



FOGARTY

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FOGARTY INTERNATIONAL CENTER • NATIONAL INSTITUTES OF HEALTH • DEPARTMENT OF HEALTH AND HUMAN SERVICES

Genomics is transforming infectious disease studies

With unexpected speed, the field of genomics is revealing secrets of some of the world's most persistent pathogens. Scientists now have molecular tools to track how diseases spread and understand the tricks they use to become more virulent or develop drug resistance, according to Sir Mark Walport, who spoke recently at the NIH.

"Modern genetics has the potential to transform the management and assessment of infectious disease," said Walport, who directs the Wellcome Trust and will become the U.K.'s chief science adviser in April. "The tools that are available for research in terms of their power and their scale are such as we've never had before."

Walport visited NIH to deliver the annual David E. Barmes Global Health Lecture that honors its namesake

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Photo by Emile Branson/NIH



Wellcome Trust Director Sir Mark Walport discussed the potential of genomics to transform the study of infectious diseases as he delivered the 12th annual David E. Barmes Global Health Lecture.

Global disease study reveals successes, challenges

A landmark study of the global causes of death and disability shows a dramatic shift from infectious to noncommunicable diseases—with the exception of sub-Saharan Africa, where the scourges of HIV/AIDS and malaria remain entrenched. The Global Burden of Disease Study 2010, published as a special edition of *The Lancet*, is the largest ever systematic effort to describe the worldwide distribution and causes of a wide array of diseases, injuries and health risk factors. Nearly 500 scientists from 50 countries participated, with more than half located in low- and middle-income countries.

While child mortality used to be the largest contributor to the world's health burden, injuries and chronic diseases now pose the biggest challenges and are multiplying as people live longer. Since 1970, men and women worldwide have gained slightly more than 10 years of life expectancy, the study reported, but they spend more years living with injury and illness.

"We're finding that very few people are walking around with perfect health and that, as people age, they accumulate health conditions," noted Dr. Christopher Murray, director of the Institute of Health Metrics and Evaluation at the University of Washington, and one of the founders of the Global Burden of Disease project. "At an individual level, this means we should recalibrate what life will be like for us in our 70s and 80s. It also has profound implications for health systems as they set priorities."

The types of illnesses and injuries causing death and disability are also changing. While ischemic heart disease and stroke remained the two greatest causes of death between 1990 and 2010, all the other rankings in the top 10 changed. Diseases such as diabetes, lung cancer and chronic obstructive pulmonary disease moved up, and diarrhea, lower respiratory infections and tuberculosis moved down. Notably, measles plunged from 12th to 38th

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FOCUS



Water and its impact on global health

- Fogarty's crosscutting grants spur research on water issues
- International collaboration aims to reduce diarrheal disease
- Climate and environmental changes spur spread of pathogens

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Mobile health technology spurs rapid advances

Innovative mobile health devices and applications continue to transform global health and clinical care worldwide, while there are growing concerns in the research community about the lack of evidence and evaluation of mHealth approaches. At the fourth annual mHealth Summit, more than 4,000 attendees from 56 countries convened in the Washington area to describe advances and new products, and discuss problems and concerns related to the rapidly growing field. The summit was organized by the nonprofit organization mHIMSS in partnership with the Foundation for National Institutes of Health, the mHealth Alliance and the NIH.



Some experts at the conference warned that

many new applications are being quickly developed and implemented without rigorous study. NIH Director Dr. Francis S. Collins challenged mobile health researchers and engineers to base their approaches on research findings and to properly evaluate new tools through randomized control trials. According to Collins, only 20 such trials testing mobile health applications were documented in peer-reviewed literature between

2008 and 2012. “Surprisingly few have been tested systematically,” he said. “I urge this audience to think of ways to test them. The plural of anecdotes is not data.”

Mobile health specialists should adopt a “learning ecosystem” approach that would involve constantly evaluating outcomes and incorporating discoveries into mhealth projects, said Dr. Wendy Nilsen, a behavioral health expert at the NIH. Nilsen led a public-private partnership session designed to address these concerns and spark dialogue between the research and business communities regarding evidence-based design. She also hosted a weekend-long training institute on how to work with subject matter experts across varied technical fields to develop an mHealth application.

Dr. Jeffrey Sachs, director of the Earth Institute at Columbia University, echoed this enthusiasm, predicting that mobile health will help transform the U.S. health care system as a result of gains made in the developing world. “We will see huge breakthroughs in Africa, in South Asia, and other low-income settings,” said Sachs. “Those breakthroughs will eventually become breakthroughs in the United States.”

mHealth to improve obstetric care, pregnancy outcomes

Photo courtesy of Shegufta Sikder



Researcher Shegufta Sikder collected data in Bangladesh to implement a mobile phone-based pregnancy and childbirth information system.

In remote areas of Bangladesh, women’s lives are often threatened during pregnancy and childbirth by complications such as hemorrhage, sepsis, eclampsia and obstructed labor. Researcher Shegufta Sikder, working with a team from Johns Hopkins University, is helping break new ground for a mobile health system that should reduce these risks and improve emergency obstetric care for Bangladeshi mothers.

The mobile phone-based platform, known as mCARE,

is a pregnancy and neonatal health information system that connects rural health workers and facilities with pregnant women and their newborns. The system includes automated reminders for antenatal, postnatal and essential newborn care, notification of labor and birth, referral and decision-making support for rural women and families, and provision of emergency dispatch of health care.

In the country’s rural northwest where the mCARE study was focused, few mothers deliver babies at hospitals. “Seventy-five percent of women give birth at home—in the absence of skilled medical personnel—and most women are at home when complications occur,” said Sikder. “For the women who can reach health facilities to address their health problems, we were interested to understand whether these facilities can address these life-threatening conditions.”

She evaluated emergency obstetric care capabilities at 14 high-volume health facilities while also identifying ideal patient referral locations for the mCARE system. The study, which was partially funded by Fogarty, determined there was potential to improve referral and that mobile health technology could play a key role.

RESOURCE

mCARE website: <http://bit.ly/12yR8js>

New partnership models emerge for research training

New models of research training partnerships are emerging in the global health arena, reflecting the increased ability and desire of middle-income countries to expand their research capacity and develop international scientific partnerships. Authorities in China and South Korea recently made pacts with entities in the U.S. to support research training and joint projects.

South Korea's Health Industry Development Institute announced it will support the training of a dozen Korean postdoctoral-level scientists at the NIH where they will benefit from the large pool of experts and high-tech equipment. Training will initially focus on six areas of interest: cancer, neuroscience, cardiovascular conditions, metabolic processes, allergy and chronic disease, and reproductive health. Korea will contribute \$1.4 million over two years.

