read them carefully. For example, I am attacked on the Web virtually daily for having said that the battle to feed all of humanity is over. That was in the first couple of lines of *The Population Bomb*. There were about half a billion people hungry at that time. Today, there are about a billion people hungry, and yet people are saying, “Ehrlich was wrong and he was disproven.” You have to remember that scientists live by the opinion of other scientists. I've perpetually had the full support of my colleagues and the majority of the scientific community. Show me an area of science where somebody who wrote something in 1968 believes exactly the same thing 40 years later, and I’ll show you an area of science that’s dead.

**TS:** The only concrete solution that Hall and Day offer is to make these growth/scarcity issues central to education at all levels. Isn’t that a rather long-term solution, when at the same time they stress that we’re running out of time?

**PE:** The problem is that virtually all the really important things have to be long-term. You can’t change the education system in two years; you can’t change the energy system in two years; and you can’t make any change humanesly in population size in less than a number of decades. All of which tells me that we should have started long ago, and we certainly should start now. We know more than enough about the science of what’s happening to the world to know in what directions we ought to be moving. The problem is we’re not going in those directions.

**TS:** Are you worried that people may ignore these issues because they are so depressing?

**PE:** Most of my colleagues who look at this closely think we might have something like a 10 percent chance of keeping civilization from collapsing. When you have grandchildren and a great-grandchild as I do, it seems to me we owe it to them to do our best to try. I still think that if we had a World War II-type mobilization of society, then we’d have a fighting chance of pulling through. The issue is: will we ever get together the political will to do it?

**Ehrlich has been a Faculty Member since 2006 and is the president of Stanford University’s Center for Conservation Biology. You can access his review of the article at: [http://bit.ly/GrowthPeakOil](http://bit.ly/GrowthPeakOil)**

**Comment**

**Culture and Civilization**
by anonymous poster,
[Comment posted 2010-12-08 14:11:37]
How come China and India and Egypt and Indonesia have lived for so may centuries with more population pressure than us in the west and the US ?...and continue to live and thrive, as we debate the population explosion question ?

Maybe there is something about old world “culture” that we could learn from as we push American “civilization” ideology on the rest of the world ?

Maybe good idea to leave those old, highly tuned and interwoven cultures alone in their highly developed social fabric and sensitive, symbiotic environments, while we race along with our “scientifically oriented” civilization, innovating the future by churning out new products every day, and shedding obsolescence at a similar rate.

Maybe good idea to let the “old world” assimilate appropriate technologies and systems that we invent, at their own pace and transform them to fit their own needs (as they do now?)

**Stem cell transplant has cured HIV infection in 'Berlin patient', say doctors ****
Keith Alcorn
Published: 13 December 2010
Doctors who carried out a stem cell transplant on an HIV-infected man with leukaemia in 2007 say they now believe the man to have been cured of HIV infection as a result of the treatment, which introduced stem cells which happened to be resistant to HIV infection.
The man received bone marrow from a donor who had natural resistance to HIV infection; this was due to a genetic profile which led to the CCR5 co-receptor being absent from his cells. The most common variety of HIV uses CCR5 as its ‘docking station’, attaching to it in order to enter and infect CD4 cells, and people with this mutation are almost completely protected against infection.

The case was first reported at the 2008 Conference on Retroviruses and Opportunistic Infections in Boston, and Berlin doctors subsequently published a detailed case history in the *New England Journal of Medicine* in February 2009.

They have now published a follow-up report in the journal *Blood*, arguing that based on the results of extensive tests, “It is reasonable to conclude that cure of HIV infection has been achieved in this patient.”

**The case history**

The 'Berlin patient' is an HIV-positive man who developed acute myeloid leukaemia, received successful treatment and subsequently experienced a relapse in 2007 that required a transplant of stem cells.

Doctors chose stem cells from an individual who had an unusual genetic profile: a mutation inherited from both parents that resulted in CD4 cells that lacked the CCR5 receptor. This mutation, called CCR5 delta 32 homozygosity, is present in less than 1% of Caucasians in northern and western Europe, and is associated with a reduced risk of becoming infected with HIV.

This is because all new infecting viruses need to use the CCR5 receptor on CD4 cells when infecting an immune system cell of the CD4 type.

Later in the course of HIV infection another type of virus emerges that can use the CXCR4 receptor instead.

Before the stem cell transplant the patient received chemotherapy treatment that destroyed most immune cells and total body irradiation, and also received immunosuppressive drugs to prevent rejection of the stem cells.

Antiretroviral therapy was halted on the day of the transplant, and the patient had to receive a second stem cell transplant 13 days after the first one, due to a further relapse of leukaemia.

The patient continued to receive immunosuppressive treatment to prevent rejection for 38 months, and at 5, 24 and 29 months post-transplant colon biopsies were taken to investigate possible graft-versus-host disease in the intestine. At each investigation additional samples were taken to check for signs of HIV infection in the abundant immune cells of the gut wall.

During the 38 month follow-up period the donor CD4 cells repopulated the mucosal immune system of the gut, to such an extent that the frequency of CD4 cells was almost twice as high as in HIV-negative healthy controls, and this phenomenon was also seen in a control group of ten HIV-negative individuals who received stem cell transfers.

The repopulation of CD4 cells was accompanied by the complete disappearance of host CD4 cells, and after two years the patient had the CD4 count of a healthy adult of the same age.

One of the challenges for any approach to curing HIV infection is long-lived immune system cells, which need to be cleared before a patient can be cured. In the case of the Berlin patient CCR5-bearing macrophages could not be detected after 38 months, suggesting that chemotherapy had destroyed these longer-lived cells, and that they had also been replaced by donor cells.

The German researchers and San Francisco-based immunologist Professor Jay Levy believe that the findings point to the importance of suppressing the production of CCR5-bearing cells, either through transplants or gene therapy.

The patient did not resume antiretroviral therapy after the transplant.

Nevertheless HIV remained undetectable by both viral load testing (RNA) and tests for viral DNA within cells, and HIV antibody levels declined to the point that the patient has no antibody reactivity to HIV core antibodies, and only very low levels of antibodies to the HIV envelope proteins.

Seventeen months after the transplant the patient developed a neurological condition, which required a brain biopsy and lumbar puncture to sample the cerebrospinal fluid for diagnostic purposes. HIV was also undetectable in the brain and the CSF.

An additional indication that HIV is not present lies in the fact that the patient’s CD4 cells are vulnerable to infection with virus that targets the CXCR4 receptor. If any virus with this preference was still present, the researchers argue, it would be able to swiftly infect the large population of memory CD4 cells that has emerged.

**The Berlin patient speaks to the press**

The 'Berlin patient', Timothy Ray Brown, a US citizen who lives in Berlin, was interviewed this week by German news magazine *Stern*. 
His course of treatment for leukaemia was gruelling and lengthy. Brown suffered two relapses and underwent two stem cell transplants, as well as a serious neurological disorder that flared up when he seemed to be on the road to recovery.

The neurological problem led to temporary blindness and memory problems. Brown is still undergoing physiotherapy to help restore his coordination and gait, as well as speech therapy. Friends have noticed a personality change too: he is much more blunt, possibly a disinhibition that is related to the neurological problems.

On being asked if it would have been better to live with HIV than to have beaten it in this way he says “Perhaps. Perhaps it would have been better, but I don’t ask those sorts of questions anymore.”

Timothy Brown is now considering a move from Berlin to Barcelona or San Francisco, and, reports Stern magazine, enjoying a drink and a cigarette.

Stern also interviewed Dr Gero Hütter, who was in charge of Timothy Brown’s treatment. Dr Hütter told Stern that as a scientist he was “in the right place, at the right time” and that “for me it is important to have overthrown the dogma that HIV can never be cured. Something like this is the greatest thing one can achieve in medical research”.

**Implications for future approaches to curing HIV infection**

If a cure has been achieved in this patient, it points the way towards attempts to develop a cure for HIV infection through genetically engineered stem cells.

The German researchers and San Francisco-based immunologist Professor Jay Levy believe that the findings point to the importance of suppressing the production of CCR5-bearing cells, either through transplants or gene therapy.

Scientists were sufficiently intrigued by the Berlin patient that they met in Berlin in 2009 to discuss how they could coordinate efforts to identify CCR5-delta32 homozygous donors and expand the supply of stem cells from these donors, for example through sampling blood cells from the umbilical cord of babies born to mothers who are homozygous for CCR5-delta32, in order to eventually facilitate stem-cell therapy.

Gene therapy techniques which can transform stem cells – and all their descendents – into cells resistant to HIV entry may be a more practical option than looking for matching donors.

Several US research groups announced in October 2009 that they had received funding to explore techniques for engineering and introducing CCR5-deficient stem cells.

If these approaches prove successful they will be expensive, so in the early stages it is likely that they would be reserved for people with no remaining treatment options or a cancer requiring bone marrow or stem cell transfer.

As Timothy Brown’s experience shows, curing HIV infection through ablative chemotherapy, immunosuppressive drugs and stem cell transfer is not a course of treatment for the faint-hearted. It has required courage, determination and a lot of support to become the first person to be pronounced ‘cured’ of HIV infection.

**Reference**


**Canada faces a flood of heroin and addicts**

By Alex Roslin and Bilbo Poynter, Postmedia News December 12, 2010

It’s just before 1 p.m. on a cool, sunny Monday afternoon in late November. On a quiet residential street in Montreal, half a dozen heroin addicts are waiting by office phones and cellphones in a drop-in centre and residence for opiate users and recovering addicts.

Their fingers are poised to hit the speed dial button. At precisely 1 p.m. each Monday, the phone lines open at the city’s main opiate-addiction treatment centre, the Centre de recherche et d’aide pour narcomanes.

The centre is so overwhelmed with demand, only the first caller to get through each week gets a coveted treatment spot.

Treatment centres in cities around Canada are struggling to cope with a surge of addicts — many younger than ever before — who are hooked on a rising tide of heroin pouring into this country from war-torn Afghanistan.

It’s a similar story across much of the rest of the world. After years of declining use in the 1990s, heroin and other opiates have made a startling resurgence around the globe — thanks in large part to a 37-
A fivefold increase in Afghan opium production since 2001, when Canadian soldiers helped the U.S. overthrow the country’s Taliban government. Afghanistan now supplies 92 per cent of the world’s opium.

Increased heroin supply in Canada, Europe and Asia and falling prices of the drug are the little-noticed side-effects of the Western presence in Afghanistan since 2001.

While the Taliban had banned opium production, the poppy now flourishes in Afghanistan under the noses of Canadian and other Western officials — and sometimes directly under the boots of Canadian soldiers who are occasionally pictured in newspaper photos sauntering through poppy fields while on the prowl for Taliban fighters.

Opium generated $3.4 billion for Afghanistan’s economy in 2008 and accounted for a third of its GDP, employing about two million Afghans. It prompted Hillary Clinton to call Afghanistan a “narco-state” during her confirmation hearing as U.S. secretary of state last year.

Despite this, critics say Canadian and other Western governments have entertained close ties with Afghan warlords and officials suspected or known to be involved in the opium business and have turned a blind eye to a devastating drug that kills 100,000 people worldwide each year.

These concerns were heightened earlier in December, when whistle-blowing website WikiLeaks released a U.S. diplomatic cable that said Afghan President Hamid Karzai had intervened in several drug cases, including one in which he pardoned five Afghan policemen convicted of transporting 124 kilograms of heroin.

Another cable said the president’s half-brother, Ahmed Wali Karzai, the most powerful official in Kandahar province, where Canadian Forces are headquartered, “is widely understood to be corrupt and a narcotics trafficker.”

As a former addict, Guy-Pierre Levesque, knows all about the consequences of heroin addiction. Now 55 years old, he started doing morphine at age 20, then heroin a year later. It consumed his life. He lost his job, his car, his house. He stole for years to support a habit that lasted until he was 39.

While getting clean, he found a new obsession: helping other addicts. He spearheaded the creation of the Meta d’Ame drop-in centre in Montreal, which opened its doors last summer.

The centre offers clients 26 small apartments and works with residents and walk-in visitors to help turn their lives around. Also available are laundry facilities, computers with Internet access, a rooftop vegetable garden, cooking classes, warm meals prepared by residents and volunteers, and help booking appointments and finding ever-elusive treatment spots.

He said the clientele he sees is getting younger.

“When I started doing heroin, people began to use when they were 19 or 20 years old. Today, some are 14,” Levesque said.

Sylvie Des Roches, director of the city’s main opiate addiction treatment centre, says she’s noticed the same trend.

“We’re seeing an increase in abuse among young people, and we’re seeing them start at a younger age,” she says.

The growing addiction problems have swamped her centre and others, she said.

The Centre de recherche et d’aide pour narcomanes now has 90 opiate users age 18 to 34 enrolled in its most intensive treatment program for hard-core addicts — a figure that’s doubled since 2007.

“We find ourselves with clients who ask for treatment whom we can’t help,” Des Roches said.

“It’s a problem because when a young person wants treatment, they can’t be on a waiting list since they can overdose or commit suicide.”

The Quebec coroner’s office has reported a 20 per cent jump in accidental opiate overdose deaths since 2006, when the office started to track the data. The number of deaths went up from 64 in 2006 to 76 in 2008.

The opiate abuse is also leading to other problems. More than two-thirds of injection drug users have hepatitis C, while 18 per cent have HIV, said the Public Health Agency of Montreal in a report last week. It said the rates of both infections have gone up since 1998 although no data was given on how much.

Other Canadian cities are also seeing a resurgence of heroin. In Toronto, 10,500 students in Grades 7 to 12 — or 1.1 per cent of all students in those grades — reported using heroin in the previous year in 2007, according to the Toronto-based Centre for Addiction and Mental Health.

That was nearly two times the 0.6 per cent of students who reported the same thing in 2001.

Heroin use among Toronto students is now nearly back at the levels seen during the heroin heyday of the 1980s and early 1990s. That was when a global glut of cheap “junk” spawned the undead “heroin chic” look on fashion catwalks and contributed to the deaths of celebrities such as actor River Phoenix and Smashing Pumpkins keyboardist Jonathan Melvoin.
In British Columbia, the data is inexact, but an adolescent health survey in 2008 noted a “small but significant increase” in heroin use among students in the previous five years. “It’s really an epidemic,” Levesque said.

One cause, he said, is the younger age of today’s users, who are less likely to be aware of the need to use clean needles to avoid passing on infections. “There’s more contamination among young people.”

Another growing problem, he said, is Afghan heroin is often less pure than the product from other countries. Wholesalers cut — or dilute — heroin with various products to fatten up their profit margins. They use everything from benign substances such as flour and baby powder to more dangerous products such as disinfectants, plaster and sawdust that can cause infection, poisoning and even death.

The price has also fallen thanks to Afghanistan’s booming opium supply. A point of heroin (a tenth of gram, the most commonly purchased quantity for street users) has dropped from $35 to $30 in the past decade, said Levesque.

Canada is far from being the only country hit by the flood of Afghan opium. Among the worst-hit countries is Afghanistan itself, which has an estimated one million opiate addicts — eight per cent of the population. The number of heroin users has doubled in the past five years.

Ground Zero of the impacts is Russia, a major transshipment route for Afghan heroin to Europe. There, the number of heroin addicts has exploded tenfold in the past decade. President Dmitry Medvedev last year called the drug a threat to national security and accused Western nations of not doing enough to stop Afghan opium production.

A UN report last year put the problems in stark perspective. “The number of people who die of heroin overdoses in NATO countries per year (above 10,000) is five times higher than the total number of NATO troops killed in Afghanistan in the past eight years,” it said.

“We need to go back to the dramatic opium addiction in China a century ago to find comparable statistics.”

Andre Michalski started shooting heroin at age 15 and eventually turned to smuggling it between Montreal and New York to support his habit. He lost promising jobs as a network cameraman and film location scout and was arrested for heroin trafficking in 2005. Now 45, he is on probation and getting treatment while he lives at Meta d’Ame in Montreal.

He tallies the toll the drug took on his life: “No career, no job, a lot of broken relationships.”

Heroin seizures appear to be more prevalent nationwide. Canadian police seized 92 kilograms of heroin in 2008, up from 67 kilograms in 2001 — a 38 per cent increase, according to Health Canada, which tests seized drugs for police forces. They also seized 67 per cent more raw opium.

Quebec and Ontario both saw fourfold increases in the total amounts of heroin and opium seized in each province between 2001 and 2008.

In Alberta, the seizure data has gone through the roof. Police in the province seized 42 times more heroin and opium each year on average between 2002 and 2008 than in the 1995-2001 period.

Heroin and opium are also now popping up in parts of Canada where they were unheard of before, such as Nova Scotia, despite the fact that RCMP reports say the main heroin entry points are Toronto, Vancouver and to a lesser extent Montreal.

It comes in concealed on passengers and in courier parcels, by air cargo, regular mail and ship cargo. Nova Scotia didn’t have any heroin or opium seizures in the seven years up to and including 2001. Then, in 2002, the province saw a whopping 21 kilograms of heroin seized, nearly half of the total in the entire country that year, along with another 52 kilograms of opium in 2004.

Canada is also seeing new types of opiates for the first time. Such as doda.

Vicky Dhillon is a limo driver-turned-city councillor in the Toronto suburb of Brampton, Ont. He first heard about the doda coming to Canada when his teenage son told him kids were using it in his high school and buying it openly.

The highly addictive brownish powder, made by grinding the seed pods of opium poppies, is mixed with tea or hot water and is known as “poor man’s heroin” because it’s so cheap.

Last year, police arrested 22 Toronto-area doda dealers and seized 432 kilograms of suspected doda — enough to get 432,000 people high.

Doda has now spread across Canada and is available in Montreal, Quebec City, Edmonton and Vancouver, Dhillon said.

Addiction workers in Vancouver said in a CBC report this year that doda is as common today as marijuana in some city neighbourhoods and that doda abuse has become a “big problem” in the city’s South Asian community.
The face of heroin traffickers is also changing. New Southwest Asian-linked crime groups now dominate heroin and opium smuggling and have elbowed out Italian and East Asian organized crime that used to dominate the heroin market, according to former users and RCMP drug situation reports.

Their methods are innovative. Canadian police have found heroin and opium hidden inside cricket bats, the inner lining of briefcases, hollowed-out women’s shoe soles, chocolates and a tombstone.

In Vancouver, Indo-Canadian crime gangs that sell Afghan heroin are fighting a violent war over drug turf that has seen 100 shootings.

Indo-Canadian gangs have also branched out to become involved in smuggling prescription opiates into Canada, such as oxycodone and codeine, RCMP drug situation reports say. That has helped feed an explosion in prescription opiate abuse among Canadians.

The profits from all this heroin are fantastic. Cocaine pales in comparison as a money-maker.

A kilogram of heroin that goes for $2,500 U.S. in Afghanistan wholesales in Montreal for $70,000 and has a street value of $300,000. It’s six times more valuable than the same amount of gold.

By contrast, cocaine selling for $2,000 in Colombia wholesales for about $40,000 in Montreal and is worth $120,000 on the street.

But little of that profit goes to the Afghan opium farmers who tend all those poppies. Even the Taliban rebels, who are widely accused of profiting from the opium trade, make only about $110 to $150 million a year off taxing opium farmers and shipments, according to UN estimates — small change compared to the $3.4 billion that opium generated in Afghanistan in 2008.

Much of those profits go into the pockets of Afghan warlords and officials allied with Canadian and Western forces, said one Canadian government official who spoke on condition of anonymity.

The official said the Canadian government has done little to curtail the Afghan warlords’ drug activities or even question Afghan politicians thought to be involved with drugs.

“We’ve been very passive. We haven’t taken controversial positions on these kinds of questions.”

The official tells one particularly grim story. In one province, an Afghan district chief convinced the British to send him troops, saying he needed protection from the Taliban.

Right away, the British soldiers who arrived faced withering attacks and were forced to withdraw. They later learned the district chief was actually an opium trafficker and that he had merely wanted the Brits to help him fight a rival drug gang. The attackers weren’t Taliban after all; they were the rival gangsters.

“The British ended up intervening in a gang war. This happens all the time,” the Canadian official said.

“We’re propping up crooks.”

Amir Attaran agrees. “Opium is the problem in Afghanistan. A corrupt narco-elite runs the country,” he said.

Attaran is a University of Ottawa law professor and development expert who has studied Afghanistan’s drug trade.

He said both sides in the country’s war have an interest in perpetuating the conflict because of their involvement with opium. “You cannot grow opium and traffic it on a large scale in peacetime. You need a fog of war,” he said.

“If you want to understand the conflict in Afghanistan, you have to understand this is a gang war.”

Attaran’s solution: Legalize Afghan opium and sell it for medical uses, joining countries such as India and Turkey that grow legal opium crops for the pharmaceutical market.

The result, he thinks, would be to turn warlords into regular businessmen and reduce the country’s violence and corruption. “I don’t really see an alternative that would succeed,” Attaran said.

**South African Teen Sex Challenges Anti-AIDS Fight**

*Agence France Presse*, (12.01.2010)

Official figures show some 13.7 percent of pregnant teenage girls are HIV-positive in South Africa, highlighting the challenge health officials face in lowering risky behaviors and infections among youths.

The foundation of the government’s HIV prevention program has been “ABC”—Abstain from sex, Be faithful, and use Condoms. While a survey released this year by the Medical Research Council showed that 38 percent of teens ages 13-19 reported having had sex in 2008, just 31 percent of sexually active students said they regularly used condoms. Nearly one in five had been pregnant or gotten someone pregnant.
“Sexual coercion is very common, and girls are often unable to ‘choose’ safe sex or to access contraception,” said Rebecca Hodes, deputy director of the University of Cape Town’s AIDS and Society Research Unit.

Botha Swarts, spokesperson for the state-funded group Lovelife, said, “Seventy percent of calls received at our call center are from young people who are peer-pressured into doing things they are not ready to, for example sex to prove love....”

“Being a virgin is not cool at all,” said one 14 year-old girl. “Having the latest cell phone or wearing designer clothes doesn’t make you cool anymore. You need that extra little something that will make people take notice. If you take pictures of yourself posing sexy or better yet have a sex video and post them on Facebook or circulate them ... maybe you will be cool.”

Swarts said campaigns must address the realities of adolescent life in South Africa. “What is often sexy to adolescents is the idea of risk itself,” she said. “The power and mystique of raunchy, casual sexual encounters is promoted perpetually by the mass media. This is very difficult for safe-sex campaigns to counter.”

**DR Congo’s HIV/AIDS Prevalence Hits 3.24 Percent**
*Xinhua News Agency*, (12.01.2010)
During a recent meeting of the National Multisectoral Council for Fighting Against AIDS, Health Minister Victor Makweng said HIV/AIDS prevalence in the Democratic Republic of Congo stands at 3.24 percent. “DR Congo is surrounded by countries with very high rates of prevalence, and it was therefore important that we know our prevalence rate,” said President Joseph Kabila, who was in attendance. The meeting was held to assess the effectiveness of DR Congo’s anti-AIDS efforts and to reevaluate the National Multisectoral Program for Fighting Against HIV/AIDS, which was created by presidential decree in 2004.

**Zambia Distributes 19 Million Male Condoms in Nine Months**
*Xinhua News Agency*, (12.10.2010)
The national Ministry of Health distributed more than 19 million male condoms and 1.5 female condoms between January and September 2010, the Post of Zambia said Friday. These figures did not include condoms distributed through non-governmental organizations, said Reuben Mbewe, a ministry spokesperson. He added that the totals are up significantly from last year, when the ministry handed out more than 15 million male and 800,000 female condoms. In addition to condom distribution, Zambia’s government is encouraging voluntary HIV counseling and testing as well as male circumcision, which has been shown to reduce the risk of female-to-male HIV transmission by up to 60 percent. An estimated 14.3 percent of Zambians ages 15 to 70 are HIV-positive.

**Series Of Papers Highlights Challenges With Moving African-Developed Drugs, Technology Forward**
"Africa is struggling to turn local discoveries into drugs and other health care inventions," according to studies published in *Science* and *BMC International Health and Human Rights*, *Nature News* reports (Nordling, 12/12).

The papers, produced by Canada’s McLaughlin-Rotman Center for Global Health (MRC), at the University Health Network and University of Toronto, offer "a broad range of evidence and concrete examples of African innovation to address local health concerns," according to an MRC press release. "The papers draw on the experiences of authorities, researchers and entrepreneurs in Ghana, Kenya, Madagascar, Nigeria, Rwanda, South Africa, Tanzania, and Uganda. In addition to efforts involving health products, the experiences of health venture capital funds in African and other developed countries are profiled," the release states (12/12).


"What we found in Africa is that there is funding for basic research, but there is nobody taking these findings forward," said paper co-author Ken Simiyu, a technology commercialization researcher at the University of Toronto, Canada, the news service writes (12/12).

The researchers did, however, "identify some success stories, such as the Tanzanian company A to Z Textiles, which managed to overcome regulatory and procurement hurdles to become one of the world’s
largest producers of insecticide-treated bed nets," as described in an article included in the series, Agence France-Presse writes.

The failure to get home-grown technologies off the ground in Africa "is not entirely financial. It is a more general innovation problem, which involves politics and finance," explained Simiyu, AFP reports. "African countries dedicate an average of 0.2 to 0.3 percent of GDP to research and development, 10 times less than developed countries," according to the news service (12/12). "Scientists in Africa have no incentive to commercialize results, and there is scant institutional support for knowledge transfer. In addition, venture capital is scarce, existing regulatory frameworks inhibit innovation and intellectual property protection remains weak," Nature News writes.

