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Grand Challenges
in Global Health

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June 27, 2005

Grand Challenges in Global Health Initiative Selects 43 Groundbreaking Research Projects for More Than \$436 Million in Funding

Scientists around the world to discover new ways to fight disease in poorest countries

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SEATTLE -- The Grand Challenges in Global Health initiative, a major effort to achieve scientific breakthroughs against diseases that kill millions of people each year in the world's poorest countries, today offered 43 grants totaling \$436.6 million for a broad range of innovative research projects involving scientists in 33 countries. The ultimate goal of the initiative is to create "deliverable technologies" – health tools that are not only effective, but also inexpensive to produce, easy to distribute, and simple to use in developing countries.

The initiative is supported by a \$450 million commitment from the Bill & Melinda Gates Foundation, as well as two new funding commitments: \$27.1 million from the Wellcome Trust, and \$4.5 million from the Canadian Institutes of Health Research (CIHR). The initiative is managed by global health experts at the Foundation for the National Institutes of Health (FNIH), the Gates Foundation, the Wellcome Trust, and CIHR. Additional proposed Grand Challenges projects are under review and may be awarded grants later this year.

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The Grand Challenges initiative was launched by the Gates Foundation in 2003, in partnership with the National Institutes of Health, with a \$200 million grant to the FNIH to help apply innovation in science and technology to the greatest health problems of the developing world. Of the billions spent each year on research into life-saving medicines, only a small fraction is focused on discovering and developing new tools to fight the diseases that cause millions of deaths each year in developing countries.

"It's shocking how little research is directed toward the diseases of the world's poorest countries," said Bill Gates, co-founder of the Bill & Melinda Gates Foundation. "By harnessing the world's capacity for scientific innovation, I believe we can transform health in the developing world and save millions of lives."

Each of the 43 projects seeks to tackle one of 14 major scientific challenges that, if solved, could lead to important advances in preventing, treating, and curing diseases of the developing world. The 14 Grand Challenges, which were identified from among more than 1,000 suggestions from scientists and health experts around the world, address the following goals:

- *Developing improved childhood vaccines* that do not require refrigeration, needles, or multiple doses, in order to improve immunization rates in developing countries, where each year 27 million children do not receive basic immunizations
- *Studying the immune system to guide the development of new vaccines*, including vaccines to prevent malaria, tuberculosis, and HIV, which together kill more than 5 million people each year
- *Developing new ways of preventing insects from transmitting diseases* such as malaria, which infects 350-500 million people every year
- *Growing more nutritious staple crops to combat malnutrition*, which affects more than 2 billion people worldwide
- *Discovering ways to prevent drug resistance* because many drugs that were once successful at treating diseases like malaria are losing their effectiveness
- *Discovering methods to treat latent and chronic infections* such as tuberculosis, which nearly a third of the world's population harbors in their bodies
- *More accurately diagnosing and tracking disease* in poor countries that do not have sophisticated

laboratories or reliable medical recordkeeping systems

Following the publication of the Grand Challenges in October 2003, more than 1,500 research projects were proposed by scientists in 75 countries.

"We were overwhelmed by the scientific community's response to the Grand Challenges. Clearly, there's tremendous untapped potential among the world's scientists to address diseases of the developing world," said Nobel laureate Dr. Harold Varmus, chair of the international scientific board that guides the Grand Challenges initiative. Dr. Varmus is president of Memorial Sloan-Kettering Cancer Center, and former director of the National Institutes of Health.

"Science has revolutionized health in wealthy countries, while developing countries have been left to fight disease with only a handful of tools that are either grossly inadequate or far too expensive for widespread use," said Dr. Nirmal Kumar Ganguly, a member of the Grand Challenges scientific board and director-general of the Indian Council for Medical Research. "The Grand Challenges initiative has provided the resources needed to bring together top scientists in both developed and developing countries to help address this imbalance."

Research projects tackle wide range of developing world health challenges

The 43 Grand Challenges projects will support cutting-edge research managed by teams of scientists working in partnership across disciplines, with researchers from the developing world and private industry as integral partners in many projects. Many of the initiatives include leaders from fields such as chemistry, engineering, statistics, and business, who have never before focused on global health. While many of the Grand Challenges projects seek to improve on existing technologies, others attempt to develop entirely new approaches. Examples of the 43 projects include (see accompanying backgrounder for descriptions of all projects):

- *Heat-stable vaccines:* Many life-saving children's vaccines must be constantly refrigerated to remain effective, making delivery to areas without electricity very difficult. Several Grand Challenges projects will develop low-cost technologies for formulating vaccines that do not require refrigeration. One research team will encase vaccines in harmless bacteria that have

natural temperature-regulating abilities. Vaccines prepared this way could be distributed in ready-to-use packets, mixed with water, and easily consumed. (Lead investigator: Dr. Abraham Sonenshein, Tufts University School of Medicine, U.S.)