Meanwhile, the Fudan Institute of Global Health in China and Duke University's Global Health Institute in North Carolina have pledged to facilitate undergraduate and graduate student exchanges and research projects between their institutions. They will also jointly support interdisciplinary research in Asia and Africa, strengthening South-South partnerships and leveraging research funding

Photo by Jeff Gray/Fogarty



For the first time, South Korea will fund 12 post-doctoral trainees at the NIH. Above, NIH Director Dr. Francis S. Collins and Korean official Dr. Kyung-Hwa Ko, hold the signed agreement.

opportunities for important health fields such as non-communicable diseases.

An agreement also has been forged between Peking University Health Science Center and the University of Michigan Health System. The two universities jointly committed \$14 million to fund collaborative research projects and education focusing on three pervasive medical conditions: pulmonary, cardiovascular and liver diseases.

"We are seeing more governments interested in stepping up the capacity for scientific research in their country by advancing funds for the quality training of scientists at collaborating institutions in the U.S.," said Fogarty Director Dr. Roger I. Glass. "I am hopeful that these types of arrangements will multiply, allowing researchers to expand and deepen international partnerships that will improve the health outlook for populations everywhere."

RESOURCES

- Duke/Fudan accord: <http://bit.ly/Duke4Fudan>
- Michigan/Peking accord: <http://bit.ly/14Sqy7H>

NIH urges progress in reducing health disparities



Dr. John Ruffin

Improved access to health care is essential to break the cycle of poverty that individuals face in many societies around the globe. Steps to facilitate this include more scientific research, partnerships and community involvement, according to speakers at a recent NIH summit on the Science of Eliminating Health Disparities.

Led by the NIH's National Institute on Minority Health and Health Disparities (NIMHD), the summit focused on how to accelerate the narrowing of health disparities. "While we're making progress, we still have unfinished business," said NIMHD Director Dr. John Ruffin.

Environmental injustice, residential segregation, incarceration and reduced educational opportunities continue to limit progress. "For us to break down the multiple barriers and achieve health equity, we have to get better at collaborating, partnering, connecting the dots

and taking advantage of one of our greatest strengths, the diversity of this nation," Ruffin said.

The NIH has a powerful role to play in reducing health disparities, said NIH Director Dr. Francis S. Collins. "We've enjoyed many successes and our cause is noble, but not all have benefited equally from the successes of medical research. Disparities persist in health and also in the diversity of our own workforce."

Among the initiatives the NIH is taking to combat these imbalances is a plan to offer undergraduates with diverse backgrounds and an interest in science more exposure to cutting-edge research during their undergraduate years, greater access to loan repayment programs and more mentoring "to encourage them to continue that dream of becoming major participants in our future," Collins said.

RESOURCE

- NIMHD website: www.nimhd.nih.gov

Global disease study reveals successes, challenges . . . continued from p. 1

place, thanks to improved vaccination programs. HIV/AIDS, not even in the top 20 in 1990, surged to number six.

GBD 2010 is the only comprehensive picture of human illness and death worldwide, noted Sir Richard Feachem, Director of the Global Health Group at the University of California, San Francisco. “It will be of immense value to policymakers and public health practitioners in all countries. It will also generate heated debate, which will lead to further advances in data collection and analysis and better estimates in the future.”

The study is an “indispensable resource,” observed Dr. Jim Kim, president of the World Bank Group. “Its value lies not only in the data but the critical discussions it makes possible. Specifically, the GBD 2010 has sharpened thinking on issues as diverse as the measurement of comorbidities; the role of culture in mediating the experience of disease; the meaning of disability; and the impact of poverty on health.”

A few weeks after the report’s launch, Murray presented the data to an NIH audience and spent a day on campus leading small group discussions on various aspects of the study. In his talk, Murray outlined four significant aspects of the global health burden, including the improved condition of children, shift to noncommunicable diseases, large impact of disability and dominant health risks around the world.

Along with the good news of a declining trend in infectious diseases and other life-shortening conditions related to birth and nutrition, comes the bad news of a rising burden from noncommunicable disease, Murray noted. Death is increasingly caused by cardiovascular conditions, cancers or diabetes, rather than malaria, pneumonia or diarrhea. “The pace of the cause of death transition is quite fast,” he said.

“At an individual level, this means we should recalibrate what life will be like for us in our 70s and 80s. It also has profound implications for health systems as they set priorities.”

— DR. CHRISTOPHER MURRAY

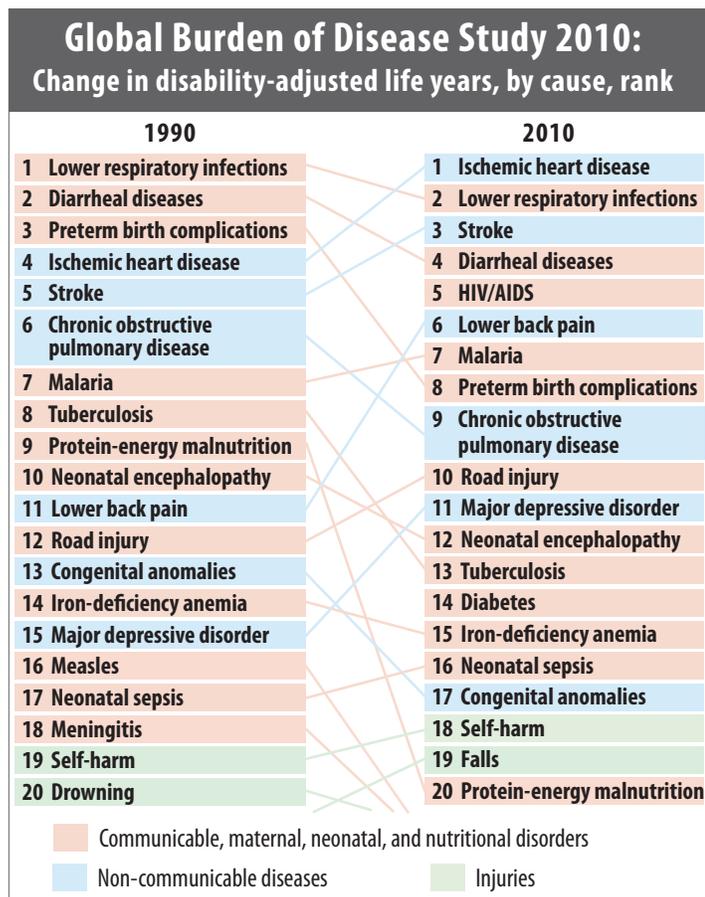
Sub-Saharan Africa is also showing a rising proportion of burden from noncommunicable diseases, although this change is occurring more slowly than in the rest of the world. Because of HIV/AIDS, the burden of infectious diseases is actually rising in a handful of countries, Murray noted.

Leading causes of disability differ from those bringing early death. Lower back pain tops the list nearly everywhere, followed closely by depression. Other common problems are anemia, muscular-skeletal disorders, migraines, vision or hearing loss, injury and endocrine diseases.