Still, African researchers have benefited from some investment in neglected tropical diseases in recent years, the news service notes. For instance, "In Uganda ... health-research spending more than tripled from US$18 million in 2005–06 to US$56m in 2008–09, according a status report published in June this year by the Uganda National Council for Science and Technology," according to Nature News (12/12).

"Both Simiyu and [McLaughlin-Rotman Centre for Global Health Director Peter] Singer hope the extensive collection of papers – what they call the most 'comprehensive study' of African health technologies ever completed – can foster new investment capital that is also accompanied by strong business relationship to help these ideas along," PostMediaNews/Canada.com writes. "As a 'primary recommendation,' the McLaughlin-Rotman Centre suggests a series of innovation centres or business incubators be set up to bring scientists and entrepreneurs together; the researchers argue that would help with the financial capital needed, as well as some of the cultural bias the researchers say needs to be overcome," the news service adds (Husser, 12/12).

Nature News notes the presence of such a center in Rwanda and how such centers are in the works in Kenya, Tanzania and Uganda. The article also includes comments from Marcel Tanner, director of the Swiss Tropical and Public Health Institute and Umar Bindir, director general of Nigeria's National Office for Technology Acquisition and Promotion, who address additional barriers to the production of innovative products in Africa (12/12).

In a preface to the series of studies, "Harvard professor Calestous Juma noted that concern over access to medicines had dominated the health policy debate for years, wrongly assuming that Africa would continue to rely on imports," AFP adds. "This collection of original papers provides a different prognosis. They reveal an emergent 'health innovation system' in Africa," Juma said (12/12).

"The large firms of the developed world producing drugs, vaccines, diagnostics and other health products are a great resource and partner. But many people will die if we wait for scientists from elsewhere to invent and market the health products Africa needs," Singer said, according to the MRC release. "Our message to international agencies, donors and African governments: support these enterprises and nurture their potential, because they can make a major contribution to better health in developing countries – and to their own health," Singer said (12/12).

Report Examines Academic Journal Use Among Researchers In Africa

Although "[e]lectronic access to journals is improving dramatically in eastern and southern Africa ... actual use by academics and students is not keeping pace," according to a study published last month by the Association of Commonwealth Universities (ACU), SciDev.Net reports in an article that highlights several reasons behind the trend.

According to the report, "many postgraduates lack access to, and the skills for working on, computers. ... And academics spend little time on research activity because of time and money constraints," the news service writes. "The report identifies 'a clear need for better promotion of resources, awareness-raising, and skills development'. And it sees developing libraries and librarians as a key to achieving this," SciDev.Net writes.

The article quotes Mary Abukutsa, a lecturer at the Jomo Kenyatta University of Agriculture and Technology, Kenya; Jonathan Harle, co-author of the ACU report; and Ruth Oniang’o, editor of the African Journal of Food, Agriculture, Nutrition and Development (Ogodo/Adhiambo, 12/9).

**Health Experts Call For More Vaccines, Antibiotics To Address Cholera In Haiti**

On Friday in a Lancet Comment, health experts called for more vaccines and antibiotics to be used to control the cholera epidemic in Haiti, Reuters reports.

"Their recommendation ... adds to a growing chorus of voices speaking in support of a vaccination program. Health authorities, including the Pan American Health Organization, had argued against
vaccination, saying it would be too difficult and expensive. But Paul Farmer of Harvard Medical School
and colleagues... said current strategies are not working," the news service reports (Fox, 12/10).

In the piece, Farmer and colleagues list five recommendations. "First, we must identify and treat all
those with symptomatic cholera. This effort requires both the capacity to identify and refer those with
symptoms, and the existence of centres equipped and trained to treat them," they write. "Second, a
concerted effort should be made to make oral cholera vaccines available in Haiti and elsewhere. This
would require a global stockpile of cholera vaccine. ... Third, prevention in this context means doing
everything we can to remedy Haiti’s water insecurity and improve sanitation. ... Fourth, all vertical health
projects, whether focused on AIDS, cholera, nutrition, women's health, or any other endeavour, must be
dedicated at least in part to strengthening Haiti’s health system. ... Fifth, cholera demands not simply a
harmonisation of global health policy, but also raising the bar on our goals. 10 years ago, we argued that
AIDS treatment with antiretroviral therapy was possible even in rural Haiti, and pressed for adequate
funding of integrated prevention and care programmes," the authors write (Ivers et al., 12/10).

"Rehydration alone without any antibiotics, in our view, is not a good idea, even for moderate cases of
cholera," Farmer said at a news briefing, according to Reuters. "Sometimes we are seeing them really late,
when they are very ill and being carried in. Treatment needs to be much more aggressive," he added
(12/10).

Dan Epstein, a spokesperson for PAHO, cautioned, "Cholera vaccine is not going to be the magic
bullet for stopping the cholera outbreak at this stage," CNN's blog "The Chart" reports. "For vaccination to
work, he says, one has to take two oral doses one to two weeks apart and one isn’t fully protected until
about a week after getting the second vaccine dose. However, Epstein and Farmer both say vaccines are
part of the equation to slow the progression of the epidemic," the news service writes (Falco, 12/10).

"There are only two brands of cholera vaccine in the world: Dukoral, made in Sweden, which is WHO-
approved and costs $40 per dose, and Shanchol, introduced last year by India’s Shantha Biotechnics at $6
a dose," the New York Times reports. Though Shanchol has not been approved by the WHO, "it was
created at the International Vaccine Institute in Seoul, South Korea, under a grant from the Bill & Melinda
Gates Foundation and designed to meet WHO standards," the newspaper writes. The article notes the
WHO's "shifting" position on the use of a cholera vaccine in Haiti in light of new information about the
availability of vaccines.

Now that PAHO is aware there might be one million to two million additional cholera vaccine doses,
Jon Andrus, PAHO's deputy director, said, "We recognize that it's time to rethink our position." Andrus
added, "We don't want to miss an opportunity." PAHO will hold a meeting of experts in Washington next
Friday to consider whether to buy those doses and move them to Haiti," according to the New York Times
(McNeil, 12/10).

Atypical Polio Outbreak Kills More Than 200 In The Congo, UNICEF Spokesperson
Says
More than 200 people have died from an atypical, highly lethal polio outbreak in the Republic of Congo,
Martin Dawes, a UNICEF spokesperson, said on Friday, the Associated Press/Washington Post reports.
"The disease usually strikes children under 5, but most of those affected have been young
men between the ages of 15 and 24... Up to 10 percent of people paralyzed by polio can die when
their breathing muscles stop working. But Dawes said that 42 percent of the cases in Republic of
Congo had been fatal," the news service writes. "Polio is an absolutely a red hot traveling virus, which
will affect a lot of people if immunization rates are not good,” Dawes said. "The fact we've have this virus
means there was a hole in the immunization rates in the past,” he added (Gross, 12/10).

Potential chink in armor of African sleeping sickness parasite: It's social
Research presented at American Society of Cell Biology's 50th annual meeting in
Philadelphia
Long considered a freewheeling loner, the Trypanosoma brucei parasite responsible for African sleeping
sickness has revealed a totally unexpected social side, opening a potential chink in the behavioral armor of
this and other supposedly solitary human parasites, according to research presented at the American

"The concept of bacteria acting as groups of cells communicating and cooperating with one another
has had a major impact on our understanding of bacterial physiology and pathogenesis, but this paradigm
has not been applied to parasitic protozoa," said Kent Hill, Ph.D., of University of California, Los Angeles,
who presented the findings. "Social motility offers many potential advantages, such as facilitating colonization and navigation through host tissues."

The unexpected discovery that at the right time and on the right surface, T. brucei are extremely social reveals "a level of complexity and cooperatively to trypanosome behavior that was not previously recognized," said Hill.

It also suggests a whole repertoire of behavior for other "loner" parasites that are responsible for malaria and epidemic diarrhea.

These supposedly solitary protozoa were better known for their propeller-like flagella and for cycling between tsetse fly and human hosts. But seeded onto a semisolid surface, T. brucei during their tsetse fly stage collect into large multi-cellular communities whose members sense their environment, exchange messages, and coordinate their movements in response to external signals.

T. brucei's flagellum provided the clue about the parasite's social behavior, said Hill. While examining the proteins exposed on the outside of the trypanosome flagellum, he and his colleagues identified a family of surface-exposed receptors and downstream signaling cascades involved in cyclic adenosine monophosphate (cAMP) intracellular signal transduction.

Using genetics to block gene expression and drugs to block protein activity, the researchers found that their flagella possessed sensing and signaling systems that equipped trypanosomes for social behavior.

**Drug-Resistant HIV Genes Identified**

ScienceDaily (Dec. 12, 2010) — It is estimated that 38 million people worldwide are currently infected with HIV and that 4.1 million more are added each year. For scientists to design treatment therapies that are effective over the long-term it is essential to learn more about how the virus mutates and develops resistance to medications.

New, groundbreaking research by University of Victoria biomedical engineer Stephanie Willerth has significantly advanced the understanding of HIV and how to treat it.

"The virus mutates at a very high rate which is very problematic for HIV patients because the virus eventually develops resistance to medications," explains Willerth, a faculty member with UVic's Department of Mechanical Engineering and the Division of Medical Sciences.

Willerth and her team studied approximately 15,000 different versions of the virus—something that has never been done before. This information has allowed them to locate the specific genes of the virus that were resistant to the drugs—knowledge that could ultimately help researchers develop more effective treatments for HIV.

Willerth says that the methods she used can be applied to other difficult-to-treat viruses such as swine flu, Ebola, influenza or even staph infections.

"To study all of these different versions we have to replicate them millions of times, especially when it comes to complex viruses like HIV," explains Willerth. "Because this research method requires a large amount of genetic material and there are obvious risks of duplicating highly contagious viruses, scientists have avoided doing this. Our research was unique because of the method we used—we isolated the genetic material from HIV, so that it was no longer alive, before we replicated it."

After replicating the virus from a small sample obtained from a long-term HIV patient who had developed drug resistance to their treatment, Willerth and her team studied its genetic make-up using "next generation" DNA sequencing—a new method that allows researchers to study millions of molecules at a time.

**Journal Reference:**


**Cellular Protein Hobbles HIV-1 ****

ScienceDaily (Nov. 16, 2010) — A cellular protein called BST-2 had already been known to interfere with the spread of human immunodeficiency virus type 1 (HIV-1), by inhibiting the release of its progeny particles from infected cells. Now a team from McGill University, Montreal, shows that in addition, each progeny virion's ability to cause infection is severely impaired.

"BST-2 may exert a more potent inhibition effect on HIV-1 transmission than previously thought," says coauthor Chen Liang. The research is published in the December *Journal of Virology*.

BST-2 appears to attenuate infectivity of progeny particles by interfering with their maturation. Normally, during synthesis of new virus particles, a protein called PR55Gag is cleaved into three major
structural proteins of HIV. "This cleavage process transforms HIV-1 from an immature and non-infectious virion into a mature and infectious virion," says Chen. The protease inhibitors, drugs given to AIDS patients to contain the disease, block this step. Similarly, BST-2 seems to interfere with this step, because in the study, its presence was associated with accumulation of uncleaved Gag precursor and intermediate products. The mechanism of that interference has yet to be elucidated.

BST-2 (bone marrow stromal cell antigen-2), also known as tetherin, is a cellular protein which has been shown to restrict production of enveloped viruses besides HIV-1, including HIV-2, simian immunodeficiency virus, Kaposi’s sarcoma herpes virus, Lassa virus, Marburg virus, and Ebola virus. It interferes with release of new virus particles by anchoring one end of itself in the plasma membrane of the infected cell while the other end becomes inserted into the viral envelope.

Different viruses have evolved various countermeasures. For example, in the case of HIV-1, the viral protein Vpu downregulates BST-2 from the cell surface, removing it from virus budding sites.

"The antiviral function of BST-2 has been extensively studied by a number of groups besides ours," says Chen. "Our hope is that the results of all of these studies can eventually be used to develop a BST-2 based anti-HIV-1 therapy."

Journal Reference:

High triglycerides increase risk of neuropathy for patients with HIV
Michael Carter
Published: 14 December 2010

HIV-positive patients with high triglycerides have an increased risk of neuropathy, according to US research published in the online edition of AIDS. The association between triglyceride levels and neuropathy was independent of any other risk factor.

"Since triglyceride levels were identified as a major risk for HIV-sensory neuropathy, interventions leading to reduction of triglyceride levels could reduce incidence of HIV-sensory neuropathy, a possibility that should be explored in future studies," write the investigators.

Damage to the nerves responsible for sensation – sensory neuropathy – is common in patients with HIV. It can be an extremely painful and debilitating condition that mainly affects the feet and lower legs.

Before effective antiretroviral therapy became available, neuropathy was associated with a low CD4 cell count and a high viral load. Neuropathy has also been associated with treatment with some older anti-HIV drugs (especially d4T, ddc and ddI), as well as statins and life-style factors such as alcohol consumption.

Research involving patients with diabetes has established a relationship between high triglycerides and sensory neuropathy. A large number of patients with HIV have elevated triglycerides, due either to HIV infection or particular antiretroviral drugs. Therefore investigators from the HIV Neurobehavioral Research Center in San Diego wished to see if high triglycerides were associated with neuropathy in patients with HIV.

Their study was single centre and had a cross-sectional design. The participants were 436 HIV-positive individuals and 55 HIV-negative controls. All were seen between January 2000 and December 2009.

Most (86%) of the HIV-positive patients were men and their average age was 47 years. Three-quarters were taking antiretroviral therapy and had an undetectable viral load. Their current median CD4 cell count was 458 cells/mm³.

Mean triglyceride levels were significantly higher in the patients with HIV than the HIV-negative controls (245 mg/dl vs. 160 mg/dl, p < 0.001)

Individuals with HIV were also significantly more likely than individuals who were HIV-negative to have signs of sensory neuropathy (27% vs. 10%).

Factors associated with neuropathy in patients with HIV included older age (p < 0.001), increased height (p < 0.001), a lower nadir CD4 cell count (p < 0.002), type 2 diabetes (p < 0.01), treatment with a protease inhibitor (p < 0.02), and use of statins (p < 0.01). Surprisingly, treatment with “d” drugs (d4T, ddC, ddI) was not associated with neuropathy.

Further analysis identified an independent relationship between high triglycerides and neuropathy. On the basis of their triglycerides, the patients were divided three groups: low (144 patients, below 141 mg/dl), medium (145 patients, 142-243 mg/dl), and high (145 patients, above 243 mg/dl).

Patients with the highest triglyceride levels were almost three-times more likely than those with the lowest triglyceride measurements to have sensory neuropathy (OR, 2.6; 95% CI, 1.2-5.8).
“After adjusting for concomitant clinical and demographic factors related to HIV-sensory neuropathy, the association of HIV-sensory neuropathy with triglyceride levels persisted,” the researchers emphasise. They conclude, “these findings illustrate the pathogenic complexity of HIV-sensory neuropathy to which not only HIV infection, but also its treatment, is a major contributor.”

Routine HIV care should include regular monitoring of lipid levels, and treatment of high triglycerides could not only reduce the risk of cardiovascular disease, but also help avoid neuropathy.

Reference

SWAZILAND: Army slowly winning the HIV/AIDS battle
MBABANE, 14 December 2010 (PlusNews)—Swaziland has the world’s highest estimated HIV prevalence, and its military is not exempt, although a wellness and prevention programme has seen a remarkable drop in AIDS deaths over the past two years, with a steady decline in new infections.

"We have seen [that] the infection rate has dropped dramatically – not suddenly, but declining gradually. We just tested 200 soldiers, and six were HIV-positive,” said Captain Bongani Msibi, Umbutfo Swaziland Defense Force (USDF) Monitoring and Evaluation Officer assigned to the HIV/AIDS Wellness Programme. The unit operates out of army headquarters in Bethany, 20km east of the capital, Mbabane.

"The composition of the army mirrors the society in many ways, and it may be time to see how other HIV programmes in the country are getting similar results, because our success shows the infection rate is going down,” Msibi added.

Army officials could not reveal exact figures for HIV-positive personnel or deaths from AIDS-related illnesses due to confidentiality issues, but an estimated 26 percent of Swazis between the ages of 15 to 49 are living with HIV.

Susceptibility
"A soldier’s life makes him or her vulnerable to AIDS. A soldier is far from home. There is loneliness and boredom. Sometimes it is tempting to use sex against the loneliness and boredom," Lieutenant Colonel Thembeni Magongo, implementing officer in charge of the programme, told IRIN/PlusNews.

The army’s HIV/AIDS campaign was introduced almost a decade ago in 2000 and uses peer counsellors and special drama shows to encourage enlisted staff to be tested. The shows feature a trio of HIV positive soldiers who put a human face to the condition, which is highly stigmatized in Swazi society.

"These soldiers are our best tools. We call them our heroes, because they have saved so many lives,” Magongo noted.

Private Ntokozo Zwane went public with his HIV-positive status in 2008, and is one of the three enlisted men who testify on living with HIV at army events.

"I am not yet on medication, but I am keeping myself healthy by eating properly, avoiding stress, getting exercise and being faithful to my wife,” he said, looking like any other fit soldier in his 20s.

Officer Class 2 Samuel Hlope offers counselling, while his wife, who is HIV negative, counsels the families and wives of soldiers who test positive.

"She helps us a lot. She convinced us that with this sensitive matter women like to talk to women. More and more of our soldiers are women. And this is the way it is with the peer counsellors in the ranks. The top talks to the top, the middle talks to the middle and the bottom talks to the bottom,” said Magongo.

Once trained, peer counsellors seek out their fellow soldiers and officers, from training fields to sports grounds to local hangouts, driving home the message.

Addressing stigma
Lance Corporal Thembinkhosi Dlamini, second in command of the campaign, also credits the Simomondiya Drama Society for reducing the stigma attached to HIV.

"They are part of our shows and the soldiers respond well to their plays. They have done a lot to boost the popularity of condoms. Before, no soldier would wear a condom. Condoms were thought to be unmanly and unSwazi,” Dlamini said.

This past year, the army distributed 1.2 million condoms, donated by the American NGO AIDS Healthcare Foundation.

Antiretroviral drugs are available through the army’s treatment programme.
John Kunene, principal secretary for the army, was transferred from the Ministry of Health, where he was also principal secretary, at the height of HIV infections among army personnel five years ago. "I often asked myself why I was brought to the army when I have no military background," he told IRIN/PlusNews.

"A lot of soul searching and praying accompanied my transfer, and I felt I was placed here to help the army in this crisis. We are making headway," he said.

**New report provides women's perspectives on medical male circumcision for HIV prevention**

**Findings from community-led research in 5 African countries**

New York, 13 December 2010—A new report from the Women's HIV Prevention Tracking Project (WHiPT), a collaborative initiative of AVAC and the ATHENA Network, features an unprecedented collection of voices from Kenya, Namibia, South Africa, Swaziland and Uganda reflecting on what male circumcision for HIV prevention means for women. It highlights women's perspectives, advocacy priorities and recommendations on this new prevention strategy.

Making Medical Male Circumcision Work for Women is the first report from WHiPT, which was launched in 2009 to bring community perspectives, particularly women's voices, to the forefront of biomedical prevention research and the broader response to HIV.

The report highlights community-level support as well as concerns and misperceptions that can hinder effective implementation.

"Women are excited for medical male circumcision because they're desperate for new prevention options, but they lack detailed factual knowledge of its benefits and risks," says Cebile Dlamini of Swaziland for Positive Living. "For example, the fact that it only provides partial protection can be overlooked and some women and men believe once a man is circumcised, he is by definition HIV-negative."

In total, nearly 500 women in HIV-affected communities completed a questionnaire, developed and administered by the women-led WHiPT teams in five countries. Almost 40 focus groups provided additional information about women's attitudes about medical male circumcision. In each country, research took place in different locales, selected to reflect a diversity of circumcision practices, including communities that practice traditional male circumcision and those that do not circumcise, as well as those practicing female genital mutilation.

The majority of teams conducted their research in settings where male circumcision for HIV prevention had not yet been introduced as part of a national HIV strategy. Therefore many reported perceptions and concerns can be integrated into emerging programs—making this report both timely and urgent.

The Kenyan WHiPT team surveyed women in settings where male circumcision was evaluated in a clinical trial and subsequently introduced. Reports from women reached by the Kenyan WHiPT team underscore women's fears that male circumcision may lead to changes in men's behaviors and perception of risk.

"The women reported their partners either adapting or continuing risky behavior after 'the cut'," says Carol Odada, from Women Fighting AIDS in Kenya.

The report documents women's concerns that medical male circumcision might lead to an increase in heightened stigma for women living with HIV. This would be a result of circumcised men's misperceptions that they could not be HIV positive and/or could not transmit the virus. Thus sex and or safer sex would be less negotiable than before circumcision, putting women at greater risk for gender-based violence and HIV.

The report also highlights perceptions of male circumcision for HIV prevention in the context of traditional practices. Specifically, it underscores the need for communications campaigns that directly address the distinctions between medical male circumcision, traditional circumcision and female genital mutilation.

"Some women report the concern that the promotion of circumcision for men would increase the promotion of female genital mutilation," says Allen Kuteesa from Health Rights Action Group in Uganda. The myths and misunderstandings identified by WHiPT teams – such as the perception that medical male circumcision is directly protective for women – underscore the urgent need for adequate education campaigns directed at women. Further, for women to access and act on information related to medical
male circumcision and HIV, the information needs to be specifically tailored to women, and the socio-cultural context and realities of women's lived experience need to be taken into account.

The report summarizes advocacy activities that WHiPT teams will undertake over the coming year to ensure that male circumcision implementation addresses women's concerns.

**UCSF 'fountain of youth' pill could restore aging immune system**

UCSF researchers have identified an existing medication that restores key elements of the immune system that, when out of balance, lead to a steady decline in immunity and health as people age.

The team found that extremely low doses of the drug lenalidomide can stimulate the body's immune-cell protein factories, which decrease production during aging, and rebalance the levels of several key cytokines – immune proteins that either attack viruses and bacteria or cause inflammation that leads to an overall decline in health.

The initial study, which was designed to define the dose range of such a therapy in a group of 13 patients, could lead to a daily pill to boost immunity in the elderly, the researchers said. Data will appear in the January issue of the journal Clinical Immunology, and can be found online at [www.elsevier.com/locate/yclim](http://www.elsevier.com/locate/yclim).

The identification of a drug to reverse the immunological decline in aging, known as immunosenescence, is the culmination of years of research by Edward J. Goetzl, MD, at UCSF and the National Institute on Aging, into how cytokine levels change as people age, how that varies by gender, and which changes dictate whether someone will be healthy into their 90s or begin a downward cycle of decline starting in middle age.

"No one's really talking about longevity and lifespan now, but about 'health span,'” said Goetzl, director of UCSF Allergy and Immunology Research, which focuses on developing new diagnostics and treatments for allergic and immunological diseases.

"If, at age 50, your cytokine levels are the same as they were at 25, you’ll probably stay healthy as you age," he said. "But if they're heading downhill, we need to do something about it. If you could take a low-dosage pill with no side effects, wouldn’t you do it?"

In 2009, Goetzl had studied a group of 50 elderly adults through the National Institute on Aging, examining their levels of key cytokines – Interleukin (IL)-2, IFN-gamma and IL-17 – and discovered that truly healthy 70-80 year old women had the same levels of those as did healthy 20 year olds.

However, elderly men and frail women who showed increased levels of inflammatory diseases and weakened defenses against infections tended to have lower levels of the first two cytokines, which are protective, and higher levels of IL-17, which is linked to inflammation. That imbalance, the researchers found, began in late middle age.

They then set out to find a drug that could raise IL-2 and IFN-gamma and either have no effect on IL-17 or lower it.

"We now had a profile – in humans – that we could take to test tubes to say, 'Does this drug have a desirable effect?'” Goetzl said. "Our job was to find a therapy that not only works, but does so at a dose range with no side effects."

The team focused on three classes of drugs, among them the one that includes lenalidomide – a derivative of thalidomide – which is undergoing a renaissance, Goetzl said.

First introduced in the late 1950s as a sedative, thalidomide was never approved in the United States, but was withdrawn from the world market in 1961 after causing severe birth defects in infants whose mothers took the drug to reduce nausea during pregnancy.

In recent years, however, lenalidomide has been found to be an effective co-therapy for some cancers, particularly multiple myeloma and kidney tumors, as well as leprosy, at doses of 5 mg to 20 mg per day. Those cancers are tied to a drop in IL-2, the main cytokine that Goetzl's team had linked to declines in aging immune systems.

In this study, the team tested the drug in healthy seniors, each of whom were matched in race, gender and national origin to a healthy young adult participant. They found that extremely low levels of lenalidomide – 0.1 µM – optimally stimulated IL-2 production in the young people (21-40 years) roughly sevenfold, but stimulated IL-2 production in patients over age 65 by 120-fold, restoring them to youthful levels for up to five days. At that dosage, the drug also increased IFN-gamma up to six fold in the elderly patients, without suppressing IL-17 generation.
The researchers also found that lenalidomide had many other beneficial effects on the elderly participants' T cells, including better migration throughout the body, more efficient patrolling activity and longer survival after defending the body against an infection.

The team plans to begin larger-scale clinical trials in 2011 to test the drug's effectiveness and hopes for broader availability within a few years.

