



Grand Challenges Canada™
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News Release

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Inventive: 102 Bold New Global Health Ideas Win Grand Challenges Canada Funding

*59 creative, out-of-box health innovations devised in 13 low- and middle-income countries,
plus 43 from Canada, share \$10.9 million in seed grants and a single goal:
reduce debilitating disease, save lives in developing countries*

Grand Challenges Canada, which is funded by the Government of Canada, today announced 102 new grants of \$100,000 each for bold new global health ideas. Of these, 59 grants went to innovators in 13 low- and middle-income nations worldwide to pursue bold new imaginative ideas to tackle health problems in resource-poor countries.

Grants of \$100,000 each were also announced for 43 Canadian-originated projects to be implemented in a total of 49 countries throughout the developing world.

The full global portfolio of 102 creative, out-of-the-box ideas, selected by independent peer review from 436 applications, include:

- **A cheap instant test strip to diagnose deadly diseases à la litmus paper**
- **A vaccine for smokers against nicotine's addictive effect**
- **Teaching old drugs new tricks in the fight against HIV**
- **Saving mothers and children with affordable, needle-free anemia-screening**
- **Using mobile phones to monitor maternal and child health in rural Nepal**
- **A fast track to safer pesticides via super-computer**
- **Tapping local businesses in Tanzania: Malaria drugs on wheels**
- **Reading ultrasound images of rural patients via cyberspace**

... and many others

The *Stars in Global Health* program seeks breakthrough and affordable innovations that could transform the way disease is treated in the developing world -- innovations that may benefit the health of developed world citizens as well. A total of roughly CDN \$10.9 million will support the global portfolio of projects, broken down by region and country as follows (and detailed here: <http://www.grandchallenges.ca/stars-r4-grantees-en/>):

- 40 projects based in seven **African** countries (14 in Kenya, 10 in Uganda, seven in Tanzania, three in Ethiopia, and two each in Ghana, Nigeria and Rwanda)
- 19 projects based in six countries in **Asia** (10 in India, four in Pakistan, two in Nepal, and one each in Bangladesh, Cambodia, and Vietnam)
- 43 projects based in 16 **Canadian cities** (12 in Toronto, six in Montreal, three in Saskatoon and Calgary, two in Vancouver, Ottawa, Waterloo, Sudbury, Hamilton, Victoria, and Edmonton, and one in Guelph, London, Kitchener, Winnipeg and Halifax)

The 43 Canadian-based projects will be implemented worldwide:

- 22 countries in **Africa** (Botswana, Burkina Faso, Cameroon, Democratic Republic of Congo, Ethiopia, Ghana, Kenya, Liberia, Malawi, Mozambique, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Togo, Tanzania, Uganda, Yemen, Zambia, Zimbabwe)
- 17 countries in **Asia** (Afghanistan, Bangladesh, Bhutan, Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam, Papua New Guinea)
- 8 countries in **South and Latin America** (Brazil, Guatemala, Guyana, Haiti, Honduras, Mexico, Nicaragua, Peru)
- 2 countries in the **Middle East** (Egypt and Jordan). Several projects will be implemented simultaneously in more than one country.

"Our government is focused on what matters most to Canadians -- jobs, growth and long-term prosperity," says Foreign Affairs Minister John Baird. "We are pleased to work with our like-minded partners around the world to support global innovation and entrepreneurship that help produce better, brighter futures for people around the world."

"Canada's commitment to bold ideas with big impact is captured in each of these more than 100 peer-reviewed projects," says Dr. Peter A. Singer, CEO of Grand Challenges Canada. "By matching talent with opportunity, Grand Challenges Canada is contributing to saving and improving lives."

If their ideas prove effective, the innovators will be eligible for an additional Grand Challenges Canada scale-up funding of up to \$1 million.

Today's grants will advance bold new ideas in remote diagnostics and monitoring, health protection, drug and vaccine development and accessibility, and many others.

Among highlights of grants announced today:

A cheap, instant test strip to diagnose deadly diseases à la litmus paper (Canada, Brazil, Uganda)

(project videos: <http://bit.ly/XOXa0L> and <http://bit.ly/XYebrm>)

Malaria is the tropics' most widespread infectious disease but #2 is dengue - also transmitted by mosquitos - affecting 50 to 100 million people across 110 countries every year, leading to about 500,000 annual hospitalizations and 25,000 deaths due to fever and shock. Early diagnosis significantly improves chances of survival.