The last two decades have seen a change in risk factors behind health burdens, Murray noted. Today, the largest factor is elevated blood pressure, followed by tobacco, alcohol and household air pollution. Collectively, diet accounts for about 10 percent of the burden of disease risk and obesity is the sixth most common risk factor, he said.

Murray urged the NIH to collaborate on future disease burden studies and suggested the project could transition to a continuously updated open access dataset that would reflect the latest available information. He also noted the team plans to improve research methods, produce forecasts, obtain extensive feedback on drug and vaccine adverse effects, and track dollar costs by disease and injury categories.

Common standards, transparent peer review and better data are also needed, suggested WHO Director General, Dr. Margaret Chan. “We must not forget that the real need is to close the data gaps, especially in low-income and middle-income countries, so that we no longer have to rely heavily on statistical modeling for data on disease burden. Accountability for health should be based on sound monitoring of results, tracking of resources and transparent reviews, with a focus on equity.”



RESOURCES

GBD 2010 website: <http://bit.ly/XgnhwD>
 Murray NIH lecture videocast: <http://1.usa.gov/WWQjyr>

US steps up efforts to protect world's children

Aiming to shield the world's children from deprivation, exploitation and danger, the U.S. government recently launched its first-ever Action Plan on Children in Adversity. The initiative underscores that adequate care in early life is essential for producing successful adults and thriving communities, which in turn feed a nation's social and economic progress.

Specifically, the plan is intended to accomplish three key goals: provide strong beginnings, put family care first and protect children from violence, exploitation, abuse and neglect. The result should be significantly fewer children who fail to meet age-appropriate growth and development milestones, who don't live in a family structure and who suffer violence or exploitation.

The NIH role in the interagency collaboration includes



Photo by Sudipto Das/PhotoShare

The NIH is participating in a U.S. government plan to enhance global efforts to protect children from neglect, abuse, exploitation and other dangers.

helping countries collect relevant data so they can develop evidence-based policies and programs. With expanded research, policymakers in target countries can measure the prevalence of various problems, how well corrective steps are working and whether programs are maximizing the use of funds.

U.S. agencies participating include: USAID, the Peace Corps and the Departments of Health and Human Services, Agriculture, Defense, Labor and State.

Genomics is transforming infectious disease studies . . . continued from p. 1

for his career spent improving health in low-income countries. The lecture is co-sponsored by the National Institute of Dental and Craniofacial Research and Fogarty.

During his talk, "From John Snow to Genomic Science," Walport illustrated the progress in medical science since physician John Snow determined that London's 1854 cholera epidemic came from a single water pump. Now, scientists have sequenced the genomes of varying *vibrio cholera* strains in samples going back over 100 years, giving insight into the bacterium's structure, rate of mutations and global spread.

Genomic studies of other pathogens are likewise giving valuable insight while raising questions about how to manage disease. For instance, health authorities are asking whether closing national borders can stem epidemics. A U.K. study of a swine flu outbreak showed the virus arrived at numerous points before any cases had even been identified in physician offices. Aside from revealing how pathogens spread internationally, genomics can also help pinpoint how they spread locally. In a U.K. hospital, sequencing of methicillin-resistant *Staphylococcus aureus* led researchers to identify the single staff member behind an ongoing outbreak.

Genomics also has enormous potential to identify bacterial virulence and drug resistance, holding the promise of tactics to counteract both and to develop new drugs and vaccines, he noted, adding that such insight is urgently needed to stop malarial *Plasmodium* parasites, which are building resistance to the most effective drug, artemisinin.

Genomic sequencing "will tell us more about the pathogenicity, we will be able to identify the virulence factors, we'll be able to identify the antibiotic resistance as it evolves, and importantly, we're going to be able to investigate transmission of infections both at the global scale but also at the local scale in ways that will alter clinical management," Walport said.

He hailed the many partnerships built between the Wellcome Trust and NIH to further genomics understanding. Most recently, the two organizations established H3Africa, a project funding studies of genomics and environmental causes of diseases and of drug responses common in Africa. Such partnerships are essential to nurture research capacity in developing countries. "Successful scientists must have an environment in which they can operate as well," Walport said. "All too often, we see superb scientists from parts of the developing world, where there is very little local institutional capacity, vote with their feet and leave."

Forging research partnerships is also critical, he noted. "Building capacity is about connections between people, increasingly it's about interdisciplinary research, about developing teams, leaders, mentorship. And the challenge for all of us," he concluded, "is to make the whole greater than the sum of its parts."

RESOURCES

Barnes lecture videocast: <http://1.usa.gov/Vzus4T>
H3 Africa website: <http://h3africa.org>

NICHD marks 50 years of improving child health

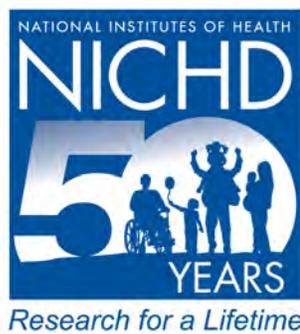
Photo courtesy of NIH



Hailing 50 years of scientific discoveries, National Institute of Child Health and Human Development Director Dr. Alan E. Guttmacher says he also sees promising research opportunities ahead.

From discoveries that prevent the transmission of HIV from mother to child, to vaccines that protect children from deadly diseases, the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) has contributed to nearly every major advance in children’s health since 1962. The Institute recently marked these achievements with a symposium titled, “Research for a Lifetime.”

“Because of NICHD, it’s fair to say, many of the accomplishments of the last 50 years have become possible,” said NIH Director Dr. Francis S. Collins. “NICHD has been in the middle of those advances, not as an observer but as a central participant. It has not only been reading the story, but has been writing it.”



In a brochure produced for the anniversary, NICHD Director Dr. Alan E. Guttmacher acknowledged that scientific progress is incremental, with collaboration playing a vital role in achieving breakthroughs. “As we look back over the last five decades, we recognize the research challenges that gave way to research advances. We

highlight not only the big steps forward, but also the small steps that made those advances possible.”

Many of the achievements have had an enormous impact worldwide, contributing to a more than 50 percent drop in the global infant mortality rate since 1960. Mother-to-child transmission of HIV—once prevalent in the developing world—has fallen below 10 percent in Asia and Africa, thanks to the discovery of effective treatments and safe breastfeeding practices. Meanwhile, the inexpensive drug misoprostol provides a safe and convenient way to prevent postpartum hemorrhage, a major killer of women in developing countries. A global campaign, Helping Babies Breathe, is teaching midwives and birth attendants in poor countries how to spur newborns to take their first breaths. Today, screening tests can quickly detect a number of congenital diseases in infants, speeding treatment.