"Berlin Patient" Still HIV-free 4 Years after Bone Marrow Transplant ****

**SUMMARY:** The "Berlin Patient"—now known to be Timothy Ray Brown—remains free of any detectable HIV in his blood, gut tissue, and other reservoir sites 4 years after receiving a bone marrow transplant containing stem cells from a donor with the CCR5-delta32 mutation, according to a report in the December 8, 2010 advance online edition of Blood. These findings, his doctors say, "strongly suggest that cure of HIV has been achieved in this patient."

By Liz Highleyman

This year has seen an increased emphasis on a cure for HIV, spurred in part by the proof-of-concept offered by the "Berlin Patient," an HIV positive man who needed a bone marrow transplant to treat leukemia.

HIV requires one of 2 co-receptors, CCR5 or CXCR4, to enter human cells. Individuals with a natural genetic mutation known as CCR5-delta32, who do not express CCR5 on their CD4 T-cells, are resistant to HIV infection. Those who do become infected may be "elite controllers" who maintain very low viral load without antiretroviral therapy (ART).

The Berlin Patient underwent leukemia treatment that involves using potent chemotherapy to kill off immune cells—which eliminates the cancer—and reconstituting the immune system with donated hematopoietic stem cells, which differentiate into all the different types of blood cells, including T-cells.

Gero Hütter and his team at Charité-University Medicine in Berlin searched the German bone marrow donor registry and managed to find a donor who was not only a compatible match, but also had a double or homozygous CCR5-delta32 mutation.

As reported in the February 12, 2009, New England Journal of Medicine, after the first transplant, researchers were unable to find any evidence of HIV, even though the patient stopped taking ART. He then received a second transplant from the same donor due to a relapse of leukemia. In the latest report, Hütter and colleagues provide an update on the patient's current status.

In every other known case to date, HIV remains in the body at low levels despite ART, hidden in resting memory T-cells and other viral reservoirs. When treatment is stopped, the virus begins replicating anew, leading to viral load rebound.

The Berlin Patient, however, shows no evidence of residual HIV and has not experienced disease progression. His immune system was successfully reconstituted, and now contains HIV-resistant CCR5-delta32 cells, like those of the donor. Furthermore, the researchers noted, "We found evidence for the replacement of long-lived host tissue cells with donor-derived cells indicating that the size of the viral reservoir has been reduced over time."

"[O]ur results demonstrate successful CD4+ T-cell reconstitution at the systemic level as well as in the largest immunologic organ [the gut] following CCR5-delta32/delta32 stem cell transplant, and additionally provide evidence for the reduction in the size of the potential HIV reservoir over time," they elaborated in their discussion.

CCR5-delta32 cells may not render a person completely resistant, since some strains of HIV may still be able to use the alternate CXCR4 co-receptor. The potent chemotherapy used in this case to ablate or kill off the man's original immune cells may have also played a role in the apparent eradication of HIV.

"Although the recovered CD4+ T-cells are susceptible to infection with [CXCR4] HIV infection, the patient remains without any evidence for HIV infection since more than 3.5 years after discontinuation of ART," the researchers concluded. "From these results, it is reasonable to conclude that cure of HIV infection has been achieved in this patient."

The Patient Comes Out

Concurrent with Hütter and colleagues' report in Blood, the Berlin Patient revealed his identity in a profile in the December 8 online issue of the German magazine Stern.

According to Google translation of the original article, Timothy Ray Brown, 44, is an American citizen living long-term in Germany. HIV positive since 1995, he developed leukemia in 2006. He was initially treated with chemotherapy, but without sustained response. Hütter—who had little experience with HIV but had heard about the CCR-delta32 resistance mutation—decided to try an unprecedented experiment.
The case will go down in history as a milestone in the epidemic; not only does Brown show no signs of HIV, he also is in long-term remission from leukemia.

It is not possible, of course, to give every HIV positive person a stem cell transplant. In addition to the great expense, the ablation process can be fatal and there are too few CCR5-delta 32 donors to go around. But the Berlin Patient provides proof-of-concept needed to move forward with related approaches now under study, such as using zinc finger gene therapy to delete CCR5 from hematopoietic stem cells that are then returned to the body in the hope of creating an HIV-resistant immune system.

12/14/10

Reference

Parasite and Bacterium Illustrate Convergent Evolution: Both Hijack Cells' 'Post Office'

ScienceDaily (Dec. 14, 2010) — The protozoan parasite *Toxoplasma gondii* and the pathogenic bacterium *Chlamydia trachomatis* exemplify convergent evolution, the development of a similar biological trait in unrelated lineages, according to research presented December 13 at the American Society of Cell Biology's 50th Annual Meeting in Philadelphia.

The biological trait shared by the two pathogens is their modus operandi—how they operate inside human host cells to reproduce themselves, said scientists at the Johns Hopkins Bloomberg School of Public Health, working with researchers at the University of Maryland Dental School and the University of Zurich in Switzerland.

Both *T. gondii* and *Chlamydia* hijack their host cells' Golgi apparatus, the "post office of the cell" because it packs up and dispatches cellular cargoes such as lipids in sealed vacuoles. After taking over the Golgi, both pathogens reorganize the organelle into mini-stacks conveniently aligned just outside each invader's hiding place in the cell.

In addition to being an example of convergent evolution, the pathogens' predatory similarity is a possible clue for improving therapies to contain two of the most common infections on earth, said Julia Romano, Ph.D., and Isabelle Coppens, Ph.D.

The research that led to the discovery of *T. gondii* and *Chlamydia*’s similar mode of action was prompted by a study on how *Toxoplasma* secures a nutrient supply inside an infected host. In that National Institutes of Health supported study, scientists noticed a strong parallel with chlamydial infection that had not been suspected since protozoa and bacteria stem from distant evolutionary branches.

Romano and Coppens investigated *Toxoplasma*-infected host cells to determine how the parasite hijacks lipids named ceramides and found that the protozoan hid from the host’s immune system by living inside its own capsule, parasitophorous vacuole (PV). They then determined that the protozoan was able to grab nutrients without exposing itself, because it had located its PV near the hub of the cell's cargo system, the pericentriolar region, and thus close to the Golgi. Within 32 hours of infecting a host cell, the protozoan had sliced the Golgi into fragmented mini-disks and was ingesting intact vacuoles containing ceramides through its PV membrane.

The remodeled Golgi, the PV’s location in the pericentriolar region, and the efficient capture of the host’s sphingolipid supply reminded the researchers of infection by *C. trachomatis*, which causes the most frequently reported sexually transmitted disease in the U.S. To test the parallel, the researchers co-infected mammalian cells with *T. gondii* and *C. trachomatis* and then observed the two pathogens’ quickly dividing the Golgi between them. The two disparate pathogens’ distributing the fragments of the organelle equally indicates a common evolutionary strategy.

According to the U.S. Centers for Disease Control (CDC), 1.2 million cases of *C. trachomatis* infection were reported during 2008 in the U.S. "Silent," untreated *C. trachomatis* infections can cause infertility in women. Spread by infected meat, *Toxoplasmosis* is the third leading cause of death attributed to food borne illness.

Dr. Romano will present, "Co-option of the Host Cell Golgi by the Intracellular Parasite Toxoplasma gondi," on Dec. 12, 2010.
Trials to find cure for HIV in final stage ****
Wed, Dec 15, 2010
New Straits Times

KUCHING- Sarawak and American scientists are in the final stage of conducting clinical trials on a compound from the Bintangor tree for the treatment of HIV, Chief Minister Tan Sri Abdul Taib Mahmud said yesterday. The scientists have been conducting trials over the last 10 years in Seattle in the United States in a bid to find a medication for HIV/ AIDS.

They believe that the Calanolide compound could be the answer for the treatment of HIV, for which there is no cure yet.

The compound was extracted at the Sarawak Biodiversity Centre (SBC) by the local scientists and sent for clinical trials in Seattle.
"The compound, if proven effective in curing HIV, will be a major discovery from Sarawak," Taib said at the opening of the centre's new administrative building at Km40, Jalan Penrissen, near here.

He, however, could not say when the compound could be finally distributed and commercially marketed worldwide.

Taib announced that the state government had set aside a piece of land in Bau district for the planting of Bintangor tree, and that RM10 million had been allocated to the centre for research purposes.

Any scientist from the centre who made discoveries on plant compounds that could cure illnesses would be given a share in the centre. The others who would be given the shares are research institutions that conduct clinical trials on the compounds and pharmaceutical companies which manufacture the compounds into medicines.

Taib also praised the centre for its Library of National Products, consisting of plants and microbes which had become the basis of screening for active compounds.

"Today, this library, which is supported by the state's legal and systematic approach to collaborative research work, has become the main attraction or draw for researchers and institutions to collaborate with SBC to screen for bioactive compounds."

With the setting up of the library, he added, the state had taken the initiative to enhance its own knowledge on indigenous biodiversity and its potentials, and to transform the discoveries into products by establishing partnerships with research institutions, biotech companies and local entrepreneurs.

Deputy Chief Minister Tan Sri Dr George Chan, meanwhile, said the centre was conducting research on a plant found in Ba'Kelalan that had the potential to be developed as an anti-cancer agent.

The plant, known as "segera" to the Iban and "kelabuno" to the Orang Ulu, contains a potent compound called silvestrol which has been patented worldwide by the Sarawak government, covering 16 countries.

"Silvestrol has drawn intense attention from a number of high-profile international research groups. "For example, the National Cancer Institute in the United States, a leading agency in cancer research and clinical trials, has teamed up with the prestigious Ohio State University to work with SBC in conducting pre-clinical and clinical trials on silvestrol.

"Furthermore, there are several renowned universities and commercial companies enquiring on the availability of this compound," Dr Chan said at the event yesterday.

He added that the state government was reviewing future agreements, and once these collaborations take off, the biodiversity centre would be the main agency to coordinate the supply of this drug candidate.

Making Medical Male Circumcision Work for Women: A new report from the Women’s HIV Prevention Tracking Project

How can male circumcision for HIV prevention benefit or backfire as a strategy affecting women?

The new report from AVAC and ATHENA Network’s Women’s HIV Prevention Tracking Project is an unprecedented collection of voices from Kenya, Namibia, South Africa, Swaziland and Uganda, documents women’s perspectives on male circumcision for HIV prevention.

The report is based on the input of approximately 500 women in HIV-affected communities who were reached by WHiPT country teams with questionnaires and focus groups designed to elicit knowledge, opinions and recommendations. The teams worked in urban and rural settings and sought out communities with and without traditional circumcision practices. There was a specific focus on perceptions in settings where female genital mutilation is also practiced.
The report provides reason for the cautious rollout of medical male circumcision (MMC) while offering recommendations on how to program its scale-up to ensure MMC is safe and beneficial to whole communities—including men and women.

Download the report.

U.S. considers new tools in global AIDS fight
Tue, Dec 14 2010
By Andrew Quinn
WASHINGTON (Reuters) — The U.S. global AIDS program may turn to new tools such as microbicide gels and pre-infection treatment to slow the epidemic in hard-hit countries, the program's director said on Tuesday.

Eric Goosby said the President's Emergency Plan for AIDS Relief (PEPFAR) was looking closely at both the gels, which can protect women against infection during sex and "pre-exposure prophylaxis (PrEP)," which involves giving AIDS drugs to people in high-risk groups before they are infected.

"We would support PReP in terms of high risk populations," Goosby, the U.S. Global AIDS coordinator, told Reuters, adding that various country approval plans were already under internal consideration.

Goosby said microbicide gels—a focus of hope since a South African clinical trial this year showed at least one version lowered HIV infection rates—could also play a part once full regulatory approval is obtained and more is understood about how they work.

"We haven't worked out the delivery system or the dosing or interval of application," Goosby said. "We are absolutely positioned to engage in it as soon as we know those."

Goosby spoke as PEPFAR signed a new five-year deal with South Africa to bolster its AIDS fight, signaling a deepening cooperation between Washington and a country once depicted as representing the wrong approach to the AIDS epidemic.

"We are here at a moment when South Africa is turning the tide against HIV/AIDS. It is exciting to see," said U.S. Secretary of State Hillary Clinton, who signed the five-year deal with South Africa's visiting Foreign Minister Maite Nkoana-Mashabane.

Goosby said the agreement would commit the United States to working with South Africa as it identifies its own AIDS-fighting priorities, with an emphasis on helping to build up the country's overall medical infrastructure.

SOUTH AFRICAN TURNAROUND
The United States contributes around $560 million a year to South Africa under PEPFAR, and Goosby said funding levels were expected to remain roughly constant for the country, where 1,000 people die from AIDS-related illnesses each day.

"We have developed a level of trust that is extraordinary," Goosby said. "They are revealing needs and vulnerabilities, and their ability to move forward has allowed us to have a heads up on where their areas are that we can help."

South Africa was criticized under former President Thabo Mbeki, who questioned accepted AIDS science and failed to make life-prolonging AIDS drugs widely available.

Mbeki's successor, President Jacob Zuma, has taken a different approach, promising drugs to more people and fighting the deep social stigma attached to the disease.

South Africa has been approved for more than $300 million in support from the Global Fund for AIDS, Tuberculosis and Malaria and devotes more than twice that amount from its own budget to fighting the disease.

The addition of PrEP and microbicide gels could represent a potentially large new budget item for PEPFAR, the $18.8 billion program launched by former President George W. Bush, but Goosby said new efficiencies in both care and treatment were already streamlining the overall bill.

He said South Africa had proposed using PrEP to treat uninfected inmates in South Africa's prisons—a major vector for HIV—while pilot projects elsewhere were looking at sex workers and men who have sex with men.

Last month researchers showed that Truvada, a once-a-day pill combining two Gilead Sciences Inc (GILD.O: Quote, Profile, Research, Stock Buzz) HIV drugs, markedly reduced the risk of men contracting HIV. Gilead’s tenofovir was also used in the South African study that showed a microbicide gel lowered the infection rate by 30 percent for women.
South Africa has sought to expand its purchase of generic drugs, and Goosby said the United States actively supported efforts by developing nations to buy cheaper versions of drugs to save money.

**Hepatitis C Pouncing on Boomers at Midlife**
*Palm Beach Post*, (12.07.2010) Stacey Singer

Health experts say the vast majority of people with hepatitis C virus are unaware they are infected. HCV can hide in liver cells for years, stealthily doing damage—cirrhosis, liver cancer, and liver failure are common. The disease accelerates as people hit middle age, with 55 the median age for HCV diagnosis, said Dr. Mitchell Davis of South Florida Gastroenterology.

Davis said people often associate HCV with inmates, addicts, and prostitutes. “It’s got this creepy, ‘Why should I care? This is a disease of druggies,’ connotation,” he said. “Well, the people who experimented in college, during the Vietnam War, are now Baby Boomers. They are professionals. They briefly experimented and have been carrying it ever since.”

The blood-borne virus is very infectious. “Even a small drop of blood can have 3 million or 4 million virus particles,” said Davis. Sharing needles or other drug paraphernalia like a contaminated cocaine straw can spread HCV, as can unsterilized tattoo and manicure equipment. “I tell people if they get manicures to bring their own nail kits,” he said.

Nationwide, an estimated 3 million to 5 million people carry HCV. Palm Beach County Health Department records show nearly 1,400 residents have been diagnosed with HCV so far this year.

“This is mainstream America we are talking about,” said Dr. Eugene Schiff, director of the Center for Liver Diseases at the University of Miami School of Medicine in Miami.

Schiff believes all primary care doctors should routinely screen middle-age patients for HCV. Current CDC guidelines call for screening of persons who report high-risk behaviors. But Schiff said the reality is patients do not readily acknowledge drug use, especially if it occurred long ago and infrequently.

**Parliament Blocks Philippines Condom Funding**
*Agence France Presse*, (12.13.2010)

On Monday, the Philippine parliament halted a government plan to provide free contraception, cutting a proposed 200 million peso (US $4.5 million) allocation to the Health Ministry’s 2011 budget.

“The 200 million pesos allotted for the purchase of pills, injectables, and even condoms has been removed because these contraceptives are in violation of … the constitution,” said Vicente Sotto, majority leader of the Senate, citing a provision that states: “It [the state] shall equally protect the life of the mother and the life of the unborn from conception.”

House and Senate members meeting in a conference committee to finalize the 1.634 trillion peso budget bill made the decision. President Benigno Aquino can either veto or uphold the move when he signs the 2011 budget act into law. Aquino has supported the contraceptive plan, while the dominant Roman Catholic Church vigorously opposes it.

Senate President Juan Ponce Enrile said the Health Ministry’s budget for programs like maternal care and parenting classes, 680 million pesos, remains intact. Despite majority support in the House, the reproductive bill has been denounced by key senators like Enrile and Sotto. However, Enrile said he is open to debate.

**Gay Groups Blast City-Sponsored HIV Ad**

Last week, New York City health officials launched a new prevention effort that seeks to counter HIV complacency among men who have sex with men (MSM). However, two gay and lesbian advocacy groups said the campaign’s TV ad is stigmatizing and too sensational.

In the video, a voiceover states, “When you get HIV, it’s never just HIV,” noting “dozens of diseases” for which HIV-positive persons are at increased risk, “even if you take medications.” The ad graphically depicts dementia, noting “permanent memory loss,” and osteoporosis, “a disease that dissolves your bones.” It states that with HIV, “you’re over 28 times more likely to get anal cancer,” which is visually depicted. “Stay HIV-free. Always use a condom,” the voiceover ends.

“It really paints this picture of gay men as these sort of disease-ridden vessels, and so the message is really sort of, ‘Stay away from gay men,’” said Francisco Roque, director of community health for the New York-based HIV advocacy group Gay Men’s Health Crisis. The ad’s “horror movie” quality and eerie
sounds seem to demonize gay men, he said. GMHC and the Gay & Lesbian Alliance Against Defamation said the ad creates a grim portrait of life with HIV, further stigmatizing those with the infection.

“While some community groups may dislike the message, others have spoken out to support it,” the city's Department of Health & Mental Hygiene said. The department said it plans to air the ad, which is also on YouTube.com, on cable and broadcast television for two weeks this month and two weeks in January.

“Silence is no solution when the number of new HIV diagnoses among MSM is up by more than 50 percent in eight years, the department said. “In developing this video spot, we tested various approaches in focus groups. The spot was informed by that process and by lessons learned from our successful anti-smoking efforts. It was also carefully vetted for technical accuracy.”

**Scientists decode secrets of a very common virus that can cause cancer**

DURHAM, N.C. – About 90 percent of people are infected at some time in their lives with Epstein-Barr virus (EBV), usually with no ill effects. But individuals with compromised immune systems, such as people with organ transplants or HIV infection, have a greater risk of cancer occurring because of this virus.

Scientists at the Duke Cancer Institute have discovered a pathway that infected cells use to root out EBV infections, a finding that has implications for understanding the human response to cancer-causing viruses in general.

"Using cell culture studies, we have uncovered a major pathway that the infected host cell activates to prevent an oncogenic virus from causing cancer," said senior author Micah Luftig, Ph.D., Assistant Professor of Molecular Genetics and Microbiology. "We proposed that the cell was sensing that the virus is trying to take over. When this oncogenic stress response is activated, it keeps the virus in check, and now we know why."

The Luftig group also learned how the Epstein-Barr virus overcomes the cell’s response. "The findings may eventually yield therapies to benefit people who don't have good immune systems and who need protection from a threatening EBV infection," Luftig said.

This work appears in the Dec. 15 online issue of *Cell Host and Microbe*.

Very early in many people’s lives, there is a huge expansion of immune system B cells infected with EBV. But thanks to the oncogenic stress response and a strong immune system, the majority of these infected cells are killed off and the person remains healthy. Luftig and his group, including lead authors Pavel Nikitin and Chris Yan, found two enzymes, called kinases, which were critical in mediating this oncogenic stress response and preventing unchecked B-cell cell growth, called immortalization.

When the scientists blocked the ATM and Chk2 kinases, unchecked growth resulted in 10 times more infected cells. This burgeoning cell growth is related to several types of cancer, including post-transplant lymphoproliferative disorder, in which a transplant patient gets a form of lymphoma because of B-cell proliferation, and HIV-associated B-cell lymphomas among others.

"This finding can be extended to the general case of any oncogene being activated that might start the process of tumor formation," Luftig said. "About 20 percent of all human cancers are caused by infectious agents, where about 80 percent of these infections are viral." Another example of a viral infection leading to cancer is the human papillomavirus, implicated in cervical cancer.

Epstein-Barr virus infection can mean different courses for different people. In children 4-5 years old, a first infection with the virus may cause a mild illness, but if this primary infection happens during adolescence, the person may suffer a case of mononucleosis with heavy fatigue and other symptoms. In immune-compromised people, the virus can do much worse damage and cause forms of lymphoma.
Blood-sucking superbug prefers taste of humans
Staphylococcus aureus bacteria bind best to human hemoglobin

"Staph" bacteria feed on blood. They need the iron that's hidden away inside red blood cells to grow and cause infections. It turns out that these microbial vampires prefer the taste of human blood, Vanderbilt University scientists have discovered.

The researchers report in the Dec. 16 issue of Cell Host & Microbe that Staphylococcus aureus (staph) favors human hemoglobin – the oxygen-carrying protein that contains iron – over hemoglobin from other animals. The findings help explain why staph preferentially infects people and suggest that genetic variations in hemoglobin may make some individuals more susceptible to staph infections.

Staph lives in the noses of about 30 percent of all people – usually without making them ill, said Eric Skaar, Ph.D., M.P.H., associate professor of Microbiology and Immunology.

"A big question in staph biology is: why do some people continuously get infected, or suffer very serious staph infections, while other people do not? Variations in hemoglobin could contribute," he said.

If that is the case – something Skaar and his team plan to explore – it might be possible to identify patients who are more susceptible to a staph infection and provide them with prophylactic therapy in advance of a hospital stay or surgery.

Staph is a significant threat to global public health. It is the leading cause of pus-forming skin and soft tissue infections, the leading cause of infectious heart disease, the No. 1 hospital-acquired infection, and one of four leading causes of food-borne illness. Antibiotic-resistant strains of S. aureus – such as MRSA – are on the rise in hospitals and communities.

"It seems as if complete and total antibiotic resistance of the organism is inevitable at this point," Skaar said.

This dire outlook motivates Skaar and his colleagues in their search for new antibiotic targets. The group has focused on staph's nutritional requirements, searching for ways to "starve" the bug of the metals (such as iron) that it needs.

Staph obtains iron by popping open red blood cells, binding to the hemoglobin, and extracting iron from it. Skaar and colleagues previously identified the staph receptor for hemoglobin, a protein called IsdB.

In the current studies, they showed that S. aureus bacteria bind human hemoglobin preferentially over other animal hemoglobins, and that this binding occurs through the IsdB receptor. The preferential recognition of human hemoglobin by S. aureus is due to the increased affinity of IsdB for human hemoglobin compared to other animal hemoglobins.

The team studied staph's ability to infect a mouse expressing human hemoglobin (a "humanized" mouse model) and found that these mice were more susceptible to a systemic staph infection than control mice.

The investigators also examined the hemoglobin-binding preferences of other microbes and found that bacterial pathogens that exclusively infect humans, such as the bacteria that cause diphtheria, prefer human hemoglobin compared to other animal hemoglobins. In contrast, pathogens such as Pseudomonas and Bacillus anthracis (the cause of anthrax), which infect a number of different animals, "didn't exhibit a hemoglobin preference," Skaar said.

The human hemoglobin-expressing mice will be a valuable research tool, Skaar said, because staph infects these mice in a way that more closely mimics the infectious process in humans. His team will also explore whether these mice provide a good model for studying the infectious biology of other pathogens.

Skaar hopes to utilize Vanderbilt's DNA Databank, BioVU, to examine whether genetic variations in hemoglobin contribute to individual susceptibility to staph infections. His team will continue to study the molecular interaction between hemoglobin and the IsdB receptor, with the aim of disrupting this interaction with new antibiotic therapeutics.
**Plasma therapy: an alternative to antibiotics?**

**15 December 2010**

Cold plasma jets could be a safe, effective alternative to antibiotics to treat multi-drug resistant infections, says a study published in the January issue of the *Journal of Medical Microbiology* on 15 December. The team of Russian and German researchers showed that a **ten-minute treatment with low-temperature plasma was not only able to kill drug-resistant bacteria causing wound infections in rats but also increased the rate of wound healing**. The findings suggest that cold plasmas might be a promising method to treat chronic wound infections where other approaches fail.

The team from the Gamaleya Institute of Epidemiology and Microbiology in Moscow tested a low-temperature plasma torch against bacterial species including *Pseudomonas aeruginosa* and *Staphylococcus aureus*. These species are common culprits of chronic wound infections and are able to resist the action of antibiotics because they can grow together in protective layers called biofilms. The scientists showed not only that **plasma was lethal to up to 99% of bacteria in laboratory-grown biofilms after five minutes**, but also that **plasma killed about 90 % of the bacteria (on average) infecting skin wounds in rats after ten minutes**.

Plasmas are known as the fourth state of matter after solids, liquids and gases and are formed when high-energy processes strip atoms of their electrons to produce ionized gas flows at high temperature. They have an increasing number of technical and medical applications and hot plasmas are already used to disinfect surgical instruments.

Dr Svetlana Ermolaeva who conducted the research explained that the recent development of **cold plasmas with temperatures of 35-40°C** makes the technology an attractive option for treating infections. “Cold plasmas are able to kill bacteria by damaging microbial DNA and surface structures without being harmful to human tissues. Importantly we have shown that plasma is able to kill bacteria growing in biofilms in wounds, although thicker biofilms show some resistance to treatment.”