- *Single-dose vaccines:* Most vaccines must be given over weeks or months – a serious obstacle for families who must travel long distances to the nearest health clinic. This project will develop a single-dose version of the vaccine for whooping cough (pertussis), a respiratory disease that causes an estimated 200,000 to 400,000 deaths each year, most during early infancy. The vaccine will be delivered via the mucosal lining of the nose or mouth, stimulating immunity at the surfaces where the whooping cough bacteria usually enters the body. The researchers anticipate that this novel vaccine formulation could also be used for vaccines against other neonatal diseases. (Lead investigator: Dr. Lorne Babiuk, University of Saskatchewan, Canada)
- *Mosquito control to prevent dengue:* The dengue virus infects up to 100 million people each year, and can cause severe fever, hemorrhaging, and death. Controlling the mosquitoes that transmit the disease is increasingly difficult, in part because many insecticides are no longer effective. This project will employ an innovative strategy for controlling mosquitoes that does not depend on insecticides: researchers will introduce a bacterial parasite that occurs naturally in other insects into mosquitoes so that it causes them to die before they are old enough to transmit the virus. Mosquitoes would “inherit” the parasite and pass it from generation to generation. (Lead investigator: Dr. Scott O’Neill, University of Queensland, Australia)
- *More nutritious staple crops:* Poor nutrition contributes to half of the almost 11 million deaths among children under 5 each year. This project will develop a more nutritious strain of cassava, a root that is the staple food for more than 250 million people in Africa, but contains little nutrition and can be toxic if not prepared properly due to low levels of naturally occurring cyanide. In addition to increasing the levels of key micronutrients in cassava, researchers will modify the plant to eliminate naturally occurring cyanide and to allow it to be stored for longer periods of time. (Lead investigator: Dr. Richard Sayre, Ohio State University, U.S.)
- *New HIV vaccine strategies:* To contain the global HIV/

AIDS epidemic, it is essential to develop an HIV vaccine that stimulates an effective immune system response. This project will work to develop an HIV vaccine that stimulates immune responses in the lining of the vagina, which serves as the entry point for HIV for most women. To date, most HIV vaccine candidates have not specifically targeted entry points in the body. The research team will work with collaborators in the U.K. and South Africa to design an HIV vaccine that would be time-released into the vaginal lining through low-cost gels or silicone rings that would be inserted into the vagina. (Lead investigator: Dr. Robin Shattock, St. George's, University of London, U.K.)

- *Diagnostics for the developing world:* Many serious diseases in developing countries go undetected because the medical tests available in wealthy countries are too expensive or impractical for developing countries. This project will develop a hand-held device that contains miniaturized versions of essential diagnostics tests. Health care workers would load a patient's blood sample onto a disposable test card about the size of a credit card. The card would be inserted in the device, and in about 10 minutes results would be available from a range of tests, such as those for bacterial infections, nutritional status, and HIV-related illnesses. (Lead investigator: Dr. Paul Yager, University of Washington, U.S.)

"The Grand Challenges projects are very ambitious, and the researchers are taking important risks that others have shied away from," said Dr. Elias Zerhouni, director of the National Institutes of Health and a member of the Grand Challenges scientific board. "Many of these research projects will succeed, leading to breakthroughs with the potential to transform health in the world's poorest countries."

"Decoding the human genome and the genomes of many important pathogens of humans, such as malaria and tuberculosis, combined with advances in chemistry, have opened up countless avenues for improving health," said Dr. Mark Walport, director of the Wellcome Trust, which contributed \$27.1 million to the initiative, and a member of the Grand Challenges scientific board. "We're very pleased to support this critical initiative, and we hope other funders will see the great potential for research to improve millions of lives in the developing world."

“The Grand Challenges initiative has brought together such a broad range of researchers, including leading scientists from disciplines that have never before focused on global health,” said Dr. Alan Bernstein, president of the Canadian Institutes of Health Research, which contributed \$4.5 million to the initiative, and a member of the Grand Challenges scientific board. “We’re particularly pleased that three Canadian-based teams are part of this initiative, contributing to this worldwide effort to harness science to improve global health.”

Projects designed to be practical and accessible in developing countries

The project teams have developed global access plans to help ensure that their discoveries can lead to new vaccines, staple crops, medical procedures, and other tools that are practical for use in developing countries and accessible for those who need them most.

“Scientific advances are of little value unless they are accessible to the people who need them,” said Dr. Richard Klausner, executive director of the Global Health Program at the Gates Foundation and a member of the Grand Challenges scientific board. “Grand Challenges researchers will pursue affordable and practical health solutions that have access built in from the very start.”

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Foundation for the National Institutes of Health

The Foundation for the National Institutes of Health was established by the United States Congress to support the mission of the National Institutes of Health – improving health through scientific discovery. The Foundation identifies and develops opportunities for innovative public-private partnerships involving industry, academia, and the philanthropic community. A non-profit, 501(c)(3) corporation, the Foundation raises private-sector funds for a broad portfolio of unique programs that complement and enhance NIH priorities and activities.

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Wellcome Trust

The Wellcome Trust is an independent research funding charity established in 1936 under the will of the tropical medicine pioneer Sir Henry Wellcome. The Trust’s mission is to foster and promote research with the aim of improving human and animal health, and it currently spends over £400 million annually.

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Canadian Institutes of Health Research

The Canadian Institutes of Health Research (CIHR) is the Government of Canada's agency for health research. CIHR's mission is to create new scientific knowledge and to catalyze its translation into improved health, more effective health services and products, and a strengthened Canadian health care system. Composed of 13 Institutes, CIHR provides leadership and support to close to 10,000 health researchers and trainees across Canada.

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Bill & Melinda Gates Foundation

Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to help all people lead healthy, productive lives. In developing countries, it focuses on improving people's health and giving them the chance to lift themselves out of hunger and extreme poverty. In the United States, it seeks to ensure that all people—especially those with the fewest resources—have access to the opportunities they need to succeed in school and life. Based in Seattle, the foundation is led by CEO Patty Stonesifer and co-chair William H. Gates Sr., under the direction of Bill and Melinda Gates and Warren Buffett.

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Guided by the belief that every life has equal value, the Bill & Melinda Gates Foundation works to reduce inequities and improve lives around the world.



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