The commemorative event also included a presentation by Dr. Duane Alexander, who served as NICHD director from 1986 to 2009. Alexander detailed examples of the Institute’s contributions to improving the health and well-being of children and families in the U.S. and around the world (see chart). For instance, vaccine advances have played an essential role in protecting children from

devastating diseases, he noted. NICHD-supported scientists helped develop a vaccine against *Haemophilus influenzae* type b—a disease that can cause meningitis, resulting in permanent deafness, brain damage or death. “Eliminating this disease is one of the NIH’s all-time major contributions to public health,” Alexander said.

The future looks bright for more groundbreaking research, Collins predicted. “The science that NIH has the potential to support right now across the board—but particularly in the areas that NICHD has responsibility for—has never been more exciting, more full of promise. Whether we’re talking about the basic science of human development or the much more applied research and translation that includes not only children’s health but also women’s health and rehabilitation, the opportunities now are breathtaking.”

During the anniversary celebrations, the Institute unveiled its scientific vision for the next decade, mapping out specific goals by category. “We are entering a new and promising era in biomedical research,” noted Guttmacher. “In the next decade, we must be ambitious and choose research questions not because they are the easiest to answer, but because they are the most important.”

Advancing child health science globally

Key advances relevant to global health supported by the National Institute of Child Health and Human Development (NICHD) include:

- Improving management of pregnancy problems such as hemorrhaging, diabetes, preeclampsia and preterm labor
- Discovering better interventions—such as resuscitation methods, intravenous fluids and special nutrition—that improve newborn survival
- Developing infant screening for nearly 30 diseases
- Expanding the types of vaccines available to protect children from debilitating or fatal infections
- Determining and promoting the safest sleeping positions for babies
- Producing more effective contraceptives

For a more extensive list, visit: <http://bit.ly/V9VGW8>

Network discovers ways to save mothers, babies

So much can go wrong during and soon after birth, especially in the developing world where many women lack access to medical care. Neonates struggle to breathe, mothers hemorrhage and infants fail to thrive.

Since 2001, the Global Network for Women's and Children's Health Research has spearheaded studies to find economical, sustainable interventions that save the lives of women and children in low-resource settings. Begun as a public-private partnership between the National Institute of Child Health and Human Development (NICHD) and the Bill & Melinda Gates Foundation, its mission is to expand scientific knowledge, develop research infrastructures and improve health outcomes. This unique collaboration comprises seven developing country research sites and a data coordinating center, with NICHD providing scientific oversight.

Support for the network has expanded to include other NIH components, including Fogarty, the National Institute of Dental and Craniofacial Research, National Center for Complementary and Alternative Medicine, National Cancer Institute and National Institute of Mental Health.

Studies focus on several high-need areas, such as preventing life-threatening obstetric complications,

modifying childbirth practices, improving infant birth weight and nutrition, and reducing prematurity. Scientists from developing countries, together with peers in the U.S., lead teams that identify population needs and conduct randomized clinical trials and implementation research. A number of the network's discoveries have led to significant improvements in maternal and child health.

Preventing postpartum hemorrhage

The leading cause of death among women during childbirth in the developing world is postpartum hemorrhage. The network conducted a trial of a cheap, safe drug called misoprostol among women giving birth in India. Results showed the drug significantly reduced hemorrhaging. Misoprostol is now used widely in low-resource settings, saving the lives of countless new mothers.

Helping babies breathe

Birth asphyxia is responsible for more than one-quarter of all neonatal deaths. The network supported development and testing of a training program to teach birth attendants how to resuscitate and care for asphyxiated newborns. Results demonstrated that one in every six neonatal deaths can be averted with this essential newborn care. The training has since been widely adopted.

Research discoveries protect babies from HIV

The last thing a mother wants to give her new baby is the HIV virus, but it was a frequent occurrence in the developing world until scientists discovered how to intervene. Babies are vulnerable to contagion throughout pregnancy, labor, delivery and breastfeeding, but today there are proven strategies to protect them.

HIV/AIDS research has been a major area of interest at the National Institute of Child Health and Human Development (NICHD) since the epidemic began in the 1980s. This sustained effort has contributed to many significant successes. For example, a seminal NICHD clinical trial in which HIV-positive mothers received an antiretroviral drug in pregnancy showed a two-thirds reduction in HIV infection passed on to the babies.

Since then, NICHD has conducted and supported numerous successful studies to identify and optimize strategies that block mother-to-child transmission, overseen by its Maternal and Pediatric Infectious Disease Branch. These include performing Cesarean deliveries and treating infected mothers or infants with antiretroviral drugs during breastfeeding, since the virus survives in breast milk. New drugs and regimens have helped bring the transmission rate down further, for instance to 1 or 2 percent in the U.S. and under 10 percent in Africa.

Photo by Virginia Lamprecht/PhotoShare



The National Institute of Child Health and Human Development has contributed to almost all major advances in children's health over the last 50 years.

As HIV research has become increasingly global in nature, research questions have emerged regarding HIV-associated coinfections, such as TB, hepatitis and malaria. The NICHD has responded by promoting and funding new research on these infectious pathogens, as well as investigations of vaccines to prevent HIV and other high-priority infectious diseases in children, adolescents and pregnant women.

RESOURCES

NICHD's 50th Anniversary: <http://bit.ly/50thCHD>
 NICHD's Scientific Vision: <http://bit.ly/XxCcNn>
 NICHD website: <http://bit.ly/NICHDGlobalNetwork>
 NICHD AIDS website: <http://1.usa.gov/XkUq8z>

PROFILE

Fogarty Fellow investigates the smallest hearts in Malawi

When the baby girl showed up in the Malawian clinic, she was limp and on the fast road to an early death. Fogarty Fellow Dr. Amy E. Sims examined her, gave a diagnosis and recommended urgent surgical repair to increase blood flow to her lungs. Without any cardiac surgeons in-country, Malawi's health ministry funded the youngster's travel to India for the procedure. A year later, the child—aptly named Miracle—bounced into the clinic and began playing a thumbs-up game with anyone who'd join in, now on the path to normal life expectancy.

Amy E. Sims, M.D.

Fogarty Fellow:	2011-2013
Local organization:	UNC Project, Lilongwe, Malawi
U.S. organization:	Children's National Medical Center
Research focus:	pediatric cardiomyopathy
Program website:	http://1.usa.gov/STgSpz

Sims, in her second year as a Fogarty Fellow in pediatric cardiology, sees many mini-sized patients with heart conditions, both in the clinic and as participants in her fellowship research project on cardiac dysfunction in HIV-positive children.

Fogarty's Global Health Program for Fellows and Scholars offers postdoctoral and doctoral students the opportunity to spend a year collaborating with a mentor at an established research site in a developing country. The experience is intended to encourage early-career scientists to pursue global health research, provide a training resource to the host institutions and nurture international research partnerships.