Plasma technology could eventually represent a better alternative to antibiotics, according to Dr Ermolaeva. “Our work demonstrates that plasma is effective against pathogenic bacteria with multiple-antibiotic resistance—not just in Petri dishes but in actual infected wounds,” she said. “Another huge advantage to plasma therapy is that it is non-specific, meaning it is much harder for bacteria to develop resistance. It’s a method that is contact free, painless and does not contribute to chemical contamination of the environment.”

**Marinomed’s iota-carrageenan effective against H1N1**

**Study published in PLoS ONE**

Carrageenan, is a polymer derived from red seaweed which helps to create a protective physical barrier in the nasal cavity and has proven to be an effective antiviral in the treatment of the common cold. The present study assessed the efficacy of Carrageenan against influenza viruses, including the pandemic H1N1 influenza strain. Results showed that the polymer directly binds to influenza viruses, effectively blocking the virus from attaching to cells and spreading further. In animal experiments, Carrageenan demonstrated equivalent efficacy when compared to the drug Tamiflu.

"Influenza viruses still represent a substantial threat to public health on a global scale and with increasing viral resistance to Tamiflu, the need for alternatives has never been greater," commented Dr. Andreas Grassauer, CEO and co-founder of Marinomed. "This study confirms that iota-carrageenan can be used as an alternative to neuraminidase inhibitors and should be further tested for prevention and treatment of influenza A in clinical trials in humans."
Vaccine Boosts Immune System, Helps Prevent Chronic Inflammation

ScienceDaily (Dec. 14, 2010) — Researchers at BRIC, the University of Copenhagen, have discovered that the human body can create its own vaccine, which boosts the immune system and helps prevent chronic inflammatory diseases. The researchers' results have just been published in the Journal of Clinical Investigation and may have significant consequences in developing new medicine.

Researchers at the Biotech Research and Innovation Centre (BRIC) at the University of Copenhagen have discovered a protein normally found in the body that can act to prevent chronic tissue inflammation. When administered in the form of a therapeutic vaccine it is able to effectively prevent and treat a number of different inflammatory disease models for multiple sclerosis (MS), rheumatoid arthritis (RA), skin hypersensitivity and allergic asthma (AA).

The results of this study have just been published by the Journal of Clinical Investigation in the article entitled "Endogenous collagen peptide activation of CD1d-restricted NKT cells ameliorates multiple tissue-specific inflammation in mice."

The study was led by Principal Investigator Shohreh Issazadeh-Navikas, group leader for Neuroinflammation Unit at BRIC, and was the result of a translational collaboration involving researchers in Denmark, Sweden and Germany. The article culminates a decade's long search for ways to combat inflammation and inflammatory diseases.

"The implications of the findings are large as they shed light on an important way that the body combats inflammation and autoimmunity. Moreover, they establish a therapeutic approach for using the newly discovered protein as a treatment for multiple conditions," says Shohreh Issazadeh-Navikas.

Many inflammatory and autoimmune diseases are chronic and affect a large majority of people. Moreover, there is an inflammatory component to many common diseases, such as Alzheimer's, Parkinson's, RA, AA, MS, type II diabetes and cancers. The vaccine discovered by the researchers boosts special cells of the immune system, called NKT cells.

NKT cells are a type of T cell that exert profound and diverse regulatory effects in disease, from autoimmunity to responses to pathogens and cancer. For over two decades since their discovery NKT cells have traditionally been considered to be activated by lipid antigens presented by CD1 molecules. However, Professor Issazadeh-Navikas' group was able to show for the first time the ability of a self peptide to activate NKT cells to suppress many tissue-specific inflammatory conditions including experimental autoimmune diseases.

This highly significant and novel finding offers a new perspective on the ways in which the body combats inflammation in both health and disease. In addition, the researchers identified the activation requirements and signaling pathway through which they exert their function.

Professor Issazadeh-Navikas highlights, "Our data offer a novel perspective on the physiological role of these cells in maintenance of tissue homeostasis and reduction of inflammation."

The findings significantly advance the fields of autoimmunity, antigen presentation, and NKT cells. They provide mechanistic insight into the biology of these cells and their roles in disease and point the way to therapies to treat many common conditions.

Journal Reference:
Asthma? Allergens Could Be Growing in Your Lungs

ScienceDaily (Dec. 15, 2010) — Scientists investigating the allergic reactions that asthmatics suffer towards a common mould have discovered that many people with asthma actually had the mould growing in their own lungs.

The research led by University of Leicester scientists at Glenfield Hospital has been published in the December 2010 issue of the *American Journal of Respiratory and Critical Care Medicine*.

The team based in the Institute for Lung Health at the University of Leicester and Glenfield Hospital examined the impact on asthmatics of a common environmental mould, *Aspergillus fumigates*, usually found in soil and compost heaps.

Professor Andy Wardlaw from the University of Leicester said: "Asthma is a very common condition where the breathing tubes (bronchi) can go into spasm making it difficult to breathe. Around a fifth of adults with severe asthma, which they have had for a long time, get permanent (fixed) narrowing of their bronchi. It is known that *A. fumigatus* can grow in the lungs of some people with asthma and mould allergy, which can cause severe lung damage.

"This problem is thought to only affect a very small number of people with asthma; however, about half of people with severe asthma have evidence of allergy to moulds like *A. fumigatus*.

Researchers in the Institute for Lung Health at the University of Leicester and Glenfield Hospital, Leicester, carried out a study funded by the Midlands Asthma and Allergy Research Association (MAARA, a Midlands based charity funding research into asthma and allergy research) and the European Regional Development Fund (ERDF), to determine whether the problem of *A. fumigatus* growing in the lungs is more common than previously thought, and whether this could explain the fixed narrowing of the airways that occurs in some people with asthma.

Professor Wardlaw added: "Our study showed that 6 out of 10 people with asthma who were allergic to *A. fumigatus* grew the mould from their sputum. We also found that if you were allergic to *A. fumigatus* you had more narrowing of the airways than if you were not allergic, and this was worse in patients from whom *A. fumigatus* was grown.

"Our research concluded that it is possible that fixed narrowing of breathing tubes in many people with asthma could be caused by *A. fumigatus* growing in their lungs.

"Treating individuals from whom *A. fumigatus* is detected with antibiotics against the mould may prevent fixed narrowing of the airways."

*Journal Reference:*

Male partner involvement in PMTCT reduces HIV transmission risk

Carole Leach-Lemens
Published: 16 December 2010

Male partner involvement in the prevention of mother-to-child transmission (PMTCT) services reduced the risks of vertical transmission and infant mortality by more than 40% compared to no involvement according to Adam Aluisio and colleagues in a prospective cohort study undertaken between 1999 and 2005 in Nairobi, Kenya published in the January 1st 2011 edition of the *Journal of Acquired Immune Deficiency Syndromes*.

Male involvement, the authors add, may be an underutilised public health intervention to address both infant HIV infection and mortality in resource-poor settings.

90% of the estimated 1,000 children infected daily with HIV live in sub-Saharan Africa. Vertical transmission accounts for approximately 95% of infections in children.

Even though access to antiretrovirals for PMTCT has improved, much more remains to be done in resource-poor settings. Over one-third of HIV-infected pregnant women and half of their infants do not get any treatment.

Infant mortality rates in sub-Saharan Africa are the highest in the world. HIV transmission, infant feeding practices as well as poverty contribute to this, note the authors. While there is evidence of diminishing vertical transmission rates, infant mortality remains high. Improved infant health outcomes necessitate addressing these public health problems together, they add.
Evidence shows that male involvement is associated with better use of PMTCT services. However, the authors note there is scant evidence of the link between male involvement and rates of vertical transmission or infant mortality.

From 1999 to 2002 HIV-infected pregnant women were recruited from antenatal clinics in Nairobi, Kenya and followed with their infants for one year. HIV DNA testing was done at birth and then at one, three, six, nine and 12 months after birth. Women were encouraged to bring their male partners for HIV prevention counselling and testing.

Out of a total of 510 HIV-infected women enrolled, a total of 10% (54) were lost to follow-up before delivery (27) or did not report a current male partner relationship (27).

Of the remaining 456 female participants, 140 (31%) were accompanied by their male partners to the antenatal clinic.

Of the 140 male partners, 75 (54%) were tested for HIV in the antenatal clinic; 42 (56%) tested positive.

Among 441 infants tested, 19% (82) were HIV-infected by one year of age.

Taking maternal viral load into account HIV-infection risk was over 40% lower in infants born to women accompanied by their male partners compared to those unaccompanied (adjusted hazard ratio (aHR)=0.56; 95% CI: 0.33-0.98; P=0.042).

The same held true with reported prior partner HIV testing compared to no report of previous partner testing (adjusted hazard ratio (aHR)=0.52; 95% CI: 0.32-0.84; P=0.008).

Adjusting for maternal viral load and breastfeeding, the combined risk for vertical transmission or infant death was significantly lower with antenatal partner attendance than without (aHR=0.55; 95%CI: 0.35-0.88; P=0.012) as well as with reporting of previous partner testing than without (aHR=0.58; 95% CI: 0.34-0.88; P=0.01).

The authors note this study shows that male partner involvement provides a significantly lower risk for HIV infection as well as improved HIV-free survival in infants born to HIV-infected women when compared to infants born to women without male involvement.

While these findings are consistent with other studies, this study differs in that HIV-infection and infant mortality are looked at rather than numbers accessing an intervention, for example. This finding, the authors note, provides critical new evidence for male involvement as a potential, currently underused, public health intervention.

The authors note that while PMTCT programmes in sub-Saharan Africa promote partner HIV testing they do not specifically encourage antenatal attendance for partners of HIV-infected women.

These findings support the need to further define specific male partner factors that are associated with improved health outcomes in maternal and child health programmes, they note. Barriers to partner testing and participation in antenatal settings also need to be addressed, the authors add.

71 (16%) infants died, of whom 28 (39%) were HIV-infected, 31 (44%) HIV- uninfected, and the remaining 12 (17%) of unknown status.

The mortality risk among HIV-uninfected infants born to women with antenatal partner attendance was 63% less than in those whose mothers were unaccompanied. The authors note that with increasing rates of antenatal HIV testing and improved antiretroviral treatment HIV-exposed but uninfected children make up the majority of infants born to HIV-infected mothers. So bringing down the death rates among this group will provide considerable public health benefits.

However, the authors also noted a disturbing trend that needs further exploration: increased mortality risk among HIV-infected infants born to women with partner attendance.

Limitations include not taking into account the possible negative effects of male involvement, in particular domestic violence. The authors suggest these be monitored in future studies.

A second limitation involves bias when answering sensitive questions concerning HIV testing and disclosure of their partner’s status.

The authors conclude that “these data suggest that incorporating men into PMTCT programmes with associated HIV testing may improve infant health outcomes by reducing both vertical transmission and mortality among uninfected infants.”

Reference
U.N. Says It Will Investigate Source Of Haitian Cholera Epidemic As Death Toll Rises

The U.N. is looking into establishing an independent commission to identify the source of Haiti's cholera epidemic, Alain Le Roy, the U.N. under-secretary-general for peacekeeping operations, said on Wednesday, the Associated Press/Washington Post reports. "We are urging and we are calling for what we could call an international panel," Le Roy said at a news conference at the U.N. headquarters in New York. "We are in discussions with (the U.N. World Health Organization) to find the best experts to be in a panel to be completely independent," he added.

"U.N. officials initially dismissed speculation about the involvement of [U.N.] peacekeepers," the news service writes. "The announcement indicates that concern about the epidemic's origin has now reached the highest levels of the global organization" (Katz, 12/15).

"There have been widespread media reports claiming that U.N. peacekeepers from Nepal, serving with the UN stabilization mission in Haiti, are the likely source of the epidemic, with infected water having spread from their base into a nearby tributary of the Artibonite River," the U.N. News Centre writes. Le Roy said, "There is no consensus among scientists on this issue." He also noted that none of the Nepalese peacekeepers had tested positive for cholera or displayed cholera symptoms. He added that different analyses of water from their camp had not picked up the cholera strain that triggered the epidemic (12/15).

Meanwhile, "Haiti's cholera death toll has jumped by some 210 people, with more than 2,400 now having succumbed to the epidemic, health officials said Wednesday," Agence France-Presse reports.

"The health ministry in its latest figures listed 2,405 deaths since the infections began in the impoverished nation in mid-October. More than 54,500 people have been treated in hospital, out of a total of 109,196 cases," the news service writes. Last week, daily death tolls were near 26 or 27, suggesting "that the waterborne disease could be relinquishing its grip on the quake-hit nation," AFP writes. "Those numbers from last week had represented the first time for a month that authorities had recorded less than 30 people dying from cholera on two consecutive days – after daily November tolls of 60, 70 and even 80 and above" (12/15).

In related news, the Miami Herald/Seattle Times looks at the factors that have led cholera to flourish in Haiti. "The cholera outbreak ravaging Haiti is part of a worldwide pandemic that began 50 years ago and should be easy to stop – with technology developed in the 1800s. Haiti's poor sanitation system, however, makes the country vulnerable to a disease that first swept the United States and other parts of the world more than 150 years ago. The current global wave of cholera – the seventh in history – made its way from Asia to Africa to Latin America, and is back for its second strike at this hemisphere," according to the newspaper (Robles, 12/15).

Immune cell plays unexpected role in autoimmune disease

A new study provides fascinating insight into the underlying pathology associated with the autoimmune disease, systemic lupus erythematosus

A new study provides fascinating insight into the underlying pathology associated with the autoimmune disease, systemic lupus erythematosus (SLE). The research, published by Cell Press in the December issue of the journal Immunity, reveals an unexpected role for a key type of immune cell and provides a potential new therapeutic strategy for SLE and, potentially, other autoimmune diseases.

SLE is a chronic systemic disease that can affect many regions of the body and, as a result, presents with diverse clinical symptoms. As is characteristic of other autoimmune disease, in SLE the immune system attacks and damages the body's own cells and tissues. Previous research had shown that SLE is associated with activation of the two main parts of the adaptive immune system, B cells and T cells.

"We were interested in examining the contribution of another type of immune cell, the dendritic cell (DC), to SLE pathology," explains senior study author Dr. Mark J. Shlomchik from Yale University School of Medicine in New Haven, Connecticut. "DCs initiate and control the adaptive immune response to infection and have the potential to influence SLE in many different ways."

Dr. Shlomchik and colleagues deleted DCs in a mouse model of SLE and observed that although DCs contributed to the expansion and differentiation of T cells, they were surprisingly not required for the initial activation of T cells. These findings were unexpected because it is well established that DC cells initiate the T and B cell immune response to pathogens. Alternatively, DCs were very important for the invasion of target organs by inflammatory cells, including T cells. SLE-prone mice lacking DCs had markedly reduced kidney and skin disease. DCs also markedly affected the quantity and quality of the classic autoantibody response associated with lupus.
Taken together, the observations indicate that the way DC cells function in autoimmune disease is quite different from their role in the immune response to pathogens. "Our findings reveal that DCs operate not to initiate but rather to amplify disease in a mouse model of lupus which is in contrast to how they are thought to work in response to infection," concludes Dr. Shlomchik. "Although there is much more work to do in defining the roles of DCs in autoimmunity our current data validate DCs as a potential new therapeutic target in autoimmunity as well as point to future studies to determine how DCs promote local tissue inflammation and to test if depleting DCs will be therapeutic during disease."

**Why humans are more sensitive to certain viruses: Primate immune system differences identified**

The greater susceptibility of humans to certain infectious diseases when compared to other primates could be explained by species-specific changes in immune signaling pathways, a University of Chicago study finds. The first genome-wide, functional comparison of genes regulated by the innate immune system in three primate species discovers potential mediators of differences in disease susceptibility among primates. These findings are published on December 16 in the open-access journal *PLoS Genetics*.

Humans are more sensitive than chimpanzees to the severe effects of certain viral infections, such as progression of HIV to AIDS or severe complications from hepatitis B. Genomic comparisons of humans and their close primate relatives reveal many changes in immune system genes. By stimulating immune cells from humans, chimpanzees and rhesus macaques, Luis Barreiro and colleagues tested functional differences in primate immune pathways.

The "core" response, critical to fight any invading pathogen, was found to be evolutionarily conserved, with similar gene expression patterns across all three species. However, the regulatory response associated with genes involved in fighting certain viral and microbial infections produced unique effects in each species, probably reflecting rapid adaptation cycles between specific hosts and viruses. Interestingly, many HIV-interacting genes responded uniquely in chimpanzees, animals which do not routinely develop AIDS after HIV/SIV infection, possibly pointing to mechanisms of chimpanzee resistance to the virus. In humans, immune responses were particularly enriched for genes known to be involved in cell death (apoptosis) and cancer biology.

Though detailed species-specific gene expression patterns were identified in this study, more experiments will be required to assess the phenotypic impact of those unique immune responses. Future studies will also test the immune response of each species to specific infectious agents. According to the authors, the present findings are "only the first step in characterizing inter-species differences in immune response."


**New Discoveries Make It Harder for HIV to Hide from Drugs**

ScienceDaily (Dec. 16, 2010) — The virus that causes AIDS is chameleon-like in its replication. As HIV copies itself in humans, it constantly mutates into forms that can evade even the best cocktail of current therapies. Understanding exactly how HIV cells change as they reproduce is key to developing better tests and treatments for patients.

In the *Journal of Biological Chemistry* and *Nature Structural & Molecular Biology*, MU microbiologist and biochemist Stefan Sarafianos, PhD, reveals new findings that shed light on how HIV eludes treatment by mutating. His discoveries provide clues into HIV's mechanisms for resisting two main families of drugs.

"These findings are important because identifying a new mutation that affects HIV drug resistance allows physicians to make better decisions and prescribe the proper drugs," Sarafianos said. "Without that knowledge, therapy can be suboptimal and lead to early failure."

Patients with HIV are routinely tested to track the levels of the virus and immune cells in their body. Results of the tests help physicians gauge the health of their patients and prescribe the right mix of antiviral drugs. The drugs help prevent the spread of HIV in patients by inhibiting the virus' ability to replicate.

Sarafianos’ lab determined the biochemical properties that allow strains of HIV with a specific mutation—the N348I mutation—to escape inhibition despite treatment with Nevirapine. The drug is commonly used in combination with other antiviral medications to decrease the amount of HIV in the
blood. As a result of Sarafianos' discovery, at least one major company that manufactures HIV mutation-testing kits has modified its test to detect the N348I mutation.

Sarafianos' recent findings resulted from research supported by five National Institutes of Health grants. He recently received another $417,000 award from the NIH to assist him in developing modified antibodies for HIV therapy.

"Our latest efforts to design broadly neutralizing antibodies against HIV will hopefully expand our toolbox against the virus, which remains a constantly moving target," Sarafianos said.

**Journal References:**


**London: The Tuberculosis Capital Of Europe**

17 Dec 2010

The UK is the only country in Western Europe with rising rates of tuberculosis (TB), and cases in London have increased more than 50% since 1999. Nationwide, there are now more than 9,000 cases of TB diagnosed per year (9,040 in 2009). The problem is becoming particularly acute in London, where 40% of all UK TB cases are diagnosed. In a Comment published Online First in *The Lancet*, Global TB expert Professor Alimuddin Zumla, University College London, UK, calls for recommendations from a recent UK TB review to be implemented urgently to keep this re-emerging problem under control. A World Report in this week's *Lancet* also discusses TB in homeless people in London.

The death toll from TB (often called the 'white plague' in Victorian times) in the UK began to fall in London at the start of the 20th century as living standards (better housing, nutrition and economic status) improved and subsequent TB control was achieved by the introduction in the early 1960s of anti-TB drugs, improved health services and BCG vaccination. By the early 1980s TB was considered to be conquered in the UK and National Health Service (NHS) TB services were scaled down considerably.

Alarmingly, TB has returned to London with a vengeance with an increase in the number of TB cases by nearly 50% since 1999, from 2,309 cases in 1999 to 3,450 cases in 2009 accounting for nearly 40% of all TB cases in the UK. Since current detection methods (sputum microscopy and culture) only detect up to 70% of active cases, and UK doctors generally need to strongly suspect TB as a possibility before diagnosing it, it is likely the number of cases reported is underestimated.

The increase in the number of TB cases seen in the UK has largely been in non-UK born groups; in 2009 these were black African (28%), Indian (27%) and White (10%). Interestingly most of these were not in new migrants; 85% of cases born overseas had lived in the UK for two or more years and about half had lived here for five or more years (indicating that the TB was not imported into the UK) and TB was shown to be common in London boroughs experiencing relative deprivation. Cases of drug resistant TB are also increasing in London.

Professor Zumla says: "Poor housing, inadequate ventilation, and overcrowding—conditions prevalent in Victorian Britain—are causes of the higher TB incidence rates in certain London boroughs. In all European countries, the disease is mainly concentrated in high-risk groups, such as migrants, refugees, homeless people, drug users, prisoners, and HIV-infected groups."

He highlights the issue of spread within prisons, and from prisoners and prison staff to the community. A retrospective 4 year (2004-2007) study of 205 prisoners with newly diagnosed TB showed that prisoners were more likely to be UK born (47% versus 25%), to be white (33% versus 22%) and to have pulmonary TB (75% versus 56%) compared to all other TB patients seen in the UK during that period (29,340 cases in those aged 16 years or older).

The situation in London is, says Professor Zumla, reminiscent of the multi-drug resistant TB outbreaks in prisons in the USA in the 1990s, that required a large financial investment to be brought under control. Professor Zumla refers to the recent London TB Service Review Assessment, written by the Public Health Assessment Support Team (a social enterprise organisation in London) that recommends:

- An urgent and radical re-think on delivery of NHS TB Services
- The urgent need to establish a multi-agency Board including service users for TB Control for London which will closely monitor the performance these services and achieve a year on year reduction in the incidence of TB.
• Greater integration across the full range of bodies involved in TB control, including NHS services, port health, health protection units, Directors of Public Health, local authorities, the third sector, and the office of the London Mayor
• Standardised pathways of care for TB in London, through the use of a Manual of Clinical Policies and Protocols, to be based on the New York model, ie, a community based model of care, moving away from the more traditional clinic model found in the UK.
• Improvements to the accessibility and responsiveness of TB NHS services in line with the needs of local people.

Professor Zumla concludes: “This review, if implemented by the UK NHS, would allow standardisation of TB clinical policy and practice and improve responsiveness of London’s TB services needs. An immediate and serious long-term political and financial commitment is needed from the UK Government through the NHS if the tide is to be turned against the return of the white plague in London, and if tuberculosis is to be controlled. Such measures will erase London’s reputation as the tuberculosis capital of Europe.”

By Ron Najafi

Opinion: 5 ways to save antibiotics
Here's what we need to do to create new antibiotics and extend the life of those that already exist
[Published 14th December 2010 01:45 PM GMT]
The world is facing a crisis: Bacteria have become more and more resistant to virtually all existing antibiotics, yet many companies are abandoning the field in favor of more lucrative medicines.

People are proposing various solutions, such as offering financial incentives to the pharmaceutical industry to spur the development of vitally needed antibiotics. But along with creating new drugs, we can get more life from our existing antibiotics and maintain their utility. As the head of a company focused on the development of compounds to treat and prevent a wide range of infections without causing bacterial resistance, this is an issue I find both fascinating and vitally important. In my opinion, there are five ways we can extend the functional life of our antibiotic arsenal.

1. Do the obvious
In a recent New York Times article, Ramanan Laxminarayan, director of the Extending the Cure project on antibiotic resistance at the policy organization Resources for the Future, suggested that the government should focus on conserving the effectiveness of existing antibiotics by preventing their unnecessary use in people and farm animals, and by requiring better infection control measures in hospitals.

These are crucial steps, which should be taken immediately. First, we must stop and assess the use of antibiotics as additives to the feed of our farm animals, and specifically prevent the unnecessary use of antibiotics in animals that are not sick. The U.S. Congress has already urged farmers to stop the overuse of antibiotics in animals because it is creating new, drug-resistant strains of bacteria that can spread to humans. A recent CBS news report spotlighted microbiologist Stuart Levy at Tufts University, the individual who identified tetracycline resistance in chickens more than 30 years ago. In his research, nearly all of the E. coli in the intestinal tracts of the chickens become tetracycline-resistant after one week of treatment.

2. Assess the impact
Sub-lethal quantities of antibiotics are known to create an environment for the development of resistance and multi-drug resistance mechanisms. We need to monitor the fate of all the mega-quantities of antibiotics sold as prescriptions and as over-the-counter medicine: Do they end up in our wastewater systems and landfills and become a breeding ground for new superbugs? What happens to the groundwater runoff from farms, sewage systems, and landfills?

3. Explore entirely different drugs
We must look for antibiotics utilizing new mechanisms without the development of resistance. Simply adding new drugs to existing classes isn’t cutting it. My company is developing a new class of agents with a novel mechanism of action that kills pathogens without the potential for resistance. These are fast acting, broad-spectrum, multi-targeting agents that do not persist in the environment.