Sims says the experience has cemented her plans. "It really reassured me that what I want to do with my life could be possible, to be involved in global health clinical care and research. In medical school, we're somewhat put on a path and we're expected to go straight to the next step in a linear fashion. The fellowship has opened

Courtesy of Dr. Amy Sims



Fogarty Fellow Dr. Amy Sims is studying cardiac dysfunction in HIV-positive children in Malawi.

my eyes to the benefit of integrating research into my lifelong medical career."

Sims chose Malawi for her fellowship, having worked there previously for the Baylor Pediatric AIDS Corp. "That exposure really stuck with me," she said. "You see a lot of things that are just not fair, people not having access to health care and clean water. It's a little overwhelming; you want to do something but don't really know how."

Sims found a way, though, specializing in pediatric cardiology then obtaining a Fogarty fellowship to investigate a health problem important in Malawi. Her study involved 240 children with HIV and 95 controls. She investigated signs of heart function decline using new technology and evaluated exercise tolerance in a six-minute walk test. Sims will present her findings at an international cardiology conference then submit them for publication.

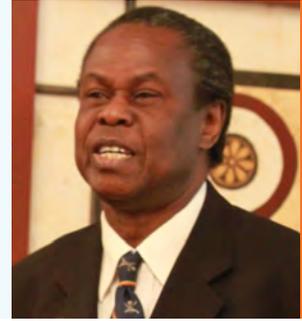
Sims says during her fellowship she learned techniques on how to shape an idea into a feasible research project, along with more tangible skills in data collection and analysis, writing and manuscript polishing.

"I have also started to think critically about health problems in Malawi and have begun to develop research questions that I would not have thought about before my fellowship," such as rheumatic heart disease, which devastates many Malawian children, she noted.

Working with mentors in both the U.S. and Malawi has keyed her into networks that she expects will foster collaborations throughout her career. Although her primary mentor in Malawi is an adult infectious diseases doctor, "she gave really great insight in terms of research. I've learned to ask the right questions to the right people and integrate what they have to offer."

Part of her interaction involves teaching. "I've been able to expose medical students to different cardiac diseases in children. Hopefully, I've inspired some of them to pursue pediatric cardiology," she said, which would offer babies such as Miracle easier access to the medical help they need.

Dr. Francis G. Omaswa is a principal investigator for the Medical Education Partnership Initiative (MEPI) Coordinating Center and directs the participating institution, the African Center for Global Health and Social Transformation (ACHEST), a think tank promoted by a network of African and international leaders in health and development. Previously, Omaswa was founding director of the Global Health Workforce Alliance and director general for Health Services in Uganda's Ministry of Health.



What's your vision for the Medical Education Partnership Initiative (MEPI)?

A successful MEPI will lead to a big shift in paradigm inside each of the countries where the grantee schools are located, linking medical education and better health outcomes of the population. Grantee countries will continue getting together various stakeholders in their countries to create and implement health workforce plans. These plans will be linked to national development plans, addressing inequalities in the different segments of the population and achieving better health outcomes.

Why is this effort so important right now?

The timing is great. According to the World Bank, eight of the world's 10 fastest growing economies are in Africa. There is more social and political stability. There are still wars, but compared with 20 years ago when we had military dictators as the norm, it is different. There is a stronger civil society movement for social justice, globally and also in our countries. In many of the elections, the health agenda of candidates is important; they get asked about health and they do make promises. The next move is to hold them accountable to those promises. So Africa is positive right now and it's a great environment in which MEPI can play a vital role.

What catalyst has MEPI provided?

When we go to visit the grantee schools, [officials there] comment that the grant has breathed new life into their school. Although the funding amount is not huge, they became committed in writing their grant applications, reflecting on what they would do with support, how they could increase their capacity to train, engage in locally relevant research, retain graduates and look at sustainability. We need to engage with African advocacy groups, civil society advocacy groups, because they are really now quite significant. Every country has a couple. Recently in Uganda, they persuaded parliament not to pass the budget until the government had put more money to

recruit rural health workers. The government increased the budget and also offered to pitch the salaries of doctors in rural areas—where most of the people are—higher than for the doctors who work in town. Civil society did that. So if we persist with these communications, engage at high levels the involvement of civil society and of professional associations, the objective of better motivated health workers will become a reality.

What's the role of research and research training in MEPI?

One of the historical weaknesses of African health systems' performance is incorporating research evidence into policies. So it was very important to put that as a key goal of MEPI. Until we get into the habit of using research as the foundation of our policies and as a way to improve our performance, then our resources will be poorly applied and we will not be getting the right results.

What are you most proud of so far?

What lifts my own spirits is going to the schools and hearing their leaders, vice chancellors, deans, tell me that because of MEPI they have been able to do what was not possible before, for example, more connectivity with the Internet, students using the library and laptops more, setting up research support centers and recruiting new faculty. Before MEPI, it was not happening. It was just frustration and saying 'I wish, I wish I could.' Now it's 'Yes I can!'

What would you like to see in 10, 20 years?

The priorities are more doctors, better doctors who are staying in the countries, particularly where the communities are, doctors who understand the potential of research and are using research evidence in their routine work. It's a priority for governments and populations to absorb and own the message of MEPI. We also need international linkages so we are not an island; we are in one world, in tandem with our partners.

FOCUS

Water poses complex issues for global health scientists



Photo by Scott Harrison/PhotoShare

Others are investigating how deforestation is affecting populations of malarial mosquitoes and the spread of disease, studying how to prevent mining from polluting groundwater and finding ways to treat people with arsenic poisoning from contaminated water.

Fogarty grants are also cultivating multidisciplinary, innovative approaches to water health issues, including developing expertise in topics that range from engineering, to chemistry, to forestry. An award to the University of North Carolina is helping to build an overarching system for managing water and sanitation research that is intended to spur policy change.

Across NIH, grants have been awarded to scientists studying how to eliminate intestinal worms spread through water, as well as insect-borne diseases such as dengue and river blindness, that flourish during rainy seasons. Additional projects study ways to prevent and treat cholera and other diarrheal diseases.

Meanwhile, a team of Fogarty's in-house epidemiologists are collaborating with Pakistan's Aga Khan University, to investigate the interplay between water and sanitation conditions with diarrheal and other diseases among children, in addition to training local scientists and health care workers.

Although some water-related health issues can be solved merely by finding a way to supply clean drinking water, others are more complex and pose thorny research questions that remain to be answered.

Water is essential to human life. Yet in many parts of the world it carries deadly toxins, parasites or bacteria that cause disease.

Water also plays a vital role in the environment, socio-economic development and poverty reduction. For these reasons, 2013 has been named International Year of Water Cooperation, to raise awareness of the issues surrounding water and encourage increased global collaboration to solve them. In many regions, clean water is becoming increasingly scarce due to population growth, urbanization, pollution and climate change.

Fogarty's crosscutting programs are combating these problems in a number of ways. Some grantees are tracking the impact of rising temperatures on waterborne pathogens, devising economical field tests to detect chemical contamination from farming and helping develop new tools to purify drinking water.



Did you know ?

- 783 million people still rely on unimproved drinking water sources
- 2.5 billion people still lack access to improved sanitation facilities
- 1.1 billion people practice open defecation

WHO data from 2010

Articles in this section are by Cathy Kristiansen

RESOURCES

UN water website: <http://bit.ly/UNWater2013>
WHO water website: <http://bit.ly/VV0p2o>

Clay water filters reduce diarrhea in South Africa

With a simple clay water filter, researchers hope to prevent diarrheal diseases in children, HIV-positive adults and others in the remote Limpopo area of South Africa. The filters, made for household water containers by a local women's cooperative, are intended to remove or kill most pathogens that cause diarrhea, the region's second biggest killer after HIV/AIDS.

The water filter plan is part of an extensive collaboration on global health research facilitated by Fogarty Framework grants since 2005, between the University of Virginia (UVA) and the Limpopo-based University of Venda (Univen), a former black homeland university. The Framework program, now in its third iteration, brings together scientists from different disciplines to develop innovative solutions for complex health problems in disadvantaged populations. Overseas fellows visit the U.S. to further their training and U.S. researchers visit the developing country, where both groups gain practical experience in global health research. The universities and faculty benefit from the increased capacity, as well as teaching and research opportunities.



"This water filter project is a prime example of how a multidisciplinary focus on an important health concern can be so synergistic in the context of the community, the university there and the university here," said UVA's Dr. Richard L.

Guerrant, principal investigator. Guerrant is also engaged in an NIH effort funded by the Bill & Melinda Gates Foundation to study linkages in Limpopo between diarrheal diseases, malnutrition and cognitive development.

The water filter venture, although relatively small, is complex. To arrive at the point where villagers consistently filter their drinking water requires much more than handing over ready-made gadgets with instructions. At the outset, researchers consulted the community about their needs, tested the water quality, selected an appropriate filter, assessed its acceptability and effectiveness, and planned how to produce it locally in a sustainable way.

The endeavor required expertise in numerous fields aside from public health, said UVA researcher Dr. Rebecca Dillingham. She led the project with Dr. James Smith, UVA professor of civil engineering, who previously tested ceramic filters in Guatemala. The team needed microbiologists, for

Photos by Dr. James Smith



U.S. and South African researchers are collaborating on a clay water filter project to reduce diarrheal diseases, the second biggest killer in this rural area.

instance, to assess how well the filter's silver nanoparticles kill pathogens; engineers to optimize the filter composition and design; anthropologists to integrate the community's perspective; and architects to design a site plan for the factory. The team also consulted potters with filter experience to give technical help, landscape architects to select fast-growing trees for kiln firewood, and business experts to determine a viable filter price and sales outlets. Univen and UVA students collaborated on each aspect of the project.

Over the past decades, UVA has hosted Univen trainees who have advanced their studies in disciplines ranging from molecular diagnostics to genetic epidemiology to clinical trial design, and who have built their skills in scientific writing, responsible conduct of research and other related topics. The trainees returned home to help Univen develop as a center of excellence for clinical and genetic epidemiology studies. In addition, the involvement of UVA researchers and students in field studies with South African scientists generates valuable experience and builds ties that will facilitate sustained, productive research partnerships.

By locally producing the filters, which last about two years, the project will generate work and income in this area of high unemployment. Once in use, the team plans to monitor the filters' impact on diarrheal rates. Further projects could blossom out of this success, Guerrant said. "The water project promises to show us a model for ways that we can learn in collaboration with brilliant colleagues in an endemic area with a huge set of health problems."

RESOURCES

UVA Limpopo website: <http://bit.ly/UVA44yy>

Univen website: www.univen.ac.za

Filter factory website: www.puremadi.org/PureMadi

Searching for causes of Buruli ulcers in Ghana

Buruli ulcers scar, maim and bring misery to thousands of victims each year, but the culprit mycobacterium remains frustratingly difficult to understand. With Fogarty support, scientists have made inroads into understanding this clandestine disease, which crops up near swamps, wetlands, rivers and lakes, and seems tied to human-produced changes to the aquatic environment. The infection occurs mainly in rural parts of sub-Saharan Africa and takes its name from Uganda's Buruli County, where the disease was prevalent in the 1960s.

"They call it the mysterious disease because nobody knows how it's transmitted," said Fogarty grantee Dr. Richard W. Merritt, of Michigan State University. "If you ask, what do you think causes it, you get a variety of answers. It's a tough one."

Nonetheless, since 2001, Merritt has used his Fogarty Ecology and Evolution of Infectious Diseases grants and other funding to investigate this strange ailment where it is most common, in Ghana. The country records about a thousand new cases annually, mostly in children. Without

Courtesy of Dr. Richard Merritt



Buruli ulcers create devastating sores that can result in amputation.

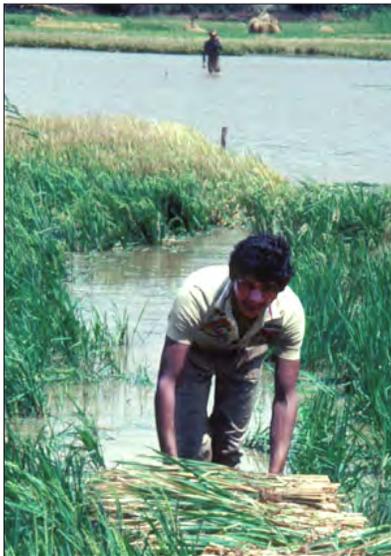
antibiotic treatment, patients develop extensive ulcers on their limbs and can eventually face amputation.

Pinning it down is difficult for several reasons. "The pathogen is outcompeted by so many other bacteria," Merritt said. "It's very slow growing and requires low oxygen, so it's not easy to culture in the lab."

Although Merritt and his team confirmed the pathogen lurks in the biofilm floating on water and in detritus at the bottom, they're still investigating how humans become infected. "My thought is it may be present in the environment," Merritt said. "And maybe when the right nutrients are prolific enough—for instance nitrates and/or phosphates from farming—they cause it to multiply to a certain critical level, then it may be transmissible."

Uruguay herbicide test spurs regional interest

Photo by Yoşef Hadar/Wooid Bank



Researchers in Uruguay devised a simple test to measure herbicide levels in water.

What started as an initiative to protect Uruguayan drinking water from an herbicide commonly used by rice farmers has blossomed into an international network of budding researchers focused on solving water problems in Latin America. With Fogarty support, researchers and trainees are teaching others how to develop and use molecular-based tests to measure water purity.

The project began in 2001, when Dr. Jerold A. Last of the University of California (UC), Davis, received his first International Training and Research in Environmental and Occupational Health grant. This Fogarty program aims to nurture trainees from a variety of disciplines to help developing countries and emerging democracies develop capacity in both environmental and occupational health.