Confirmatory experiments in our labs are slated for publication in 2011. The preliminary experiments indicate that our Aganocide compounds exert their activity against pathogens by the rapid and preferential inactivation of specific amino acid residues on essential membrane proteins, such as ATP
machinery or ion channels which are located on the membrane of the bacteria. However, this machinery is protected inside of the mammalian cells. The consequence of this inactivation induces a change in the protein’s tertiary structures and results in dysfunction, dysregulation or protein shedding from the membranes of pathogens. The end result is a fast-acting, broad-spectrum antimicrobial agent that is safe to mammalian cells within a therapeutics window. We continue to confirm these findings and integrate these observations into the elucidation of the mechanism of action as we develop this new class of antimicrobial agents.

**Inactivate multiple essential targets**

When we attack bacteria with agents targeted against one particular cellular mechanism—for example, fluoroquinolones target DNA gyrase—the bugs simply select for a mutation to that mechanism that make them resistant, and the agent becomes ineffective. This will always be true of targeted agents, so we wind up with more of these agents every few years. We urgently need a parallel initiative in the development of multi-target agents, such as non-antibiotic agents that can inactivate essential protein targets that mutations cannot sidestep, and are not damaging to human tissues. As stated above, our company is currently pursuing multi-target agents.

Subtle and selective multi-target agents to which bacteria cannot develop mutational resistance are the key to solving this huge problem. They are pivotal for our survival and should have fast-track consideration by all agencies.

**Encourage and incentivize the industry**

Finally, we should encourage and incentivize the pharmaceutical and biotech industry to develop safe and effective non-antibiotic anti-infectives that could replace all topical antibiotics for eyes, skin, ear, over-the-counter antibiotics, etc.

Overall, we need to understand the sources of antibiotic resistance—whether it originates in farms, sewers, landfills, or other locations—and find ways to save our precious few antibiotics for systemic bloodstream infections. Otherwise, the overall result will be fewer effective drugs to treat bad bugs.

**Comment**

**Differentiate pathogens from colonizers and discontinue antibiotics sooner**

by Philip Onigman, [Comment posted 2010-12-17 07:49:18]

Hospitals use significant quantities of antibiotics for “coverage” of infection, when a clinician starts an antimicrobial agent based on either early symptoms of possible infection (fever) or early diagnostic indicators of infection (positive blood culture).

This practice can be fine-tuned now, because more rapid species identification methods are now available. Vancomycin is one of the most widely used antibiotics in hospitals. Vancomycin can induce its own resistance during and requires ever higher earlier doses in order to fight Staphylococcus aureus bloodstream infections. For decades, vancomycin was prescribed 1–2 grams per day (weight adjusted) for the first several days on the signal of a positive blood culture that is considered “Gram positive”. IDSA guidelines now call for consideration of nearly doubling the daily dose of vancomycin in order to be effective. Unfortunately for many patients, higher vancomycin doses have toxic effects (kidney function). This dilemma adds additional costs of serum drug level monitoring and more careful calculations of drug dosing. (Am J Health-Syst Pharm 2009 v.66 p.82-98). The increased management requirements of vancomycin dosing are also driving faster utilization of several drugs such as daptomycin, linezolid or tigecycline that could be held in reserve.

However, at most hospitals, 60–70% of “Gram positive cocci in clusters” (GPCC) primary blood culture reports ultimately prove to be coagulase negative staph (CNS), that are skin colonizers. When the bottle grows CNS, the initial Lab report of GPCC can trigger an unnecessary 3–5 days of IV vancomycin therapy for an inpatient that does not have a bloodstream infection. Depending on the dosing of vancomycin in early stages, if the clinician is unsure of infection vs contamination, the vancomycin could be under-dosed or entirely unnecessary. Exceptions are cases of CNS Lab data and patient symptoms and history that warrant continuation of antibiotics to treat infections caused by coagulase negative staph.

Forrest, et al (JAC 2006 v.58 no.1 p. 154-8) first described the practice of proactively limiting vancomycin for CNS to either a single initial dose, or avoidance of vancomycin altogether vs the usual 6-10 grams that would otherwise be administered over 3-5 days. This report also concluded that shorter courses of unnecessary vancomycin enabled their hospital to safely shorten length of hospitalization for many patients.

Ly, et al (Therapeutic Clinical Risk Management 2008 v.4 no.3 p.637-40) found that rapid identification with very effective notification of infection vs contamination and educational support to attending clinicians resulted not only in reduction of unnecessary antibiotics and shorter hospitalizations, but a reduced mortality for ICU cases because the message of “infection” from the Lab triggered an earlier, certain and more aggressive course of antibiotics; therefore effective and appropriate use.

The old paradigm is “It is safe to use antibiotics for several days to cover in case of serious infection while we wait for complete diagnostics”.

The new paradigm is “We have rapid species identification and decision support that rules in or rules out a serious pathogen. When patient symptoms and chart indicate no infection, we can discontinue coverage antibiotics sooner”.

**Natural course??**

by anonymous poster, [Comment posted 2010-12-16 15:53:32]

Prior to the advent of antibiotics, the outcome of infections running their natural courses was a lot of dead people.

And, I object to the various statements that imply that bacteria are somehow striving to develop resistance. Rather, selection is imposed on a population ALREADY harboring mutations that will confer resistance. Inappropriate prescription and incorrect usage provide selection scenarios that eventually yield additional resistant strains. And bacteria are very good at sharing those factors via plasmid exchange, etc.

The article struck me as a fund-raising pitch for the author’s company.
Resistance management strategies
by Graham Small, [Comment posted 2010-12-15 03:35:20]
Similar problems are encountered with multiple resistance to pesticides in arthropod pests of agricultural, veterinary and public
health importance. Therefore, resistance management strategies have been implemented, some of which may be of use in managing
antibiotic resistance:

1. Only prescribe antibiotics when its absolutely required;
2. Implement a rotation of prescribed antibiotics with different modes of action to reduce the selection pressure on antibiotic
classes;
3. Combine antibiotics with different modes of action into a single formulation.

Sewage and the spread of antibiotic resistance
by Edo McGowan, [Comment posted 2010-12-14 21:31:12]
Some thoughts on ways to extend the life of antibiotics. One way is to reduce the number of antibiotic resistant microbes that are
released to the environment. Accordingly, it will be necessary to control the release of resistant pathogens that is occurring in
American rivers and on our farmlands through wastewater processing and thus sewage and its byproducts. These byproducts
include reclaimed (recycled) water, sewage sludge (biosolids) and composted biosolids.

We are seeing that the FDA is active in reviewing antimicrobials used in agriculture and that is one control mechanism. In a
message (Government Agencies FDA Releases First Estimate on Antibiotics in Ag by Helena Bottemiller | Dec 13, 2010), as
forwarded by ROAR discusses this FDA activity.

Allow me thus to explore another route where the expansion of resistance in the environment could be greatly reduced but
where the requisite federal and state agencies that one might think should be involved are tactfully absent.

We here in Santa Barbara are working on resistance as found within sewage and spread by sewage and its byproducts. Although
having funded a major study on wastewater generated antibiotic resistance in the late 1970s, see: [LINK] the US/EPA has remained
silent on the topic. Its higher management assures me that it has none of its scientist working on the topic. Since the paper by the
Wastewater Research Division, Municipal Environmental Research Laboratory, U.S. Environmental Protection Agency, Cincinnati,
Ohio came out in 1981, the agency has seen fit to pull the entire study and its background data from the entire EPA website and data
base. One might ask, why? Interestingly the material is also absent from the data base of the CDC. I also brought up this study
and the topic of wastewater created antibiotic resistant microbes with the CDC and all they could tell me about it was that CDC had no
focus on the topic. I then went to the federal Inter Agency Task Force on Antibiotic Resistance, asking them where they were on the
topic—answer, not part of their focus.

We are in a conversation with the State of California on this topic. The state is attempting to ignore the topic. We have informed
the state that in our testing reclaimed water that is state certified and used on crops consumed raw, we find multi-antibiotic resistant
bacteria in the same groupings containing serious pathogens. We have suggested that the state repeat our work, but that suggestion
falls on deaf ears. In using the state approved lab tests for this water, when we test the reclaimed (recycled) water just as it leaves the
treatment works we often get non-detect. But when we test it down the pipe at point of use we often find it wildly outside allowed
limits. Thus something is happening during the transit to the sprinkler. We suspect that it is either development of biofilms from the
bacteria in the reclaimed water and the fact that it is quite nutrient rich. Another possibility is that bacteria are in the viable but non-
culturable state (VBNC) and resuscitate while in transit. It could also be a combination of these two processes. The up-shot is that
bacteria bearing antibiotic resistance are being put on crops consumed raw and these bacteria can be internalized in the crop where
no amount of washing at the kitchen sink will have any effect. Once these bacteria are in the human gut they can multiply.

Here is a bit from the 1981 work by US/EPA:
"Several researchers have pointed out that wastewater, treated or untreated, is a primary contributor of bacteria to the aquatic
ecosystem (12, 16, 17, 20, 27, 29). Studies have been conducted which demonstrate that significant numbers of multiple drug-
resistant coliforms occur in rivers (17), bays (9), bathing beaches (28), and coastal canals (19). Waters contaminated by bacteria
capable of transferring drug resistance are of great concern since there is the potential for transfer of antibiotic resistance to a
pathogenic species."

"When bacteria which carry transmissible Rfactors (R+ bacteria) are ingested by a human host, the R-factors may transfer into
commonly occurring bacteria of the gastrointestinal tract (32). These organisms may subsequently transfer this resistance to
pathogenic organisms, resulting in reduced efficacy of antimicrobial chemotherapy in the event of an infection. In vivo studies have
shown that when individuals carrying R+ bacteria are subjected to antibiotic therapy, these organisms flourish and transfer their
resistance to other bacteria (25)."

These bacteria when released by sewage treatment or contained within sewage byproducts are thus able to colonize
environmental niches, and animals, including humans, through ingestion. Once ingested, the plasmids may be transferred to normal
flora, and subsequently to pathogenic bacteria found in humans or animals, making later treatment with particular antibiotics
ineffective. Also one must consider transfer of genetic information from these organisms to more robust organisms as highlighted by
Sjolund et al. (2005) [1] indicating that resistance in the normal flora, which may last for several years, might contribute to increased
resistance in higher-grade pathogens through interspecies transfer.

Sjolund et al go on to note that since populations of the normal biota are large, this affords the chance for multiple and different
resistant variants to develop. This thus enhances the risk for spread to populations of pathogens. Furthermore, there is crossed
resistance. For example, vancomycin resistance may be maintained by using macrolides [2]. Sjolund also notes that the resultant
effects from these gene transfers can remain within the gut biota for years.

Schentag, et al. (2003), as found in Walsh [3], followed surgical patients with the subsequent results. Pre-op nasal cultures
found Staphylococcus aureus 100% antibiotic susceptible. Pre-op prophylactic antibiotics were administered. Following surgery,
cephalosporin was administered. Ninety percent of the patients went home at post-op day 2 without infectious complications. Nasal
bacteria counts on these patients had dropped from 10^5 to 10^3 or 10^4, but were now a mix of sensitive, borderline, and resistant
Staphylococcus sp. By comparison, prior to surgery, all of the patients' Staphylococcus samples had been susceptible to antibiotics.
For the patients remaining in the hospital and who were switched on post-op day 5 to a second generation cephalosporin
(ceftazidine), showed bacterial counts up 1000-fold when assayed on post-op day 7 and most of these were methicillin resistant
Staphylococcus aureus (MRSA). These patients were switched to a 2-week course of vancomycin. Cultures from those remaining in
the hospital on day 21, revealed vancomycin resistant enterococcus (VRE) and candida. Vancomycin resistant enterococci infections
can produce mortality rates of between 42 and 81%.

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Note in the above, that these patients in the Schentag study harbored NO resistant bacteria in their nasal cavities upon entry to the hospital. But what would be the result if there had been inadvertent acquisition of resistance from environmental contamination such as through sewage sludge or recycled water.

This then brings into question the current paradigm on infection and its dose response to a certain load of a particular pathogen, i.e., ID and LD 50s. Lateral transfer of mobile genetic elements conferring resistance is not considered in this old paradigm. With the prodigious capacity for the gut bacteria to multiply, once the lateral transfer has taken place, very small original numbers—well below the old paradigms can be multiplied into impressive numbers. Since viruses and phages are also involved, their capacity to multiply, which dwarfs that of bacteria, must also be included. Thus there is a need for a new paradigm; unfortunately, the regulatory community seems not to recognize this. When one considers the multiplication within sewer plants and also within their byproducts, dispersed into the environment, the transfer to background organisms, hence to man and his animals, then the remultiplication within commensals, the emerging picture is worrisome.

Further, there are opportunities and interrelationships between microbes that can degrade antibiotics, e.g., antibiotic resistant bacteria, and those that can degrade metals as well as pesticides and farm chemicals that are already found in agricultural soils. In many cases, the involved cellular machinery is the same or similar, i.e., a duality (see Schleuter and abstracts of others below). Thus, in placing sewage sludge (biosolids) on agricultural land one is introducing serious human pathogens into an already primed environment, one in which food crops are grown or pasture is maintained.

This duality may have some interesting synergistic advantage for the microbes, but bad-for-human-health effects when considering sewer sludge as applied to heavily farmed lands.

The current standards controlling sewer plant operations, production of reclaimed water, the land application of sewer sludge (biosolids) or the composting of sewer sludge for making compost and potting soils consider none of these issues.

Dr Edo McGowan

Referenced Material

[1] Sjohnd et al. (2005) Emerging Infectious Diseases (Vol. 11, # 9, Sept 2005 @ p. 1389 et seq)


The 64 508 bp IncP-1 antibiotic multiresistance plasmid pB10 isolated from a waste-water treatment plant provides evidence for recombination between members of different branches of the IncP-1 group

A. Schleuter, et al

The complete 64 508 bp nucleotide sequence of the IncP-1 antibiotic-resistance plasmid pB10, which was isolated from a wastewater treatment plant in Germany and mediates resistance against the antimicrobial agents amoxicillin, streptomycin, sulfonamides and tetracycline and against mercury ions, was determined and analysed. A typical class 1 integron with completely conserved 5’ and 3’ segments is inserted between the tra and trb regions. The two mobile gene cassettes of this integron encode a -lactamase of the oxacillin-hydrolysing type (Oxa-2) and a gene product of unknown function (OrfE-like), respectively. The pB10-specific gene load present between the replication module (traA1) and the origin of vegetative replication (oriV) is composed of four class II (Tn3 family) transposable elements: (i) a Tn501-like mercury-resistance (mer) transposon downstream of the trfA1 gene, (ii) a truncated derivative of the widespread streptomycin-resistance transposon Tn5392c, (iii) the insertion sequence element IS1071 and (iv) a Tn1521-like transposon that contains the tetracycline-resistance genes tetA and tetR. A very similar Tn501-like mer transposon is present in the same target site of the IncP-1 degradative plasmid pJP4 and the IncP-1 resistance plasmid R906, suggesting that pB10, R906 and pJP4 are derivatives of a common ancestor. Interestingly, large parts of the predicted pB10 restriction map, except for the tetracycline-resistance determinant, are identical to that of R906. It thus appears that plasmid pB10 acquired as many as five resistance genes via three transposons and one integron, which it may rapidly spread among bacterial populations given its high promiscuity??.

Validity of the Indicator Organism Paradigm for Pathogen Reduction in Reclaimed Water and Public Health Protection. Valerie J. Harwood

Received 27 September 2004 / Accepted 20 December 2004

The validity of using indicator organisms (total and fecal coliforms, enterococci, Clostridium perfringens, and F-specific coliphages) to predict the presence or absence of pathogens (infectious enteric viruses, Cryptosporidium, and Giardia) was tested at six wastewater reclamation facilities. Multiple samplings conducted at each facility over a 1-year period. Larger sample volumes for indicators (0.2 to 0.4 liters) and pathogens (30 to 100 liters) resulted in more sensitive detection limits than are typical of routine monitoring. Microorganisms were detected in disinfected effluent samples at the following frequencies: total coliforms, 65%; fecal coliforms, 27%; enterococci, 27%; C. perfringens, 61%; F-specific coliphages, ~40%; and enteric viruses, 31%. Cryptosporidium oocysts and Giardia cysts were detected in 70% and 80%, respectively, of reclaimed water samples. Viable Cryptosporidium, based on cell culture infectivity assays, was detected in 20% of the reclaimed water samples. No strong correlation was found for any indicator-pathogen combination. When data for all indicators were tested using discriminant analysis, the presence/absence patterns for Giardia cysts, Cryptosporidium oocysts, infectious Cryptosporidium, and infectious enteric viruses were predicted for over 71% of disinfected effluents. The failure of measurements of single indicator organism to correlate with pathogens suggests that public health is not adequately protected by simple monitoring schemes based on detection of a single indicator, particularly at the detection limits routinely employed. Monitoring a suite of indicator organisms in reclaimed effluent is more likely to be predictive of the presence of certain pathogens, and a need for additional pathogen monitoring in reclaimed water in order to protect public health is suggested by this study.

Unsubtle

by anonymous poster, [Comment posted 2010-12-14 20:41:24] A not-very-subtle plug for the author’s commercial interests. Should have been clearly labeled “Advertising”.

Re: Phage

by KEVIN HEALEY, [Comment posted 2010-12-14 15:43:24]
As indicated by "Anonymous", bacteriophage have an important role to play in treating / preventing disease related to bacterial infections. Numerous research projects are underway by reputable organisations, including VetPhage in Australia for animal health applications.

**Antiseptics**
by Janusz Byczkowski, [Comment posted 2010-12-14 15:38:20]
Ron Najafi wrote:
"...to develop safe and effective non-antibiotic anti-infectives that could replace all topical antibiotics for eyes, skin, ear, over-the-counter antibiotics..."

Well, they are developed already—they are called "antiseptics", some of them known, perhaps, even before Hippocrates ;-) Some of them do not promote bacteria to evolve resistance, but some other do. However, the problem with topical antiseptic formulations is—that they are too cheap... Thus, the manufacturer (and the pharmacist too) will rather promote and advertise quite elaborated and expensive "triple protection antibiotic with anesthetic" ointment, than let's say a cheap "Camphor-phenol" formulation (phenol has been used since times of Ignaz Semmelweis without producing resistant strains)...

**You're fighting natural selection**
by Colin Higgins, [Comment posted 2010-12-14 13:44:15]
If inhibiting a protein causes lethality in a population, you are applying selection. No matter how efficacious your agent, mutations conveying resistance to your drug will arise at a statistically determined rate. Your resistance-resistant novel drug class would controvert the theory of natural selection. A weighty claim, and one that I think will ultimately fail the test of experiment.

Combination therapy has been shown to be remarkably effective in anti-HIV cocktails, and it seems to be the way to go. Deliver antibiotics targeted to ten different targets, and require the bugs to undergo 10 simultaneous mutations.

**How about phages?**
by anonymous poster, [Comment posted 2010-12-14 13:03:59]
Whatever happened to the lytic viruses that the Soviet bloc used as an alternative to antibiotics. If there really was something to them surely we are now closer to being able to understand how to use them safely?

**Algae**
by John Toeppen, [Comment posted 2010-12-14 12:37:28]
The use of corn as a feed for cattle causes them to become ill since they are designed to eat forage materials. Antibiotics are used to mitigate the problems caused by using the wrong feed. However, corn is a major business as is beef, and these economics apparently carry more weight than the health of our population.

Algae is suitable as a cattle feed as it can be 40% oil by weight and can be grown to double its weight every day. Algae thrives on the nutrients available in waste water and is easily farmed. Carbon dioxide is available in abundance (a single coal burning power plant uses 200 train cars of coal a day which would be about 800 cars of dry ice if captured). Algae economics look much better if it is used to capture CO2, used to feed cattle, used to clean water, and used as a biofuel.

**Are there other ways?**
by anonymous poster, [Comment posted 2010-12-14 12:27:07]
Seems like a major issue is this focus on raging "war" against invading organisms (which obviously will fight back). This is natural considering that this type of medicine is essentially an extension of what our body tends to do during infections.

I'm curious, have there been other avenues explored for treatments? Rather then focusing on eradicating invading organisms, is there research or evidence out there looking at strategies for enhancing "containment" of invasions until the body either a) safely takes care of it or b) "allows" the organisms to run their own life-course?

Appologies for such a naive question, only curious to know if there are innovative or "outside the box" models already out there.

**Homophobia Sweeping Africa Like a Disease, Says Rights Group**


The African Union must end its silence concerning homophobia on the continent and take urgent measures to stop this “growing and insidious contagion,” the group AIDS-Free World says.

“The problem is definitely getting worse,” said Paula Donovan, the organization’s co-director. “Homophobia seems to be spreading like a contagion from country to country in Africa. And the efforts to criminalize homosexuality ... [have] been taken up by increasing numbers of parliaments and promoted by increasing numbers of African leaders, including heads of state and prime ministers.”

Uganda has recently considered laws that would impose harsh penalties for homosexual acts, with one measure calling for the death penalty in some cases. A gay couple in Malawi was prosecuted after their relationship became public. Other such incidents have occurred in Kenya, Zimbabwe, and recently, Ghana, said Donovan.

Many African leaders have called for the end of stigma and discrimination against people living with HIV/AIDS, Donovan acknowledged. However, “It’s been pointed too narrowly at people who are already HIV-positive,” she said. “Tolerance, openness, and refusal to discriminate have to apply to people before they are HIV-positive, as well as after.” “As long as you discriminate against people and drive them into the margins of society, then you’re going to exacerbate your HIV problems.”

Donovan said she is “not quite sure what happened to trigger this new wave of homophobia across Africa,” where national leaders historically have declared homosexuality a Western phenomenon that did not exist on the continent.
Foreign Policy Examines How The Child Marriage Bill Was Defeated
Foreign Policy's "The Cable" examines why a bill aimed at preventing child marriage in the developing world did not pass Congress. The blog highlights Ros-Lehtinen's role, writing that she defeated the bill "by invoking concerns about the legislation's cost and that funds could be used to promote abortion."

The blog notes: "Non-governmental organizations, women's rights advocates, and lawmakers from both parties spent years developing and lobbying for the 'International Protecting Girls by Preventing Child Marriage Act'... The bill failed even though 241 Congressmen voted for it and only 166 voted against, because House Speaker Nancy Pelosi (D-CA) brought it up under 'suspension of the rules.' This procedure has the advantage of not allowing any amendments or changes to the bill, but carries the disadvantage of requiring two-thirds of the votes for passage."

"So what happened? Ros-Lehtinen first argued that the bill was simply unaffordable. ... Regardless, the supporters still thought the bill would pass because House Republican leadership had not come out against it. But about one hour before the vote, every Republican House office received a message on the bill from GOP leadership, known as a Whip Alert, saying that leadership would vote 'no' on the bill and encouraging all Republicans do the same. ... 'There are also concerns that funding will be directed to NGOs that promote and perform abortion and efforts to combat child marriage could be usurped as a way to overturn pro-life laws,' the alert read."

According to the blog, the bill did not "contain any funding for abortion activities," and also reported that "federal funding for abortion activities is already prohibited by what's known as the 'Helms Amendment.'" The post looks at reaction from the bill's supporters in Congress (Rogin, 12/17).

Cholera Deaths In Haiti Top 2,500, Health Ministry Says
The Haitian health ministry on Sunday said there had been 2,535 cholera deaths since the outbreak hit in mid-October, "dashing hopes the fatality rate might be beginning to taper off," Agence France-Presse reports.

"Almost 57,000 of the 114,497 people infected have been treated in hospital. Hopes rose last week that the death rate could be slowing as less than 30 people were shown to have died on two consecutive days," the news service writes. But earlier tolls were revised on Sunday and official figures showed that 54 people died on December 14, "the most recent day recorded," AFP notes (12/19).

Speigel Online Examines Guinea Worm Eradication Efforts
Spiegel Online reports on the Carter Center's efforts to eradicate the Guinea worm, which "lives inside the human body, crawling around between muscles and bones. Eventually it tries to get out." When Pres. Jimmy Carter left the White House in 1981, Guinea worm infected 3.5 million people in Africa and Asia annually. "This year, the Guinea worm has afflicted only about 1,700 people worldwide, and it is believed that only 75 of them live outside Southern Sudan," where the Carter Center now concentrates its efforts, Spiegel Online reports. With a plan that includes the distribution of plastic drinking straws that filter out the worm's larvae, "Carter has helped eradicate the worm in 16 countries. His experts believe that Ghana will be clean by next year, and Mali and Ethiopia in two years. In Southern Sudan, health authorities counted only half as many people afflicted with the Guinea worm as last year" (Meyer, 12/17).
Prions Mutate and Adapt to Host Environment

ScienceDaily (Dec. 18, 2010) — Scientists from the Florida campus of The Scripps Research Institute have shown that prions, bits of infectious protein that can cause fatal neurodegenerative disease such as bovine spongiform encephalopathy (BSE) or "mad cow disease," have the ability to adapt to survive in a new host environment.

In this regard, although they lack DNA and RNA, they behave much like viruses, producing distinct self-perpetuating structural mutations that provide a clear evolutionary advantage.

The study was published this week in the online Early Edition the journal Proceedings of the National Academy of Sciences.

"We found that when a particular prion strain is transferred from brain cells to a different cell line, its properties gradually change, giving rise to a variant strain that is better adapted to this new cellular environment," said Charles Weissmann, M.D., Ph.D., the head of Scripps Florida's Department of Infectology, who led the study. "If those same prions are subsequently transferred to another cell line, they change again, adapting to these new host cells. And if returned to the brain, the prions gradually regain their original properties. We found physical evidence that, at least in one case, the fold of the prion changed when its properties changed."