Last's group wanted to find a low-cost way to detect the

herbicide clomazone in water. Uruguayan farmers use clomazone extensively to kill weeds and raise crop yields, but at harvest time when they need to drain their watery fields, residue chemicals can end up in the groundwater and community drinking water, posing a risk to human and environmental health. Clomazone can cause liver disease in animals, and potentially humans, and disrupt fish reproductive hormones.

To devise and test a tool farmers could use to measure clomazone concentrations, UC Davis collaborated with Uruguay's Universidad de la República to teach students skills in molecular techniques, laboratory work and epidemiology. The initiative focused on adapting so-called ELISA technology—enzyme-linked immunosorbent assays—to measure clomazone concentrations. ELISA tests are rapid and cost-effective. Efforts in Uruguay were just the beginning. The scientists reached out to their colleagues elsewhere in Latin America to present workshops, host trainees and offer online curricula.

"Experts in Uruguay have adapted a short course held in Guatemala, Peru, Chile, Paraguay and Brazil and essentially not only exported the technology, but made assay kits and gave them away, so those other countries could be self-sufficient in doing tests for a large variety of environmentally relevant chemicals," Last said. "Countries in that part of the world are not used to collaborating across borders, but we are beginning to see this change."

Identifying leptospirosis and saving patients

A tangle of factors, from floods and farming to animal urine and contaminated water, help spread the *Leptospira* bacterium to humans, especially in tropical areas but also in the U.S. and elsewhere. It is hard to diagnose, being confused in endemic areas with influenza, dengue fever or a viral hemorrhaging disease, and in some places kills more people than dengue and malaria combined.

To increase understanding and awareness of leptospirosis, Dr. Joseph Vinetz, of the University of California, San Diego (UCSD), launched a collaboration in 2004 between his university and Universidad Peruana Cayetano Heredia in Lima, to conduct research in the Amazon area of Peru. “We were able to start a laboratory, get field sites and start training lab technicians, biologists, nurses and ecology students. We took the field from literally zero to 100 over the last decade,” Vinetz said.

Vinetz, who jokes he is known as “Lepto Joe” for devoting his career to leptospirosis research, was supported by an Ecology and Evolution of Infectious Diseases grant, designed by Fogarty and the National Science Foundation to deepen understanding about how human-induced environmental changes spur the emergence and transmission of infectious diseases. He also received Fogarty funding for the related training of students at Cayetano University with a Global Infectious Disease research training grant and some support from the National Institute of Environmental Health Sciences.

The grants were critical to jump-starting recognition of the disease in Peru, where it is endemic and is spread primarily by rat urine. In some areas, nearly 30 percent of villagers have the bacteria in their blood during the wettest season and researchers estimate 1 to 2 percent of them die. The initiative, which includes both Peruvian and U.S. investigators, has generated expertise, data and published papers that have widened recognition of the difficult-to-diagnose disease and resulted in quicker treatment with simple but lifesaving antibiotics, Vinetz said.

“A huge part of the project was research capacity building,” he noted, citing expertise in infectious disease epidemiology, mammalian ecology, public health, medical microbiology and molecular epidemiology, among other specialties. Some of the biologists and lab technicians now work in the Ministry of Health and one trainee, Dr. Jessica Ricaldi, of Cayetano University, is building up her own laboratory in Lima that includes a veterinary student and other trainees, Vinetz noted.

www.fic.nih.gov

Courtesy of Dr. Joseph Vinetz



Fogarty-supported researchers are studying the potentially lethal disease leptospirosis, increasingly common in tropical regions like the Amazon but also occasionally found in the U.S. and Europe.

Leptospirosis, an emerging pathogen, thrives in tropical and subtropical areas, but has also shown up in wild boars in Berlin, Germany, and rats in Baltimore, Md., in the U.S. It spreads more readily after floods, which increase standing surface water, and after droughts when humans and animals both frequent places where water is available. Humans pick up the pathogen after infected wild and domesticated animals urinate in water or soil, so high-risk groups include rice farmers, sewage workers, veterinarians and anyone walking barefoot.

“*Leptospira* don’t just contaminate the environment, they have evolved to be part of the environment. That’s a new area of research,” Vinetz said. “There are literally hundreds of different varieties of *leptospira* that seem to be host-adaptive to various animals. Now we are working on how the environment, the wet soils and water actually select for diverse *leptospira* and increase the bacteria’s virulence.”

The research infrastructure and expertise established in Peru with Fogarty support has opened the door to other funding, including a biodefense grant from the NIH’s National Institute of Allergy and Infectious Diseases to investigate the bacterial disease buccellosis. Meanwhile, researchers in Peru forge ahead gathering evidence. “It provides data about disease risk,” Vinetz said. “Without data, public health authorities will take no action.”

RESOURCES

Dr Vinetz UCSD website: <http://bit.ly/lepto4Q>

Confronting the shifting disease burden



While it's gratifying to note a concerted global effort has dramatically reduced child mortality since 1990, there is growing evidence we're unprepared for the rising tide of chronic illnesses sweeping much of the world. The findings of the landmark Global Burden of Disease Study 2010 should serve as a wake-up call for us all.

Life expectancy has risen considerably over the past few decades. Although many people are living longer, they are suffering more from disabilities, injuries or chronic illnesses that reduce their quality of life and rob them of what should be productive years.

Cancers, heart disease, diabetes and disability-causing conditions are escalating and already account for more than half of all premature deaths in some countries. Incidences of chronic, noncommunicable diseases (NCDs) will continue to expand exponentially unless we take drastic steps.

The study's findings are particularly valuable and timely for us at Fogarty as we finalize a new strategic plan that will guide us for the next five years. We've already begun efforts to build much-needed chronic disease capacity in low- and middle-income countries, creating programs devoted to NCD research training and sending young fellows with a broad range of nontraditional specialties to share their skills and knowledge with their African peers. Through the Medical Education Partnership Initiative, the NIH is also helping Africans develop capacity in heart disease, HIV-associated cancer and surgery.

I find it particularly troubling that the HIV/AIDS disease burden continues to escalate—despite our best efforts—climbing to sixth place, up from 24th in 1990. Malaria and tuberculosis also remain firmly entrenched near the top of the list. Clearly, we must redouble our efforts toward the unfinished infectious disease agenda that continues to ravage much of the developing world.

Smoking is ranked as the second greatest risk factor for disease. Through our tobacco program, we are helping developing countries quantify the horrific costs of this addiction and find effective ways of lowering usage, but clearly we must do more. Household air pollution also

poses a major health risk and we're pleased to participate in the Global Alliance for Clean Cookstoves, aimed at reducing this blight that annually kills as many as 4 million people, largely women and children.

With tight global budgets for health and research spending, it is critical we determine how to most effectively deploy our limited resources. We could all benefit from more health economists to help guide our conversations and discover ways to increase efficiencies and improve outcomes.

While this report is illuminating, it would be even more useful if country health ministries could improve data collection and reporting to give us a more accurate picture.

I'm encouraged that the study's authors hope to make this an ongoing effort, updated online as new information becomes available, with open access for all. This study is an essential tool as we consider the research agenda required to tackle the remaining global health challenges.



RESOURCE

GBD 2010 website: <http://bit.ly/XgnhwD>



Goosby heads global health diplomacy office

Ambassador Eric Goosby has been chosen to lead the new Office of Global Health Diplomacy, the State Department announced. He will remain U.S. Global AIDS Coordinator and head of the President's Emergency Plan for AIDS Relief program.



Daulaire becomes assistant secretary

The Department of Health and Human Services has promoted U.S. Director for Global Affairs Dr. Nils Daulaire to Assistant Secretary for Global Affairs. He will continue to represent the U.S. on the WHO's Executive Board.



Nakamura named NIH's Center for Review head

Dr. Richard Nakamura has been named director of the NIH's Center for Scientific Review, after serving as acting director since September 2011. He arrived at NIH in 1976, as a postdoctoral fellow at the National Institute of Mental Health.



Former Fogarty trainee Sinkala dies

Zambian researcher Dr. Moses Sinkala died suddenly while on vacation in Thailand. One of the first graduates of Fogarty's AIDS International Training and Research Program, he founded the Center for Infectious Disease Research in Zambia and served in the country's health ministry.



Plowe honored by American College of Physicians

Fogarty grantee Dr. Christopher V. Plowe has received the 2013 American College of Physicians Award for Outstanding Work in Science as Related to Medicine. He leads the University of Maryland's malaria group and also helps develop vaccines.



Stein receives South African medical award

Fogarty grantee Dr. Dan J. Stein, of the University of Cape Town, has won the 2012 Fellowship of the Art and Science of Medicine Award, bestowed by the South African Medical Association. Stein is recognized for his work in mental health and neuroimaging.



Espinal is honored for TB work

For his achievements in combating tuberculosis globally, former Fogarty trainee Dr. Marcos Espinal has received Japan's 2012 Princess Chichibu Global TB Memorial Award. Espinal manages health surveillance and disease prevention and control at the Pan American Health Organization.

WHO updates World Malaria Report

Millions of people still lack access to malaria prevention tools, diagnostic tests or valid treatment, due to insufficient funding, according to the WHO's 2012 World Malaria Report.

Full report: <http://bit.ly/U8BXgv>

Nonprofit launches malaria website

The international nonprofit, PATH, has launched a website, "Making Malaria History," to give up-to-date information on malaria research and news, as well as data and resources for advocates.

Website: <http://bit.ly/XvLtYy>

Report links climate and health

The WHO and World Meteorological Organization's new "Atlas of Health and Climate 2012" report describes how climate variability can bring epidemics of malaria, dengue fever and diarrhea.

Full report: <http://bit.ly/G3atlas>

South-South collaborations bring success

The recently published book, "South-South Collaborations in Health Biotechnology: Growing Partnerships Amongst Developing Countries," cites large-scale research to show how such collaborations improve health care. The study was published by the International Development Research Centre.

Book: <http://bit.ly/242vQgD>

Report discusses integrity in research

A policy report, "Responsible Conduct in the Global Research Enterprise," produced by an international panel of experts, discusses how to maintain integrity in research projects.

Full report: <http://bit.ly/VXbTWy>

World RePORT online map lists funders

The NIH has launched a new online map that shows research funding by a number of government agencies and philanthropic groups. It was developed in partnership with the Heads of International Research Organizations.

Website: <http://worldreport.nih.gov>

More public-private partnerships needed

More public-private partnerships would benefit global health research, according to a U.S. Institute of Medicine paper, "Strengthening Mechanisms to Prioritize, Coordinate, Finance and Execute R&D."

Full paper: <http://bit.ly/9D3RandD>

Funding Opportunities

Funding Opportunity Announcement	Details	Deadline
Brain Disorders in the Developing World (R01) - AIDS (R21) - AIDS	http://1.usa.gov/L6UUfk http://1.usa.gov/JjpxKs	April 11, 2013
Chronic, Non-Communicable Diseases and Disorders Across the Lifespan Training Award (D43) Planning Award (D71)	http://1.usa.gov/Hj3YfL http://1.usa.gov/GW4LyT	April 17, 2013
Global Health Research and Research Training eCapacity Initiative (R25)	http://1.usa.gov/VQxkFW	May 15, 2013
Global Infectious Disease Research Training Program Training Award (D43) Planning Award (D71)	http://1.usa.gov/H0U3Gq http://1.usa.gov/GZ22uc	May 21, 2013
International Research Ethics Education and Curriculum Development Award (R25)	http://bit.ly/EXmay22	May 22, 2013
Fogarty HIV Research Training Program International Training Grant (D43) Extramural Associate Research Development Award (G11) Planning Grant (D71)	http://bit.ly/Combo724	July 24, 2013

For more information, visit www.fic.nih.gov/funding

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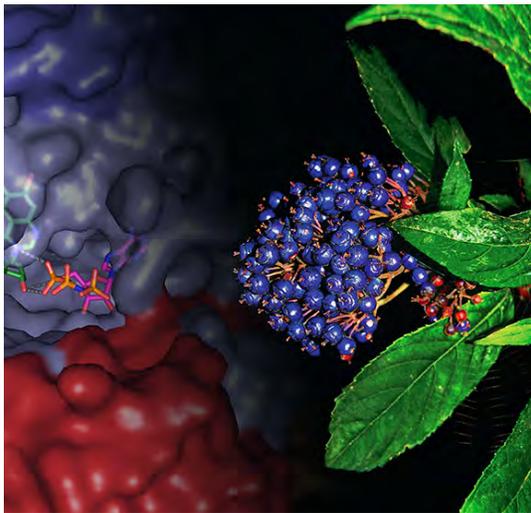


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Mysterious Chinese herb holds promise for malaria, cancer

Photo by Paul Schimmel/The Scripps Research Institute



Scientists have recently discovered exactly how a traditional Chinese herbal medicine works against malaria. The Chang Shan herb—which has been used for thousands of years—contains a compound that binds to an enzyme in the malaria parasite, blocking it from producing a protein needed for survival.

Dr. Paul R. Schimmel and his team at The Scripps Research Institute

conducted a series of molecular studies, revealing how the compound jams the process of aminoacylation, a crucial biological process that allows organisms to synthesize the proteins they require to live.

The findings, reported in a recent issue of the journal *Nature*, may drive the development of further drugs to treat malaria and compounds to combat other conditions, such as autoimmune disorders and melanoma, the authors suggest.

The study was supported by the NIH's National Institute of General Medical Sciences and by a fellowship from the National Foundation for Cancer Research.

RESOURCE

Paper: <http://bit.ly/herbCS>