Darwinian Evolution Without DNA

These new findings come approximately one year after Weissmann and colleagues published a study in the January 1, 2010 edition of the journal Science that showed that prions were capable of Darwinian evolution.

That earlier study also showed that prions can develop large numbers of mutations and that these mutations can bring about such evolutionary adaptations as drug resistance, a phenomenon previously known to occur only in bacteria and viruses. This study also suggested that the normal prion protein—which occurs naturally in mammalian cells—may prove to be a more effective therapeutic target than its abnormal toxic relation.

"Because prions can adapt to changing environments, it now becomes clear that it will be more difficult than originally thought to find drugs that will work against them," Weissmann said. "But if you could develop a drug that inhibits formation of the normal prion protein, you could, in essence, starve the infectious prions and prevent them from reproducing. This approach to treatment, although technically demanding, can be envisaged because, as we have shown earlier, deprivation of PrP is not detrimental to health—at least to the health of mice."

Folding and Misfolding

Prions, which are composed solely of protein, are classified by distinct strains, characterized by their incubation time and the disease they cause. In addition to BSE/mad cow disease in cattle, diseases caused by prions include scrapie in sheep, chronic wasting disease in deer, and variant Creutzfeldt-Jakob disease in humans. Prions have the ability to reproduce, despite the fact that they contain no nucleic acid genome.

Mammalian cells normally produce cellular prion protein or PrPc. During infection, abnormal or misfolded protein—known as PrPSc—converts the normal host prion protein into its toxic form by changing its conformation or shape. The end-stage consists of large sheets (polymers) of these misfolded proteins, which causes massive tissue and cell damage.

"The infectious prion protein can fold in different ways, and depending on the fold, a different prion strain results," Weissmann said. "As long as prions are maintained in the same host, they retain their characteristic fold, so that strains breed true."

When prions multiply, however, that fold is not always reproduced correctly, so a prion population contains many variants, albeit at low levels.

The new study found that when a prion population is transferred to a different host, one of the variants may replicate faster—an evolutionary advantage—and become the dominant strain. This new
population also contains variants, one of which may be selected over others when transferred to a different host.

"The result is that prions, although devoid of genetic material, behave similarly to viruses and other pathogens, in that they can mutate and undergo evolutionary selection," Weissmann said. "They do it by changing their fold, while viruses incur changes in their nucleic acid sequence."

**Diverse Yet Related**

The new study suggests that prion populations constitute a "quasi-species" similar in nature to RNA viruses and retroviruses, such as flu viruses and HIV.

The idea of a quasi-species was first conceived by Manfred Eigen, a German biophysicist who won the Nobel Prize in Chemistry in 1967. Basically, a quasi-species is a complex, self-perpetuating population of diverse and related entities that act as a whole. It was Weissmann, however, who in 1978 provided the first confirmation of the theory through the study of a particular bacteriophage—a virus that infects bacteria—while he was director of the Institut für Molekularbiologie in Zürich, Switzerland.

But that's where the comparison ends, Weissmann said.

"The fact that they behave like viruses doesn't mean they're anything like a virus," he said. "A bicycle is like a car in that it gets you from one place to the other, but they're not the same. The end effect is the same, however. Prions and viruses are both able to change their structure to survive."

The first author of the study is Sukhvir P. Mahal of Scripps Research. Other authors include Shawn Browning, Jiali Li, and Irena Suponitsky-Kroyter, also of Scripps Research.

**Journal Reference:**
S. P. Mahal, S. Browning, J. Li, I. Suponitsky-Kroyter, C. Weissmann. *Transfer of a prion strain to different hosts leads to emergence of strain variants. Proceedings of the National Academy of Sciences, 2010; DOI: 10.1073/pnas.1013014108*

**Bristol-Myers Squibb buys festinavir, new NRTI active against MDR HIV**

Keith Alcorn
Published: 21 December 2010

Bristol-Myers Squibb will pay up to $286 million for development rights to festinavir, a new once-daily nucleoside reverse transcriptase inhibitor that is active against viruses resistant to both tenofovir and abacavir, the company announced on December 20th.

Festinavir is a derivative of d4T (stavudine), but its developers say it is far less toxic than that drug.

Phase 1a trial data presented at the Intersciences Conference on Antimicrobial Agents and Chemotherapy in September 2010 showed that the drug was well tolerated over 10 days of monotherapy in people with previously untreated HIV infection, and test tube studies suggest that the drug is approximately 100-fold less toxic to mitochondrial DNA polymerase gamma than d4T. Mitochondrial toxicity is the cause of the major side-effects associated with d4T, such as peripheral neuropathy and lipoatrophy, that have led to that drug’s declining use.

Festinavir was developed at Yale University in the United States and licensed to Oncolys BioPharma, a Japanese company.

The greatest promise of festinavir lies in its potential activity against HIV with high levels of resistance to current nucleoside analogues. At present no other nucleoside analogue with activity suitable for use by highly treatment-experienced patients is in credible development, and festinavir could be useful for tens of thousands of people with HIV with resistance to three or more drug classes who received extensive prior treatment with nucleoside analogues in the 1990s.

However this cohort of patients is unlikely to have been attractive enough on its own to justify Bristol Myers-Squibb’s investment decision; any company investing $286 million before phase 2 trials have been conducted must see festinavir as a potential big earner, suitable for hundreds of thousands of patients.

Bristol-Myers Squibb will now take forward the development of the drug, seeking to establish the optimal dose. Phase 1a results indicated little difference in the degree of virological suppression between daily doses of 300mg or 600mg, and as 3TC (lamivudine) goes off patent, it could be tempting for Bristol-Myers Squibb to pursue a development path that co-formulates festinavir with its own generic version of 3TC, in a branded nucleoside analogue combination that competes with Gilead’s *Truvada* (tenofovir and FTC) and Glaxo SmithKline’s *Kivexa* (abacavir and 3TC).

Co-formulation could also allow the company the company to come up with fixed dose combinations that match the pair with efavirenz or with atazanavir, ensuring that Bristol-Myers Squibb remains a central player in the HIV drug market for years to come.

As patents on some of the major elements of HIV therapy begin to expire between now and 2018, the search for new agents and new drug classes will be accompanied by an intensification of approaches to re-
formulating drugs in ways that extend the patent life of big earners while delivering greater convenience in dosing for patients.

AFRICA: Risky sex does not equal HIV risk—study

JOHANNESBURG, 7 December 2010
(PlusNews)—Zimbabwean women reported significantly less risky sexual behaviour than their counterparts in Tanzania, despite being almost four times more likely to be HIV-infected, a comparative study has found.

Researchers from the Universities of Zimbabwe and Oslo in Norway disseminated data from pregnant women who visited antenatal clinics in Moshi, Tanzania, and in Harare, capital of Zimbabwe, between 2002 and 2004. The women answered questions about their sexual behaviour, medical history and socio-demographic background and were tested for HIV and several other sexually transmitted infections (STIs).

HIV prevalence among the Zimbabwean women was nearly 26 percent against about 7 percent among the Tanzanian women. Risk of infection rose with age for women in both countries up until the 25 to 29 age group, after which it started to decline for the Tanzanian women but continued to rise for the Zimbabweans. The Zimbabwean women also had somewhat higher rates of STIs, but this may have been the result of more of the women being HIV-positive and more susceptible to such infections.

In the Journal of the International AIDS Society, the researchers described the “unexpected phenomenon” revealed by the data gathered on the women’s sexual behaviour. On virtually every indicator, the Tanzanian women reported more risky behaviour from having had a casual sexual partner in the last 12 months to early sexual debut to being in a polygamous relationship. They also reported much higher levels of alcohol consumption, another behaviour that has been linked to increased sexual risk-taking.

The authors can only speculate about the explanation for this “paradox”. Perhaps by the time the survey was done, women in Zimbabwe had lowered their sexual risk-taking in response to an epidemic that had already claimed so many lives; or maybe they under-reported their sexual risk-taking because such behaviours by women are considered socially unacceptable in Zimbabwe.

Numerous studies have failed to provide definitive answers as to why HIV prevalence in sub-Saharan Africa varies so widely, with some countries recording infection rates of less than 2 percent and others recording rates of more than 20 percent.

It has long been assumed that different norms relating to sexual risk-taking from one country to another played an important role, but the recent findings suggest that other factors may be more important. The result has implications for the design of HIV prevention programmes, especially those aimed at sexual behaviour change.

The male partners of the Tanzanian women were much more likely to be circumcised, but the effect of male circumcision was not apparent in the study findings.

One possible explanation for the severity of Zimbabwe’s HIV problem compared with Tanzania’s, write the authors, is the role that non-sexual transmission of HIV may have played in the early years of Zimbabwe’s epidemic. They cite a 1990s study which found a 2.1 percent HIV prevalence among 933 women with no reported sexual experience.

“Early in the epidemic, syringes weren’t sterilized properly,” said lead author of the study, Munyaradzi Mapingure, from the Department of Community Medicine at the University of Zimbabwe. “We’re not blaming anyone, because people probably weren’t aware of it, but people who grew up in Zimbabwe in the 1970s were put in a queue and vaccinated with one needle.”

The theory that large-scale non-sexual transmission of HIV can explain severe epidemics like Zimbabwe’s is “very controversial”, admitted Mapingure, but “something we have to bring into the discussion”.
“Most HIV prevention programmes are failing because they focus on sexual behaviour,” he told IRIN/PlusNews over the telephone from Harare. “We need to look at the whole sexualization of HIV.”

**Research Shows GBL Addiction Can Be Life-threatening**

14 December 2010

Withdrawal from popular ‘party drug’ GBL can be severe and requires extensive medication and monitoring, research from the UK’s only Party Drugs Clinic has found.

Dr James Bell, head of the Party Drugs Clinic at the South London and Maudsley NHS Foundation Trust (SLaM), said his own experiences in the clinic showed that GBL withdrawal should be viewed as a medical emergency.

Dr Bell co-authored the report, GBL dependence and withdrawal, with Mr Rodney Collins, a postgraduate student at Kings College London. The report is currently available online and is soon to be published in Addiction, the leading UK academic journal on substance and addiction issues.

Dr Bell argues that in dependent, “round-the-clock” users, GBL withdrawal can be a life-threatening condition. People presenting in withdrawal require immediate treatment utilising appropriate medication.

“Health professionals are well aware of the dependence and withdrawal issues around drugs such as heroin and alcohol,” Dr Bell explained.

“It is generally assumed that the so-called ‘party drugs’ do not have the same intensely addictive qualities, nor do they require a monitored, medicated withdrawal process.”

“My experience in the clinic shows that this is not the case. With GBL in particular, dependent users experience severe and traumatic withdrawal when regular use is stopped.”

Most users at Dr Bell’s clinic downplayed the dangers associated with GBL and other party drugs. They generally used GBL for three main purposes – to achieve social confidence, facilitate sexual activity and to treat insomnia. Most began using it as a party drug then used higher doses to induce sleep, quickly resulting in ‘round-the-clock’ dependence.

Dr Bell said the majority of his patients are well-educated, socially integrated young people who prefer the person they become when using GBL.

“Ironically, while GBL may initially result in increased confidence and sociability, most dependent users said they became ‘drones’ – introverted, unmotivated and unable to maintain contact with relatives and non-GBL using friends.”

Gamma-butyrolactone (GBL), is a case study in legal highs. GBL is a liquid used in paint stripper and nail varnish. Used recreationally, GBL enhances confidence and sociability and reduces sexual inhibitions. In higher doses, it induces sleep. Its potency makes it incredibly easy to accidentally overdose. One milligram brings on euphoria, while just one and a half milligrams induces sleep.

Many users overdose inadvertently and a small proportion progress to dependence. On trying to stop, users can experience severe withdrawal symptoms, and withdrawal can be life threatening. Throughout 2009, most GPs and drug services knew nothing of GBL, and were unable to offer treatment.

Dr Bell said his patients had all experienced difficulty in getting help with their GBL dependence.

“Most of my patients had initially sought help from their GPs, many of whom were unaware of GBL and the consequences of prolonged use. As a result, the majority are self-referred, having heard about the clinic through the press, friends or a counselling service,” Dr Bell explained.

“Too often, GBL users only receive medical help after turning up in crisis at an emergency department, generally having overdosed.”

In late 2009, SLaM opened the UK’s first specialist national GBL withdrawal programme at their Party Drugs Clinic. The decision to offer a specialist service for GHB and GBL dependence followed a significant rise in the number of overdoses, with one South London hospital receiving more than three GBL or GHB overdoses every week in 2009.

In the 12 months since opening, the clinic has treated more than 30 people for GBL dependence. All but three have successfully completed outpatient detoxification, but most reported anxiety, panic attacks and insomnia after they had stopped GBL use, and in most cases it generally took several weeks for patients to show no signs of withdrawal symptoms. Some relapsed during the withdrawal period, demonstrating the need for ongoing care.

GBL was the subject of widespread media attention last year, until it was classified as a Class C drug in December 2009. Users report that the ban has had little effect, with GBL is still readily available for same day delivery, from internet sites outside the UK.
“Despite the ban, GBL is still inexpensive and accessible. GPs and emergency departments will continue to see cases of GBL dependence and withdrawal,” Dr Bell said.

“It is important that healthcare professionals, especially GPs, gain a better understanding of GBL dependence, and recognise that specialist services, like our Party Drugs Clinic, are available.”

Dr Bell said most patients at his clinic were dismayed to discover they had become dependent in just a few months or sometimes weeks, not believing so-called party drugs had addictive qualities.

“Patients frequently lament, ‘I didn’t know it was addictive’. Most doctors and policy makers are equally unaware that these new drugs can be addictive, and withdrawal can be life threatening.”

SLaM’s Party Drugs Clinic is open to anyone from across the United Kingdom and offers specialist treatment and withdrawal for people with GBL or GHB dependence, mephedrone misuse, methamphetamine misuse, and party drug dependence.

Loopholes in 'Do Not Board' List: Directory Is Designed to Keep Infectious Travelers Off Flights

USA Today, (12.17.2010) Alison Young

The top Republican on a House oversight and investigations subcommittee is asking the secretary of Homeland Security for more information about the effectiveness of the federal “Do Not Board” flight listing. Rep. Michael Burgess (Texas), a medical doctor, wrote to Janet Napolitano Thursday requesting details about three health-related breaches this year. Government spokespeople say no one was sickened by the three travelers, and the loopholes that allowed them to fly have been closed.

“Do Not Board” is separate from the terrorism “No Fly” watch list. Its purpose is to stop travelers with serious, infectious diseases from boarding commercial flights.

Burgess said he is concerned that as the peak of the holiday travel season nears, passengers with multidrug-resistant TB could board crowded flights.

Nina Marano, quarantine branch chief for CDC, said 32 people are on the list; all have TB. CDC has told congressional investigators that since 2009 authorities have prevented six people on the list from boarding flights.

“Do Not Board” was created in June 2007 after an Atlanta man with drug-resistant TB triggered an international health scare when he flew to his wedding in Europe and back, eluding federal authorities.

Last month, the Transportation Security Administration began checking passengers on all flights against the watch lists, a job previously performed by airlines. TSA spokesperson Nicholas Kimball said one of the health-related breaches involved a list-checking delay and the other two concerned different issues. Citing privacy concerns, neither TSA nor CDC would provide more details.

Sex Education Update with 'Net in Mind


Needham Public Schools (NPS) is updating its sex education curriculum to help students handle issues arising from new social networking and technology. A Health Advisory Council subcommittee, which developed the proposed program over the past two years, will present the curriculum to the School Committee at the end of January.

In the lead-up, NPS Wellness Program Director Kathy Pinkham has briefed parents about the lessons, and she hopes to have a website parents can peruse online before the winter break. “We really looked at this as a relationship with parents,” she said. Ongoing information sessions also are planned after the break.

Under the proposal, homework assignments involving parental discussion around a series of questions would be expanded from fifth grade, where they have been successful, to other grades, Pinkham said. Materials from sex education classes would be taken home for students’ parents, encouraging their involvement.

The curriculum aims to help students develop mature attitudes about sex in the Internet era, in which sexual encounters may begin with texting, Pinkham said.

“The culture has changed,” Pinkham said. “It used to be people got married at 18, 19, 20 or 21. Now it’s later and later. We will put it into context of what they want in life and their goals.” In addition to anatomy, STD and abstinence components, the curriculum focuses on delaying sex and giving students the tools needed for healthy sex and relationships when they are adults, she said.

One theme will be the importance of face-to-face as opposed to electronic interactions, which can cloud decision-making. “Sometimes people end up with someone else because of happenstance,” Pinkham
said. “We will emphasize the importance of face-to-face communication, and that spending time together is important.”

Spread of TB in prisons increases the incidence of TB in the general population
The risk of tuberculosis (TB) and latent TB (in which the bacteria that cause TB lie dormant but can reactivate later to cause active TB disease) is higher in the prison population than in the general population. And importantly, the spread of TB and latent TB within prisons can substantially increase their incidence in the general population. These key findings from a systematic review by Iacopo Baussano from the University "Amedeo Avogadro", Italy, and the Imperial College, London, UK, and colleagues and published in this week's *PLoS Medicine*, suggest that improvements in prison TB control would not only help to protect prisoners and staff from within-prison spread of TB, but would also reduce national TB burdens.

Using previous findings from published studies and data from the World Health Organization, the authors calculated the ratio between the incidence rates for TB and latent TB in prison and in the general population. The average incidence of TB in prisons was 23 times higher that of the general population, and for latent TB, was 26 times higher in prisons than in the general population. The authors also estimated the fraction of TB in the general population attributable to within-prison exposure to TB and found that, on average, the population attributable fraction for TB in high-income countries was 8.5% (that is, one in 11 cases of TB in the general population was attributable to within-prison spread of TB); in middle-to-low–income countries, the average the population attributable fraction for TB was 6.3%.

The authors say: "These data may prove useful to inform the development of rational policies to control TB transmission in correctional facilities." They add: "Future studies should assess the population attributable risk of prison-to-community spread and describe the conditions in the prison that influence TB transmission."

In an accompanying editorial, the *PLoS Medicine* editors conclude: "The publication of this systematic review marks a shift from considering the incidence of TB in each prison population to considering the massive global impact of tuberculosis in prisons."

Biomarkers could predict death in AIDS patients with severe inflammation
A study in this week’s *PLoS Medicine* suggests that AIDS patients with cryptococcal meningitis who start HIV therapy are predisposed to immune reconstitution inflammatory syndrome (IRIS) — an exaggerated inflammatory immune response that kills up to one-third of affected people — if they have biomarkers (biochemicals) in their blood showing evidence of a damaged immune system that is not capable of clearing the fungal infection.

David Boulware and Paul Bohjanen from the University of Minnesota, Minneapolis, USA, and their colleagues, David Meya and Andrew Kambugu, at Makerere University in Kampala, Uganda enrolled 101 Ugandans with AIDS and recent cryptococcal meningitis who had not previously received HIV therapy and compared biomarker patterns in individuals who did and did not subsequently develop IRIS after starting HIV therapy. 45% of patients developed IRIS of whom 36% died, while only 21% of patients who did not develop IRIS died. Furthermore, the authors found that patients who later developed IRIS associated with cryptococcal meningitis after starting HIV therapy had 4-fold higher baseline concentrations of cryptococcal antigen and lower levels of several inflammatory cytokines in their blood compared to patients who did not develop CM-IRIS.

The authors say: "This study suggests that prediction of IRIS or death may be possible with measurement of pre-antiretroviral therapy serum biomarkers." They add, "Although requiring validation, these biomarkers might be an objective tool to stratify the risk of CM-IRIS and death, and could be used clinically to guide when to start antiretroviral therapy or use prophylactic interventions."

Long lasting chemicals threaten the environment and human health
December 21, 2010
Every hour, an enormous quantity and variety of manmade chemicals, having reached the end of their useful lifespan, flood into wastewater treatment plants. These large-scale processing facilities, however, are designed only to remove nutrients, turbidity and oxygen-depleting human waste, and not the multitude of chemicals put to residential, institutional, commercial and industrial use. So what happens to these chemicals, some of which may be toxic to humans and the environment? Do they get destroyed during wastewater treatment or do they wind up in the environment with unknown consequences?
New research by Rolf Halden and colleagues at the Biodesign Institute at Arizona State University seeks to address such questions. The group’s results, reported recently in the *Journal of Environmental Monitoring*, suggest that a number of high production volume (HPV) chemicals—that is, those used in the U.S. at rates exceeding 1 million pounds per year, are likely to become sequestered in post-treatment sludge and from there, enter the environment when these so-called biosolids are deposited on land.

As Halden notes, over 4,000 chemicals in common usage in the U.S. qualify as HPV chemicals, the vast majority of which have never been evaluated in terms of exotoxicity (their potential to adversely affect ecosystems), or for the risks they may pose to humans. “With each of these compounds, we are engaged in an experiment conducted on a nationwide scale,” says Halden; “Odds are, some of these chemicals will turn out to be bad players and will pose problems for ecosystems, public health or both.”

Unfortunately, it is neither technically nor economically feasible to perform the kind of detailed analyses necessary to declare this vast swirl of chemicals safe for humans or environmentally benign following wastewater treatment. Instead, Halden’s efforts are aimed at narrowing the field of potentially troublesome chemicals, by defining traits likely to cause some chemicals to persist in the environment. To do this, the group applied a new empirical model for estimating the fraction of mass loading of chemicals in raw sewage expected to endure in digested sludge.

Chemicals which become sequestered in digested sewage sludge are a potential cause for concern in part because the treated sludge is often subsequently applied to land, including land designated for agricultural use. Halden’s group screened some 207 HPV chemicals, using a model that predicted that two thirds of these compounds are likely to accumulate in digested sludge to greater than fifty percent of their initial mass loading in raw sewage. Eleven of these chemicals were flagged as compounds of special concern and deemed potential hazards to human and environmental health.

Three principal criteria dictated the selection of these problem chemicals: (a) their propensity to accumulate and persist in sludge in large amounts (b) structural characteristics suggestive of environmental persistence on land following biosolids recycling, and (c) unfavorable ecotoxicity threshold values, whether these have been experimentally determined or were forecasted with computer models.

As Halden explains, certain classes of chemicals possess physical characteristics that make them likelier to resist breakdown during wastewater treatment. Of particular concern are hydrophobic organic chemicals. As their name implies, such chemicals are ‘afraid’ of water and preferentially attach themselves to particulate matter, thereby becoming part of the primary and secondary sludge. This characteristic trait limits the availability of hydrophobic chemicals to aerobic and anaerobic microorganisms during sewage treatment and sludge digestion.

Rather than being broken down, such chemicals can become enriched in municipal biosolids by several orders of magnitude. Through this process, substances in heavy usage, like HPV chemicals, can accumulate as pollutants in municipal sludge to parts per million (ppm) concentrations. “It’s like vacuum cleaning your home,” says Halden. “When the carpet is clean, the vacuum bag holds a concentrated burden of dirt. By analogy, the generation of biosolids enriched in non-biodegradable pollutants are the price you pay when purifying domestic sewage for water reuse.”

In order to better gauge which chemicals may go on to present human health and environmental risks following sequestration in sludge, the group conducted a computer or *in silico* analysis. The method provides a streamlined and economically attractive means of isolating those chemicals deserving more in-depth field analysis. The group applied a new empirical model able to predict the fraction of total mass of a hydrophobic chemical likely to persist in biosolids after wastewater treatment.

Another advantage of the new model, applied by Halden and Assistant Professor Randhir Deo from the University of Guam, is simplicity. The model only requires two input values in order to estimate a chemical’s environmental persistence. The chemicals to be screened were taken from the High Production Volume Information System database maintained by the EPA to monitor the environmental fate of chemicals produced in amounts exceeding 1 million pounds per year.

The empirical model was developed and tweaked to produce the best agreement between the mathematical framework based on a given chemical’s physical properties and actual measurements derived from large sewage treatment plants. The physical characteristic found to play the largest role in a chemical’s persistence in sludge was its sorption potential—the tendency of molecules of the chemical to adhere to the surface of other molecules. In the case of the HPV chemicals under consideration, high sorption values among hydrophobic chemicals caused them to stick to other particles and be sequestered from the degradative processes used to treat wastewater.

The bulk of the chemicals included in the HPV study were used for industrial purposes and included antidegradants, antioxidants, metal chelators, intermediates, by-products, catalysts, flame retardants,
phenylating agents, plasticizers, heat storage and transfer agents, lubricants, solvents, anticorrosive agents, and others. The study also identified five mass-produced chemicals used as flavors and fragrances that were predicted to persist in sludge in fifty percent or greater amounts of their initial mass loading in raw sewage.

Once chemicals likely to persist in sludge were identified, estimates of their toxicity were examined. Those with high persistence levels and high environmental toxicity made the enemies list of chemicals posing the greatest potential hazard. Prominent among the toxic chemicals were the so-called organohalogen compounds, seven of which were found to accumulate in substantial quantity in treated sludge and displayed half-lives in soil estimated to range from 120 to 360 days.

Perhaps of greatest concern are halogenated chemicals known as organobromines—popular ingredients in a range of flame retardant products, which have subsequently been identified in bird tissues, in egg pools of herring gulls, and in dust samples. Halden insists that better monitoring of just such chemicals is essential for understanding their trajectory and mitigating risks to human health and the environment.

“Our work is directed at identifying problematic compounds before they cause harm to the environment and people. Environmental chemists often can foretell adverse outcomes. What’s lacking are regulations to translate that knowledge into pollution prevention,” says Halden. “Cleaning up after the fact, is costly and hard to do.”

**Nevirapine rather than efavirenz-based HIV treatment more likely to suppress viral load to zero**

Michael Carter
Published: 22 December 2010

The inclusion of nevirapine rather than efavirenz in an HIV treatment combination was more likely to suppress viral load in the blood to completely undetectable levels, French investigators report in the online edition of *AIDS*.

A total of 81% of patients taking nevirapine (*Viramune*) had a viral load below 1 copy/ml compared to 55% of individuals treated with efavirenz (*Sustiva*). The study involved 165 patients and was retrospective. All the patients had had an undetectable viral load for at least six months and were taking either nevirapine or efavirenz in combination with FTC (emtricitabine, *Emtriva*) and tenofovir (*Viread*, the two drugs are usually combined in a single pill, *Truvada*, and are also available co-formulated with efavirenz in *Atripla*).

A viral load below 50 copies/ml is the current aim of antiretroviral therapy. Viral load tests in routine use cannot detect virus below this level. However, research assays are able to detect extremely low levels of residual viral load.

Previous research has suggested that therapy which includes a non-nucleoside reverse transcriptase inhibitor (NNRTI) is more likely to suppress viral load to extremely low levels than treatment based on a protease inhibitor. There is also some evidence that nevirapine is more effective at reducing viral load to the lowest levels than efavirenz.

French investigators wanted to gain a better understanding of the impact of nevirapine or efavirenz-containing regimens on residual viraemia. They therefore designed a retrospective study involving 75 patients treated with nevirapine and 90 individuals taking efavirenz-based therapy.

To be included in the study, patients were required to have had a viral load below 50 copies/ml for at least six months.

Viral load was monitored using an assay capable of detecting virus below 1 copy/ml.

Overall, 81% of patients taking nevirapine had a viral load of zero compared to 56% of individuals treated with efavirenz.

After controlling for potentially confounding factors, the investigators found that treatment with nevirapine was significantly more likely to suppress viral load below 1 copy/ml than therapy with efavirenz (odds ratio [OR]: 2.85; 95% CI, 1.4-6.1, p = 0.005). The only other factor associated with a viral load of zero was the duration of viral load suppression below 50 copies/ml (OR: 2.07; 95% CI, 1.3-3.5, p = 0.005).

The investigators believe that research now shows “the stronger ability of nevirapine than efavirenz to better control residual viremia, in patients presenting with low viremia.” They suggest that this is because nevirapine is better able to penetrate into anatomical sites that may harbour “reservoirs” of virus.
“The clinical relevance of having a viral load below 1 copy/ml has yet to be shown,” conclude the researchers, who call for studies “to explore, for example, the relationship between the level of residual viremia and systemic inflammatory or immune activation markers.”

Reference

**Teen Births Hit Low in Hard Times**
The birth rate for US teens fell to a record low in 2009, dropping 6 percent to 39.1 births per 1,000 females ages 15-19, according to a new CDC report. Some experts cite the recession as a key reason for the declines, which were noted for teens of all ages, races, and ethnicities.

These historic lows for teen birth rates follow the 2 percent decline reported for 2008, which reversed two consecutive years of increases. In 2008, there were 41.5 births per 1,000 females ages 15-19. The 2009 teen birth rate is 37 percent lower than the peak rate in 1990 of 61.8 births per 1,000 females ages 15-19.

Researchers caution it is still too early to explain the drop in births. Data that might help pinpoint possible reasons, such as contraceptive use, are still being collected. Some believe that would-be mothers were anxious about the costs of childrearing and high unemployment. Teen pregnancy prevention programs also may be bearing fruit, experts said.

“This decline may be seen more in delayed births for many women than foregone births,” said report co-author Brady Hamilton, a statistician with CDC’s National Center for Health Statistics.

“They see parents who have lost jobs or houses,” said Sarah Brown, CEO of the National Campaign to Prevent Teen and Unplanned Pregnancy. “They’re very aware of how tough it is now, and I think that causes teens to be more cautious.”

The 2009 Hispanic teen birth rate was a record low 70.1 per 1,000—still far greater than the 25.6 per 1,000 rate among non-Hispanic white teens and 59 per 1,000 rate among non-Hispanic black teens.

**Vaccine Approved for Anal Cancer Prevention**
*Los Angeles Times*, (12.22.2010) Melissa Healy
The Food and Drug Administration on Wednesday approved the vaccine Gardasil for the prevention of anal cancer and associated precancerous lesions caused by human papillomavirus types 6, 11, 16, and 18 in people ages nine through 26. Though anal cancer is rare in the general population, its incidence is increasing, FDA said. HPV is associated with about 90 percent of anal cancer cases, the agency said.

Supporting data for the new indication on Merck & Co.’s Gardasil HPV vaccine were based on a trial involving men who have sex with men (MSM). In the randomized, controlled study, Gardasil proved 78 percent effective in preventing HPV 16- and 18-related anal intraepithelial neoplasia, FDA said. “Because anal cancer is the same disease in both males and females, the effectiveness data was used to support the indication in females as well,” FDA said.

In the United States, about 5,300 people are diagnosed with anal cancer each year, with more women diagnosed than men. However, MSM are the population with the highest incidence of the disease, and so physicians are more likely to recommend the vaccine to young males who self-identify as gay before they become sexually active, and to other young MSM.

Treatment of anal cancer typically involves surgery and radiation or chemotherapy. “Treatment for anal cancer is challenging; the use of Gardasil as a method of prevention is important as it may result in fewer diagnoses and the subsequent surgery, radiation or chemotherapy that individuals need to endure,” said Karen Midthun, MD, director of FDA’s Center for Biologics Evaluation and Research.

For more information, visit: http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm237941.htm.

**U.N. Food Official Highlights Food Security Challenges In World’s Most Populous Nation**
U.N. Special Rapporteur on the right to food Olivier De Schutter said Thursday that recent food price spikes in China, “in the world’s most populous nation,” underscore the country’s food security challenges resulting from decreasing amounts of arable land, *Agence France-Presse* reports. Significant land degradation is also hindering China’s agricultural output, De Schutter said as he wrapped up a visit to China. “The recent food price hikes in China are a harbinger of what may be lying ahead,” he said in a
De Schutter added (12/23).  

In an interview with the Guardian, De Schutter highlighted declining soil quality – caused by the excessive use of fertilisers, pollution and drought – as a major concern. "He noted that 37% of the nation's territory was degraded and 8.2m hectares (20.7m acres) of arable land has been lost since 1997 to cities, industrial parks, natural disasters and forestry programmes. Further pressure has come from an increasingly carnivorous diet, which has meant more grain is needed to feed livestock. The combination of these factors is driving up food inflation," the Guardian writes. "This is not a one-off event. The causes are structural," De Schutter said. He said the "widenig gap between rural and urban" populations is an "important challenge to the right to food of the Chinese population" (Watts, 12/23).

But De Schutter also praised China's "remarkable progress" in expanding its ability to feed its people over the last few decades, the Associated Press reports. "China shifted from a food aid recipient to a international food donor in 2005, a sign of its "significant success" in coordinating and helping small-scale farmers boost productivity, said Olivier De Schutter," the news service writes. "It is quite remarkable that this country, despite the restraints it is facing, is able to feed itself and has achieved such a high level of self sufficiency in grain production," he said (12/23).

De Schutter also expressed concern over China’s treatment of whistle-blowers that highlight food safety issues, the BBC reports. He "said the state's actions had 'a chilling effect' on others worried about violations. He said the Chinese authorities seemed to underestimate the contribution that free expression and association could make to the right to adequate food," the news service writes (12/23). "His preliminary report [.pdf] summarizing his observations and recommendations encouraged China to boost transparency and access to information to help combat its food safety problems," the AP reports. "His report also urged less use of chemical fertilizers and pesticides that are polluting the environment and that legal protections for small farmers be stronger. Small farms in China sometimes are taken away by corrupt officials and land developers," according to the news service (12/23).

Scientific American Examines Efforts To Increase Influenza Virus Monitoring In Pigs To Prevent Pandemics In Humans

Scientific American examines how, in an attempt to improve early recognition of viruses that could give rise to pandemics in people, such as last year's H1N1 swine flu, scientists are looking to better understand "the viruses that infect the estimated 941 million domesticated pigs around the world." However, as the article notes, "[i]ntensive monitoring of pig viruses is unlikely to come any time soon ... Most pork-producing countries do not test their pigs at all, and in some that do – such as the U.S. – the testing is done on behalf of the pork producers, who have little economic incentive to share what they find. The reason: pig farmers know pork prices plummet when pigs and flu are linked in the news."

The piece examines how the rapidly-evolving nature of animal influenza viruses can present problems for human health; how the bird flu outbreak of 2003 "underscored the urgency of being on the lookout for new flu strains in animal reservoirs"; and how a lack of surveillance data on pig influenza viruses globally has influenza scientists worried.

The article describes a CDC-USDA surveillance system program, "which is still getting off that ground," that will help influenza researchers gain access to "the findings of animal health diagnostic testing." To ease farmers' concerns that sharing surveillance data on their pigs with the government, the system assures anonymity. "The human health officials can tell which state the virus was found in but not which particular county or farm," according to the magazine. The article includes comments by Nancy Cox, head of the influenza division at the CDC; University of Hong Kong Virologist Malik Peiris; Montse Torremorel of the University of Minnesota; and Richard Webby, head of the World Health Organization's collaborating center for influenza at St. Jude Children's Research Hospital in Memphis (Branswell, January 2010).

Scientific American also features a podcast examining the issue of improving the surveillance of influenza strains in pigs (Branswell, 12/22).

Discovery Suggests a New Way to Prevent HIV from Infesting Human Cells

ScienceDaily (Dec. 22, 2010) — Researchers at the University of Minnesota have discovered how HIV binds to and destroys a specific human antiviral protein called APOBEC3F. The results suggest that a simple chemical change can convert APOBEC3F to a more effective antiviral agent and that shielding of a common feature shared by related proteins may yield a similar outcome.
This discovery highlights the potential for a novel approach to combating HIV/AIDS that would seek to stabilize and harness the innate antiviral activity of certain human proteins, according to lead author John Albin, a researcher in the laboratory of Reuben Harris, associate professor of biochemistry, molecular biology and biophysics in the College of Biological Sciences.

The finding was published in the Journal of Biological Chemistry.

Human cells produce a family of antiviral proteins (called APOBECs) that have the unique and natural ability to destroy HIV. But HIV has evolved a way to overcome restriction using an accessory protein called Vif (virion infectivity factor) to degrade the APOBEC proteins and allow the virus to spread. Albin and colleagues learned where Vif interacts with one antiviral protein, APOBEC3F, and showed how the connection can be interrupted by a simple chemical change on the surface of APOBEC3F. They also noted that similar interaction sites are found on the same surface in other members of this antiviral protein family.

"This suggests that the interaction between Vif and these antiviral APOBEC proteins could be blocked with a drug that would shield the Vif interaction region," Albin says. "Such an intervention has the potential to allow as many as seven natural antiviral drugs to spring into action and prevent HIV from spreading."

The Harris lab is focused on understanding every level of the vital interaction between these human cellular proteins and HIV Vif. They envision that future studies will involve a more refined mapping of the physical interactions between Vif and APOBEC3 proteins, investigation of the potential for HIV to resist stabilizing changes in APOBEC3 proteins, and screens for drug-like compounds that help the cellular APOBECs destroy HIV.

John Albin, a student in the Combined MD-PhD Training Program at the University of Minnesota Medical School, and is completing a thesis under the guidance of his advisor, Reuben Harris, through the Microbiology, Immunology & Cancer Biology PhD program. His studies in the Harris lab focus on the potential of APOBEC proteins to impact HIV evolution and pathogenesis.

This latest finding builds on a body of research from Harris's lab about the relationship between HIV and APOBEC proteins. In 2003 and 2004, Harris helped discover that the APOBEC proteins have the ability to counteract HIV infection.

Harris, who won a 2009 challenge grant from the Bill & Melinda Gates Foundation to explore ways to block HIV and APOBEC3 interaction, has been studying mechanisms of mutation for nearly 20 years, first as a doctoral student at the University of Alberta, then as a post-doctoral fellow at the Laboratory of Molecular Biology in Cambridge, England, and for the past seven years as an NIH supported principal investigator at the University of Minnesota. His laboratory focuses on how mutations can be harnessed to destroy pathogens.

Journal Reference:

Kenya: Herb Halts Spread of HIV in Blood
Gatonye Gathura
23 December 2010
Nairobi — A vine which grows wildly in western Kenya and found to have antiretroviral properties is among a handful of neglected inventions in Africa with the potential to change the continent’s health landscape.

Imbasa as it is called locally in Emuhaya, or Tylosema fassoglensis botanically, also grows in parts South Nyanza and Maseno Hills.

It has been the subject of intense study by researchers from Kenyatta University, Kenya Medical Research Institute, Maseno University and North Carolina University in the US.

Using an extract from the climber, researchers led by Dr Michael B. Odotte, have developed a food supplement called Sunguprot now under commercial incubation at the Kenya Industrial Research Institute.

"It is a protein based protease inhibitor, meaning that it stops the replication of HIV in the body, and has been certified by the Kenya Bureau of Standards as fit for human consumption," said Dr Odotte.

Last week Sunguprot was part of a slew of papers published by Canada's McLaughlin-Rotman Centre for Global Health identified as having the potential to offer Africa a home grown health solution.
Sunguprot, says the paper published in the UK-based BioMed Central, is a promising product but it is being held back by lack of advanced scientific equipment to isolate compounds and funding to carry out large clinical trials.

Writing a forward for the papers that included innovations by the Kenya Medical Research Institutes and the Nairobi based International Centre for Insect Physiology and Ecology, Kenyan scholar at Harvard University Dr Calestus Juma says this has come at an opportune time.

"The publication has come at a time when firms in industrialised countries are rethinking their global strategies, especially in relation to the location of new research and production facilities. These papers show that some African countries could be viable partners as they seek to become part of the global knowledge ecology."

Sunguprot, which was featured in the Nation last year, and comes in the form of flour for porridge, is described as a herbal food supplement with both antiretroviral and nutritive properties, ideal for people suffering from HIV/Aids, the malnourished and the aged.

Talking to the Nation, Dr Odotte said safety and efficacy studies had been carried out in conjunction with the Kemri and it had been found to be safe in primates and significantly lowered the HIV in the blood.

"We were funded by the National Council for Science and Technology to carry out limited clinical trials but we would still need to carry out larger studies," Dr Odotte said.

He said, they are working with Maseno University on how to domesticate the wild plant for both commercial and conservation. "Already some farmers in Nyatike and Rongo are growing the plant on experimental bases."

The limited trials carried out under Prof John Mecham of the Department of Biology, Meredith College and Prof Michael Otieno, Department of Pre-Clinical Sciences, Kenyatta University,

**Human Immune System Has Emergency Backup Plan**

ScienceDaily (Dec. 27, 2010) — New research by scientists at the University of California, San Diego School of Medicine and Skaggs School of Pharmacy and Pharmaceutical Sciences reveals that the immune system has an effective backup plan to protect the body from infection when the "master regulator" of the body's innate immune system fails. The study appears in the December 19 online issue of the journal *Nature Immunology*.

The innate immune system defends the body against infections caused by bacteria and viruses, but also causes inflammation which, when uncontrolled, can contribute to chronic illnesses such as heart disease, arthritis, type 2 diabetes and cancer. A molecule known as nuclear factor kappa B (NF-κB) has been regarded as the "master regulator" of the body's innate immune response, receiving signals of injury or infection and activating genes for microbial killing and inflammation.

Led by Michael Karin, PhD, Distinguished Professor of Pharmacology, the UC San Diego team studied the immune function of laboratory mice in which genetic tools were used to block the pathway for NF-κB activation. While prevailing logic suggested these mice should be highly susceptible to bacterial infection, the researchers made the unexpected and counterintuitive discovery that NF-κB-deficient mice were able to clear bacteria that cause a skin infection even more quickly than normal mice.

"We discovered that loss of NF-κB caused mice to produce a potent immune-activating molecule known as interleukin-1 beta (IL-1β), which in turn stimulated their bone marrow to produce dramatically increased numbers of white blood cells known as neutrophils," said Karin. Neutrophils are the body's front-line defenders against infection, capable of swallowing and killing bacteria with a variety of natural antibiotic enzymes and proteases.

The new research demonstrates that the innate immune system deploys two effective strategies to deal with invasive bacterial infection, and that the IL-1β system provides an important safety net when NF-κB falls short.

"Having a backup system in place is critical given the diverse strategies that bacterial pathogens have evolved to avoid bacterial clearance," said Victor Nizet, MD, professor of pediatrics and pharmacy, whose laboratory conducted the infectious challenge experiments in the study. "A number of bacteria are known to suppress pathways required for NF-κB activation, so IL-1β signaling could help us recognize and respond to these threats."

While helpful in short-term defense against a severe bacterial infection, the dramatic increase in neutrophil counts seen in the NF-κB-deficient mice ultimately came at a cost. Over many weeks, these activated immune cells produced inflammation in multiple organs and led to the premature death of the
animals. Long-term blockade of NF-κB signaling has been explored extensively by the biotechnology and pharmaceutical industry as a strategy for anti-inflammatory or anti-cancer therapy, perhaps unaware of the risks suggested by this new research.

"One might contemplate adding a second inhibitor of IL-1β signaling to protect against the over-exuberant neutrophil response," said Karin. "Unfortunately, loss of both the NF-κB pathway and the backup IL-1β pathway rendered the mice highly susceptible to invasive bacterial infection which they no longer cleared."

Altogether, the UC San Diego research sheds new light on the complex and elegant regulatory pathways required for a highly effective innate immune system. The scientists noted that future investigations must take into account these interrelationships in order to design novel drugs against inflammatory diseases that achieve their treatment goals while minimizing the risk of infection.

Journal Reference

Daily Participation in Sports and Students' Sexual Activity
Perspectives on Sexual & Reproductive Health Vol. 42; No. 4: doi:10.1363/4224410, (12..2010) Melissa A. Habel; Patricia J. Dittus; Christine J. De Rosa; Emily Q. Chung; Peter R. Kerndt
The current study warns of the potential for heightened risk of STDs and pregnancy among youths who participate daily in sports activities.

"Previous studies suggest that student athletes may be less likely than non-athletes to engage in sexual behavior," the authors noted, though they added that little research has “explored sexual risk behavior among athletes in early adolescence.”

In 26 Los Angeles public middle and high schools in 2005, a sample of 10,487 students completed a self-administered questionnaire asking about demographic characteristics, sports participation, sexual behaviors and expectations, and relationships with parents. Chi-square analyses compared reported levels of daily sports participation, experience with intercourse, experience with oral sex, and use of condoms at last intercourse by selected characteristics. Multivariate logistic regression analyses were employed to assess predictors of sexual experience and condom use.

Daily participation in sports was reported by one-third of respondents. Compared to their peers who did not play sports daily, those who did had higher odds of ever having had intercourse (odds ratio, 1.2) and of ever having had oral sex (1.1). “The increases in risk were greater for middle school sports participants than for their high school counterparts (1.5 and 1.6, respectively),” the authors found. “Among sexually experienced students, daily sports participants also had elevated odds of reporting condom use at last intercourse (1.4).”

“Students as young as middle school age who participate in sports daily may have an elevated risk for STDs and pregnancy,” the team concluded. “Health professionals should counsel middle school athletes about sexual risk reduction, given that young students may find it particularly difficult to obtain contraceptives, STD testing, and prevention counseling.”

Dallas Teen Has Lived to Tell About Life with HIV
A 14-year-old girl in suburban Dallas is poised to tell the world something many people would keep quiet, that she has been living with HIV since birth.

Brianna Lamar is in contention to represent Texas in a program sponsored by the Children’s Miracle Network. In June, 50 children from around the country will tell Congress their stories of overcoming serious medical conditions.

“I’m living a very good, normal life with HIV,” Lamar said from the Pleasant Grove home where she was raised by her grandparents. Lamar’s mother died at 36 of complications of AIDS.

Lamar has known about her HIV status since age three or four, when her grandparents felt obligated to explain her frequent doctor visits. Lamar, born the year after protease inhibitors were approved for adults, has been a patient since birth at the AIDS-Related Medical Services Clinic at Children’s Medical Center Dallas.

“Medically speaking, Brianna’s doing fine,” said Dr. Tess Barton, Lamar’s physician at the clinic. “She’s on medications, and she’s good about taking them. She’s really typical of the patients who come to the clinic every three months for a checkup.”
Lamar seems impervious to the stigma associated with her disease. Even though the reception has not always been positive, Lamar routinely has shared her HIV status with her classmates. She also has realized her frankness about HIV obligates her to be ready for the inevitable questions. "I had to do some studying so I could tell them they couldn't get HIV by playing dodge ball with me," she said.

Lamar's lifelong adherence to treatment has staved off AIDS and other serious illnesses, a story she is eager to tell the world. "If I could, I wouldn't mind speaking about it in an auditorium," she said.

**Science Magazine Examines Efforts To Improve Disease Eradication Programs**

Years after deadlines for polio and guinea worm eradication came and went without achieving their intended goals *Science* magazine examines efforts to strengthen disease eradication. The topic was front and center of a meeting of public health experts earlier this year in Frankfurt, Germany, that "sought a new way forward" on disease eradication, the magazine reports. "The participants, many of them involved in past and current eradications, believed that eradication campaigns should continue. But 'proceed with caution' could have been the motto" of a report the group drafted during the meeting, according to *Science*.

The magazine writes, while "[w]ealthy countries in particular are determined never to let their guard down against diseases like smallpox, polio, or measles[,] ... developing countries have their own questions [about disease eradication campaigns]: Why should they keep spending inordinate amounts of time and money on a disease such as polio – now down to fewer than 2,000 cases a year – while their health systems are struggling with far more devastating diseases such as AIDS and TB?"

The article examines the history of disease eradication efforts, comparing the success of the smallpox eradication campaign to several barriers the malaria and polio eradication campaigns have faced, and documents how "tantalizingly close" public health experts believe they are getting to wiping out guinea worm. The piece also looks at several challenges disease eradication efforts can foster in countries also grappling with other health issues.

"Future eradication campaigns [cannot] afford to bypass poor countries' broader health concerns, like diarrhea or respiratory disease, which kill far more children, the group [gathered in Frankfurt] concluded," according to *Science*. "Eradication programs should not hurt existing health services by siphoning away money and effort from basic health services for an increasingly rare disease, the Frankfurt report says – and to the extent that they can, they should have a broader beneficial effect," *Science* continues.

The report also called for future disease eradication plans to "be more evidence-based than the old ones," as well as consider the "economic costs and benefits" to eradication campaigns. The article includes comments by Stephen Cochi of the CDC; Walter Dowdle, a consultant for the Task Force for Global Health; Donald Hopkins of the Carter Center; T. Jacob John, a member of the India Expert Advisory Group for Polio Eradication; Eric Ottesen of the Lymphatic Filariasis Support Center at the Task for Global Health; and Stewart Tyson, a consultant at Liverpool Associates in Tropical Health in the United Kingdom (Enserink, 12/24).

**Scientists, Public Health Officials Weigh In On What Polio Outbreak In Republic Of Congo Could Mean For Other Regions Of Africa Believed To Be 'Polio-Free'**

"Polio is a horrendous disease, but it is seldom fatal—except now. An explosive outbreak in the Republic of Congo is writing another chapter in the book on how this ancient scourge behaves," *Science* magazine writes in an article that examines how the recent outbreak has scientists and public health experts scrambling to figure out how to control the virus.

"Polio usually strikes children under age 5, paralyzing one in 200 of those infected and killing at most 5%, occasionally up to 10% in developing countries. The new outbreak tearing through this West African country has so far killed an estimated 42% of its victims, who, in another unusual twist, are mostly males between the ages of 15 and 25," *Science* writes. According to the WHO, the outbreak, which first emerged in October, "has paralyzed more than 476 people and killed at least 179 ... making this one of the largest and deadliest polio outbreaks in recent history."

The magazine adds, "The Republic of Congo – also known as Congo-Brazzaville ... had rid itself of polio in 2000 through countrywide campaigns to vaccinate each and every child. Since then, routine immunization has kept Congo-Brazzaville polio-free, even when outbreaks swept neighboring Angola and D.R.C.," leading officials to first overlook polio as the source of the health issues when they first cropped up. While "[o]utbreaks among adults are not unheard of—one in Namibia in 2006 was traced back to
inadequate routine vaccination some 16 years earlier. ... there had been no such breakdown that anyone knew of in Congo,” Science writes.

The article reports scientists' thoughts on the potential causes for the outbreak, why the polio virus affecting the populations in the Republic of Congo is proving so deadly, and fears that what's happening in Congo-Brazzaville could happen in other "polio-free parts of Africa." The piece also notes current efforts to "snuff out the outbreak before the virus reinfects other countries," including emergency vaccination campaigns.

Bruce Aylward who runs the WHO's polio eradication effort; Neal Nathanson of the University of Pennsylvania; and Mark Pallansch, who according to Science "is leading efforts to analyze the [polio] virus at the U.S. Centers for Disease Control and Prevention" are quoted in the piece (Roberts, 12/24).

MedPage Today Examines Recent Developments, Trials Underway In HIV Prevention

MedPage Today examines recent HIV prevention developments, in a 2010 year in review piece, beginning with the announcement at the International AIDS Conference in July that a microbicide gel used by women before and after sex reduced HIV infection by 39 percent. "True, the so-called CAPRISA 004 trial was only a proof of concept, as the investigators admitted openly, and it will take considerably more study to bring a product to market," the news service writes. "But in the context of prevention efforts, the trial was a landmark, one of the high points in a 15-month span that brought – for the first time ever – nothing but good news," the story reports.

The article examines the history of challenges researchers studying strategies to prevent the spread of HIV/AIDS have faced, the discovery in 2009 that an experimental HIV vaccine cut the risk of becoming infected by HIV by 31 percent, and the announcement in November 2010 that "so-called pre-exposure prophylaxis" or PrEP with daily oral antiretroviral – "a combination of tenofovir and emtricitabine (in a single pill sold as Truvada)" – reduced risk of contracting HIV by 44 percent in men who have sex with men (MSM).

"Taken together, the three studies have re-energized the field," MedPage Today writes. "It's a bit of boom time for HIV prevention," said Mitchell Warren, executive director of the AIDS Vaccine Advocacy Coalition. However, Warren noted, more trials are needed to verify the effectiveness of the products.

"Three trials are likely to report in 2011, all testing pre-exposure prophylaxis with tenofovir and emtricitabine in various populations in Africa. ... Interestingly, those studies may have the quickest clinical impact, if only because the combination pill, Truvada, is already on the market," the news service writes.

Researchers will also be closely watching a Partners PrEP study in Uganda and Kenya, expected to end in 2012 or 2013, to see whether "oral tenofovir or the combination of tenofovir and emtricitabine has any preventive effect on transmission" of HIV/AIDS in couples where one partner is infected with HIV/AIDS and the other is not. Another trial underway, known as VOICES, "is testing oral and topical prophylaxis in nearly 5,000 women; the results of this trial are expected to come in 2012, according to MedPage Today.

The article describes additional efforts by researchers to monitor the efficacy of PrEP as well as the limitations of PrEP in preventing the spread of HIV/AIDS (Smith, 12/23).

USA Today Examines Rape In Haiti's Tent Camps

"Rape was already a serious problem in Haiti even before the earthquake. The United Nations reported in 2008 that almost half of the girls and young women living in slums like Cite Soleil and Martissant had been raped. Since the earthquake the situation for women has gotten even worse, rights groups say. Rapes have gone up threefold in Port-au-Prince, according to Refugees International," according to USA Today.

"Women and advocates say that the police typically ignore or shame women when they report attacks, so many rape victims choose not to," the newspaper writes. The article also looks at how MINUSTAH, the U.N. peacekeeping agency in Haiti, is working with local police to improve the response to rape (Armstrong, 12/23).

Infant Vaccine Effectiveness:

A Lancet Article examines "whether prenatal exposure to and treatment of maternal helminth infections affects development of an infant’s immune response to immunisations and unrelated infections." Based on a trial of 2,356 women in their second or third trimester who were to deliver infants at a hospital in Uganda, the authors report, "maternal antihelmintic treatment during pregnancy can have a small effect
on an infant’s response to tetanus immunisation, but has no effects, either beneficial or detrimental, on the occurrence of infectious diseases during infancy, infant mortality, or growth and anaemia outcomes at 1 year of age” (Webb et al., 12/21). An accompanying Lancet Comment writes of the study, “This finding has serious implications for policy makers who advocate the use of antihelmintic treatment during pregnancy” (12/21).

**Protein helps parasite survive in host cells**

December 28, 2010

By Michael Purdy

Researchers at Washington University School of Medicine in St. Louis have learned why changes in a single gene, ROP18, contribute substantially to dangerous forms of the parasite *Toxoplasma gondii*. The answer has likely moved science a step closer to new ways to beat *Toxoplasma* and many other parasites.

In a study published in *Cell Host & Microbe*, scientists show that the ROP18 protein disables host cell proteins that would otherwise pop a protective bubble the parasite makes for itself. The parasite puts the bubble on like a spacesuit by forming a membrane around itself when it enters host cells. This protects it from the hostile environment inside the cell, which would otherwise kill it.

“If we can find therapies that block ROP18 and other parasite proteins like it, that could give the host the upper hand in the battle against infection,” says first author Sarah Fentress, a graduate student in the laboratory of L. David Sibley, PhD, professor of molecular microbiology. “But mice are natural hosts of *Toxoplasma*, so studies in laboratory mice are relevant to the spread of infection.”

Epidemiologists estimate that as many as one in every four humans is infected with *Toxoplasma*. Infections typically cause serious disease only in patients with weakened immune systems. In some rare cases, though, infection in patients with healthy immune systems leads to serious eye or central nervous system disease, or congenital defects or death in the fetuses of pregnant women.

In the new study, Fentress showed that the ROP18 protein binds to a class of host proteins known as immunity-related GTPases. Tests in cell cultures and animal models showed that this binding leads to a reaction that disables the GTPases, which normally would rupture the parasite’s protective membrane.

“With one exception, humans don’t have the same family of immunity-related GTPases,” Fentress notes. “But we do have a similar group of immune recognition proteins called guanylate-binding proteins, and we are currently testing to see if ROP18 deactivates these proteins in human cells in a similar manner.”

The findings could be applicable to other parasites and pathogens. Toxoplasmosis belongs to a family of parasites that includes the parasite *Plasmodium*, which causes malaria. All surround themselves with protective membranes when they enter host cells.

“*Plasmodium* doesn’t make ROP18, but it does secrete related proteins called FIKK,” says Fentress. “It’s possible they also act to thwart host defense mechanisms like GTPases and guanylate-binding proteins.”

Malaria-Infected Cells Stiffen, Block Blood Flow

ScienceDaily (Dec. 28, 2010) — Although the incidence of malaria has declined in all but a few countries worldwide, according to a World Health Organization report earlier this month, malaria remains a global threat. Nearly 800,000 people succumbed to the mosquito-borne disease in 2009, nearly all of them in the developing world.

Physicians do not have reliable treatment for the virus at various stages, largely because no one has been able to document the malaria parasite's journeys in the body.

Now researchers at Brown University and the Massachusetts Institute of Technology have used advanced computer modeling and laboratory experiments to show how malaria parasites change red blood cells and how the infected cells impede blood flow to the brain and other critical organs.

Their findings, published in the early online edition of the Proceedings of the National Academy of Sciences, could help doctors chart, in real time, the buildup in the body of cells infected with malaria or other diseases (such as sickle-cell anemia) and to prescribe treatment accordingly.

"The idea is to predict the evolution of these diseases, just like we predict the weather," said George Karniadakis, professor of applied mathematics at Brown and corresponding author on the paper.

The researchers worked with Plasmodium falciparum, a parasite that can cause cerebral malaria by lodging in capillaries of the brain, especially among children. The parasite is found globally but is most common in Africa.

Once introduced into the human body by an infected mosquito’s bite, the parasite invades red blood cells. Healthy red blood cells are tremendously elastic; even though they can reach 8 microns in length and 2 microns in thickness, they can easily slide through a capillary just 3 microns in diameter. Capillaries are vital conduits in the human brain and other organs; red blood cells are key transporters of oxygen and nutrients.

Through extensive modeling carried out on one of the world’s fastest supercomputers at the National Institute for Computational Sciences, Karniadakis and colleagues found that malaria-infected red blood cells stiffened as much as 50 times more than healthy red blood cells. The result: Infected red blood cells, having lost their elasticity, could no longer pass through capillaries, effectively blocking them.

"Basically what happens is the brain could be deprived of nutrients and oxygen," said Karniadakis, a member of the Center for Fluid Dynamics, Turbulence and Computation at Brown. "This happens because of the deformation of these red blood cells.

"This shows that as stiffening increases (in red blood cells), the viscosity of the blood increases, and the heart has to pump twice as much sometimes to get the same blood flow," Karniadakis added.

The researchers also found that infected red blood cells had a tendency to stick, flip, and flop along the walls of blood vessels—unlike healthy blood cells that flow in the middle of the channel. For reasons not entirely known, the infected red blood cells develop little knobby protrusions on their cellular skin that tend to stick to the surface of the blood wall, known as the endothelium. Scientists call the sticking cytoadhesion.

"So, what happens is the infected red blood cell is not only stiffer, it’s slowed down by this interaction (cytoadhesion)," Karniadakis said. "This drastically changes the flow of blood in the brain, especially in the arterials and in the capillaries."

Dimitry Fedosov, first author on the paper, worked on the research as a graduate student at Brown. He is now a postdoctoral researcher at the Institute of Solid State Research in Germany. Bruce Caswell, professor emeritus in the School of Engineering at Brown, contributed to the research. Subra Suresh,
former dean of the engineering school at MIT and now director of the National Science Foundation, also contributed to the research.

Journal Reference:

New Program to Text Prenatal HIV Moms for AIDS Care

Inter Press Service, (12.22.2010) Mary Itumbi

Pregnant HIV-positive women in Kenya are helping test whether text messages can help boost treatment adherence and prevent HIV transmission to their newborns.

Since July, the Kenya AIDS Control Project has been using cell phones to stay in touch with more than 90 HIV-positive pregnant women randomly selected from among those receiving antiretroviral therapy at the Pumwani Maternity Hospital in Nairobi.

From the phone messages, the women can learn how they should eat, when they should take medications and when they should return to the clinic to have their CD4 levels checked.

The first messages are weekly and remind women of their prenatal visits. In the last month of pregnancy, the messages prompt women to take their medications.

Not all women are eligible. Women in the program must live a reasonable distance from the hospital and be able to understand English or Kıswhali. Because illiteracy is so high among the women, researchers have discussed a subsequent trial with voice messages.

Poverty also is common, making it difficult for women to tend to their health even when reminded. Mindful of the stigma that surrounds an HIV diagnosis, health workers text women to take their “vitamins” rather than referring to antiretrovirals. “We don’t want to put ‘ARVs’ in a text message, because we don’t know who can come across their phones,” explained research nurse Juliet Wangari Njuguna.

The initiative is expected to continue through 2013.

Drag Queens and Volunteers Promote Safe Sex

Inter Press Service, (12.02.2010) Dalia Acosta

The “Canto a la Vida” (Song to Life) gala at the Fausto Theater in Havana was one of several local events marking World AIDS Day recently. The event, which featured the drag queen Margot Parapar, was organized by Cuba’s National Center for Sex Education (CENESEX) and other cultural and health organizations.

CENESEX and the National Center for Prevention of Sexually Transmitted Infections and HIV/AIDS (CNPSIDA) conduct prevention and awareness programs through voluntary health promoters like Parapar. Parapar’s stage shows include messages on sexual health infused with large doses of humor. On stage, in front of a rainbow flag as a backdrop, she confidently tells the audience, “I know everything: I am a protected oracle.”

Cuba has approximately 13,000 people living with HIV, for a prevalence of 0.1 percent, the lowest in the Caribbean region. However, men who have sex with men (MSM) are disproportionately affected by the disease, making up 72 percent of all diagnosed cases, said Rosaida Ochoa of CNPSIDA.

CNPSIDA has trained 1,700 MSM health volunteers, and CENESEX’s program for MSM and transgender persons (MSM-Trans) has more than 400. These volunteers are a “key factor” for conducting prevention outreach among peers as well as to wider population groups, said Malú Cano Valladares, founder and coordinator of MSM-Trans.

“They take their health messages to their usual meeting places, as well as to schools, communities, and hospitals,” said Valladares.

According to MSM-Trans member Luis Rondón, “developing closer relationships of trust” and expanding “the social influence exerted by the volunteers” have improved Cuba’s efforts to combat HIV/AIDS.

Prevalence and Correlates of Heterosexual Anal Intercourse Among Clients Attending Public Sexually Transmitted Disease Clinics in Los Angeles County

Sexually Transmitted Diseases Vol. 37; No. 6: P. 369–376, (06..2010) Marjan Javanbakht; Sarah Guerry; Pamina M. Gorbach; Ali Stirland; Michael Chien; Peter Anton; Peter R. Kerndt
Recent heterosexual anal intercourse (AI) “was reported by a non-trivial proportion of clients seen at public STD clinics” in this study, which was set in Los Angeles County, Calif.

To identify demographic and behavioral correlates of heterosexual AI and its associations with STDs among the clients, the researchers conducted a cross-sectional study of patients attending 13 public STD clinics in the county. Data on demographics, types of sexual contact, substance use, other risk behaviors, and STD test results were collected.

AI with an opposite-sex partner in the previous 90 days was reported by 10 percent of heterosexual men (n=1,978) and 10 percent of women (n=1,364). Women who reported AI were more likely to report exchanging sex for drugs or money (adjusted odds ratio=2.80; 95 percent confidence interval: 1.95-4.02) and substance use (AOR=1.35; 95 percent CI: 1.17-1.55) and were less likely to be African American (AOR=0.53; 95 percent CI: 0.43-0.65). Among male participants, African Americans were less likely to report heterosexual AI (AOR=0.70; CI: 0.60-0.82). Compared to white men, Hispanic men were more likely to report heterosexual AI (AOR=1.50; 95 percent CI: 1.29-1.76). Among men, other factors associated with AI were exchange of drugs/money for sex, anonymous sex, and sex with a drug injector. Among men and women alike, factors associated with AI varied by race/ethnicity.

In their conclusion, the authors noted that study participants “who reported AI were also more likely to report risk behaviors that place them at high risk for transmitting or acquiring [STDs]/HIV.”

Scientists, Public Health Officials Weigh In On What Polio Outbreak In Republic Of Congo Could Mean For Other Regions Of Africa Believed To Be 'Polio-Free'

"Polio is a horrendous disease, but it is seldom fatal—except now. An explosive outbreak in the Republic of Congo is writing another chapter in the book on how this ancient scourge behaves," Science magazine writes in an article that examines how the recent outbreak has scientists and public health experts scrambling to figure out how to control the virus.

"Polio usually strikes children under age 5, paralyzing one in 200 of those infected and killing at most 5%, occasionally up to 10% in developing countries. The new outbreak tearing through this West African country has so far killed an estimated 42% of its victims, who, in another unusual twist, are mostly males between the ages of 15 and 25," Science writes. According to the WHO, the outbreak, which first emerged in October, "has paralyzed more than 476 people and killed at least 179 ... making this one of the largest and deadliest polio outbreaks in recent history."

The magazine adds, "The Republic of Congo – also known as Congo-Brazzaville ... had rid itself of polio in 2000 through countrywide campaigns to vaccinate each and every child. Since then, routine immunization has kept Congo-Brazzaville polio-free, even when outbreaks swept neighboring Angola and D.R.C.," leading officials to first overlook polio as the source of the health issues when they first cropped up. While "[o]utbreaks among adults are not unheard of—one in Namibia in 2006 was traced back to inadequate routine vaccination some 16 years earlier. ... there had been no such breakdown that anyone knew of in Congo," Science writes.

The article reports scientists' thoughts on the potential causes for the outbreak, why the polio virus affecting the populations in the Republic of Congo is proving so deadly, and fears that what's happening in Congo-Brazzaville could happen in other "polio-free parts of Africa." The piece also notes current efforts to "snuff out the outbreak before the virus reinfects other countries," including emergency vaccination campaigns.

Bruce Aylward who runs the WHO's polio eradication effort; Neal Nathanson of the University of Pennsylvania; and Mark Pallansch, who according to Science "is leading efforts to analyze the [polio] virus at the U.S. Centers for Disease Control and Prevention" are quoted in the piece (Roberts, 12/24).

Virus Previously Linked to Chronic Fatigue Syndrome Was a Lab Contaminant, Not Cause of Disease, New Study Shows

ScienceDaily (Dec. 29, 2010) — A virus previously thought to be associated with chronic fatigue syndrome is not the cause of the disease, a detailed study has shown. The research shows that cell samples used in previous research were contaminated with the virus identified as XMRV and that XMRV is present in the mouse genome.

XMRV was first linked to chronic fatigue syndrome—also known as myalgic encephalomyelitis (ME)—in a study published in October 2009, where blood samples from chronic fatigue syndrome patients were found to have traces of the virus. XMRV had also been identified previously in samples from certain prostate cancer patients.
The new study, published in Retrovirology, identifies the source of XMRV in chronic fatigue syndrome samples as being cells or mouse DNA rather than infection by XMRV. The research does not rule out a virus cause of chronic fatigue syndrome—it is simply not this virus.

The research team developed improved methods to detect XMRV against the genetic noise of other sequences and make recommendations for future study of virus causes of human disease.

"Our conclusion is quite simple: XMRV is not the cause of chronic fatigue syndrome," says Professor Greg Towers, a Wellcome Trust Senior Research Fellow at University College London (UCL). "All our evidence shows that the sequences from the virus genome in cell culture have contaminated human chronic fatigue syndrome and prostate cancer samples.

"It is vital to understand that we are not saying chronic fatigue syndrome does not have a virus cause—we cannot answer that yet—but we know it is not this virus causing it."

The team, from University College London, Wellcome Trust Sanger Institute and University of Oxford, showed clearly that the experimental design of previous studies would pick up sequences that resembled XMRV; however, in this improved study, they could prove that the signal was from contamination by a laboratory cell line or mouse DNA. The sequences from the contaminated cell line and chronic fatigue patient samples were extremely similar, contrary to the pattern of evolution expected during the infectious spread of a virus in a human population.

They also showed that the existing methods would indicate that one in fifty human cell lines they examined were infected with XMRV-related viruses: they showed that contamination of human tumour cells with XMRV-related viruses is common and that a principal prostate cancer line used is contaminated.

"When we compare viral genomes, we see signs of their history, of how far they have travelled in space or time," says Dr Stéphane Hué, Post Doctoral Researcher at UCL. "We would expect the samples from patients from around the world, collected at different times, to be more diverse than the samples from within a cell line in a lab, where they are grown under standard conditions. During infection and transmission in people, our immune system would push XMRV into new genetic variants.

"Viral infection is a battle between the virus and the host and XMRV does not have the scars of a virus that transmits between people."

Together the results demonstrate that XMRV does not cause chronic fatigue syndrome or prostate cancer in these cases. The team's methods suggest ways to ensure that virus contamination does not confound the search for a cause of disease in future work.

The authors propose that more rigorous methods are used to prevent contamination of cell and DNA samples. They also suggest that consistent and considered standards are needed for identifying viruses and other organisms as cause of a disease.

"Increasingly, we are using DNA-based methods to accelerate our understanding of the role of pathogens in disease," explains Professor Paul Kellam, Virus Genomics group leader from the Wellcome Trust Sanger Institute. "These will drive our understanding of infection, but we must ensure that we close the circle from identification to association and then causation.

The strongest lesson is that we must fully use robust guidelines and discriminatory methods to ascribe a cause to a disease."

**Journal Reference:**

**Religious Differences in HIV/AIDS Discussion**
*Associated Press*, (12.11.2010) Ayana Jones
An effort to promote HIV prevention in Philadelphia's churches and mosques is underscoring how different cultures in the city respond to the epidemic.

The Interfaith Health Action Alliance of Philadelphia (IHAAP) was launched in November to help reduce health disparities in the city, particularly those involving HIV/AIDS. Approximately 100 churches and mosques committed to involve their congregations in HIV prevention with education, HIV-themed sermons, and testing.

The 20 congregations that organized testing events did not include any of the five mosques in the campaign. “This distribution of the literature is where we’ve had the most success at, but to get them to really bring [testing] to the congregation like the churches have done, we’ve not had that much success in
that area,” said Rafiyq Friend, a member of the Ahmadiyya Muslim Community who brought the five mosques into the campaign.

“Theologically we believe in certain moral positions [around] adultery, fornication, mostly illicit sexual activity,” Friend said.

Part of Friend’s motivation in bringing mosques into IHAAP is to establish their commonality with other faith communities in the city. “We are part of the social makeup of America,” he said. “We have a responsibility and the responsibility is to help eradicate some of these social ills that are affecting the community.”

The tally is not final, but the congregations in the campaign did not seem to administer a large number of HIV tests, said alliance organizer Amy Nunn, research professor of medicine at Brown University.

“If you don’t pair the testing with preaching to stimulate the demand and interest for it, to really highlight the importance of testing, you don’t really get a lot of people turning out for testing,” Nunn said. “That’s a lesson that we’ve learned from this.”

**Bacteria Provide Example of One of Nature’s First Immune Systems, Research Shows**

ScienceDaily (Dec. 30, 2010) — Studying how bacteria incorporate foreign DNA from invading viruses into their own regulatory processes, Thomas Wood, professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, is uncovering the secrets of one of nature’s most primitive immune systems.

His findings, which appear in *Nature Communications*, a multidisciplinary publication dedicated to research in all areas of the biological, physical and chemical sciences, shed light on how bacteria have throughout the course of millions of years developed resistance to antibiotics by co-opting the DNA of their natural enemies—viruses.

The battle between bacteria and bacteria-eating viruses, Wood explains, has been going on for millions of years, with viruses attempting to replicate themselves by—in one approach—invading bacteria cells and integrating themselves into the chromosomes of the bacteria. When this happens a bacterium makes a copy of its chromosome, which includes the virus particle. The virus then can choose at a later time to replicate itself, killing the bacterium—similar to a ticking time bomb, Wood says.

However, things can go radically wrong for the virus because of random but abundant mutations that occur within the chromosome of the bacterium. Having already integrated itself into the bacterium’s chromosome, the virus is subject to mutation as well, and some of these mutations, Wood explains, render the virus unable to replicate and kill the bacterium.

With this new diverse blend of genetic material, Wood says, a bacterium not only overcomes the virus' lethal intentions but also flourishes at a greater rate than similar bacteria that have not incorporated viral DNA.

"Over millions of years, this virus becomes a normal part of the bacterium," Wood says. "It brings in new tricks, new genes, new proteins, new enzymes, new things that it can do. The bacterium learns how to do things from this.

"What we have found is that with this new viral DNA that has been trapped over millions of years in the chromosome, the cell has created a new immune system," Wood notes. "It has developed new proteins that have enabled it to resists antibiotics and other harmful things that attempt to oxidize cells, such as hydrogen peroxide. These cells that have the new viral set of tricks don't die or don't die as rapidly."

Understanding the significance of viral DNA to bacteria required Wood's research team to delete all of the viral DNA on the chromosome of a bacterium, in this case bacteria from a strain of *E. coli*. Wood’s team, led by postdoctoral researcher Xiaoxue Wang, used what in a sense could be described as "enzymatic scissors" to "cut out" the nine viral patches, which amounted to precisely removing 166,000 nucleotides. Once the viral patches were successfully removed, the team examined how the bacterium cell changed. What they found was a dramatically increased sensitivity to antibiotics by the bacterium.

While Wood studied this effect in *E. coli* bacteria, he says similar processes have taken place on a massive, widespread scale, noting that viral DNA can be found in nearly all bacteria, with some strains possessing as much as 20 percent viral DNA within their chromosome.

"To put this into perspective, for some bacteria, one-fifth of their chromosome came from their enemy, and until our study, people had largely neglected to study that 20 percent of the chromosome,"
Wood says, "This viral DNA had been believed to be silent and unimportant, not having much impact on the cell.

"Our study is the first to show that we need to look at all bacteria and look at their old viral particles to see how they are affecting the bacteria's current ability to withstand things like antibiotics. If we can figure out how the cells are more resistant to antibiotics because of this additional DNA, we can perhaps make new, effective antibiotics."

**Journal Reference:**
Xiaoxue Wang, Younghoon Kim, Qun Ma, Seok Hoon Hong, Karina Pokusaeva, Joseph M. Sturino, Thomas K. Wood. Cryptic prophages help bacteria cope with adverse environments. *Nature Communications*, 2010; 1 (9): 147 DOI: 10.1038/ncomms1146

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98.6 Degrees Fahrenheit Ideal Temperature for Keeping Fungi Away and Food at Bay

ScienceDaily (Dec. 22, 2010) — Two researchers at Albert Einstein College of Medicine of Yeshiva University have found that our 98.6° F (37° C) body temperature strikes a perfect balance: warm enough to ward off fungal infection but not so hot that we need to eat nonstop to maintain our metabolism.

"One of the mysteries about humans and other advanced mammals has been why they are so hot compared with other animals," said study co-author Arturo Casadevall, M.D., Ph.D., professor and chair of microbiology & immunology at Einstein. "This study helps to explain why mammalian temperatures are all around 37° C." Dr. Casadevall also holds the Leo and Julia Forchheimer Chair in Microbiology and Immunology.

The research builds upon earlier work by Dr. Casadevall showing that the number of fungal species that can thrive and therefore infect an animal declines by 6 percent for every 1° C rise in temperature. This means that tens of thousands of fungal species infect reptiles, amphibians and other cold-blooded animals, but only a few hundred harm mammals. Such protection against fungal infection, Dr. Casadevall has speculated, could have been crucial for the triumph of mammals following the age of dinosaurs.

In this study, Dr. Casadevall and his Einstein coauthor, Aviv Bergman, Ph.D., professor and founding chair of systems & computational biology, devised a mathematical model that analyzed the benefits gained by body temperatures that protect against fungi versus the costs (in terms of extra food consumption) required to maintain body temperatures between 30° and 40° C. The optimal temperature for maximizing benefits while minimizing costs was found to be 36.7° C, which closely approximates normal body temperature.

"This study is a good example of how mammalian evolution has been driven by both external biological factors and internal physiological constraints," said Dr. Bergman.

**Journal Reference:**