DNA tests on blood samples are reliable but expensive, time-consuming and inaccessible for many -- and patients, mostly children, often resist submitting to needles.

Brazilian-born Dr. Alexandre Brolo of the University of Victoria, Canada, will lead development of a low-cost plastic strip containing gold nanoparticles that, in combination with a hand-held device, will allow for instant, bedside detection of the disease using the patient's saliva, much like a litmus paper test for alkalinity. To be tested in Brazil, the project's target cost per strip is 10 for a penny; cost of the reader, less than \$10.

A similar project in Uganda aims to develop a paper-strip test for the rare but deadly Ebola and Marburg viruses that occasionally plague Equatorial Africa. Project leader Dr. Misaki Wayengera of the Makerere University College of Health Sciences notes that the highly infectious nature of both Ebola and Marburg, poor epidemiological data on their origins, and high mortality makes both diseases major global threats. Hard to detect in early days of an outbreak in communities where quarantine criteria are poor, the diseases present a danger to all, especially health workers.

A vaccine for smokers against nicotine's addictive effect (Canada, Vietnam)

(video: <http://bit.ly/11trSf0>)

Tobacco products are the main cause of lung cancer, cardiovascular disease, and reproductive disorders, as well as nearly 6 million premature deaths annually. Treating tobacco and cigarette-related illness and disease places a huge burden on the global health-care system. Young people in developing countries constitute a disproportionate percentage of the world's more than 1 billion smokers.

Led by Hoang-Thanh Le of the Advanced Medical Research Institute of Canada, the affiliated research institute of Health Sciences North in Sudbury, Canada, researchers believe they have developed a way to reduce nicotine use and its related health effects: a vaccine administered via the nose.

The team has been working with a nicotine-derived compound administered via the nose that prevents inhaled nicotine from reaching the brain via the blood stream, thereby robbing nicotine of its potent and addictive effect. The researchers envision the technology deployed eventually against other addictions and diseases as well.

In tests to be conducted early next year in mice, and in collaboration with a Pasteur institute in Vietnam, researchers anticipate a 90% or greater reduction of blood stream nicotine reaching the brains of test animals.

Teaching old drugs new tricks in the fight against HIV (Uganda)

(video: <http://bit.ly/15vmNb6>)

Led by Dr. David Meya of Uganda's Infectious Disease Institute at Makerere University's College of Health Sciences researchers will test whether the addition of an off-patent antidepressant drug called sertraline to standard therapy will reduce the rate of early death from cryptococcal meningitis. The hope is based on sertraline's potent fungicidal effect documented in lab work.

In Africa, deaths caused by cryptococcal meningitis (CM) rivals tuberculosis. While survival rates have improved, more than 30% of patients die early -- within 10-weeks of onset.

Existing pharmaceutical and safety data already exist for sertraline, streamlining its potential new deployment against CM.

Saving mothers and children with affordable, needle-free anemia-screening (India, Canada, Egypt)

(video: <http://bit.ly/ZH9j4c> and <http://bit.ly/11rXFyk>)

Anemia -- low red blood cell counts due to childbirth and inadequate nutrition -- affects 1.6 billion people worldwide and causes more than 1 million deaths a year. Most patients are in the developing world, especially Africa and South Asia. Anemia's cures are well known, simple, inexpensive and widely available -- the problem is timely detection, regular monitoring and compliance with treatment.

In many low resource settings today, where standard \$10,000+ lab machines operated by highly-skilled technicians are days away, testing often consists of drawing blood into a test tube, mixing it with acid and distilled water and assessing its color. Needed is the empowerment of village health workers with an effective, low-cost tool.

Researchers in India, led by Dr. Myshkin Ingawale of Biosense Technologies will provide social health activists with a simple, needle-free, hand-held, battery-operated device, called "TouchHb." Attached to a finger, it can determine in 20 seconds the patient's haemoglobin, oxygen saturation and heart rate -- a simple test at the patient's doorstep involving no needles or pain.

The project's goal is to have within 18 months a model of the device ready to scale with the help of governments and NGOs.

Another project in Canada and Egypt is also focused on blood cell counts, a basic indicator of cardiovascular disease, blood disorders or infection, leukemia (~3 million cases annually), malaria (~200M cases) and tuberculosis (~9M cases).

Making fast, affordable (~10 cents per test) blood tests widely available in developing countries is the aim of a team in Toronto and Egypt led by University of Toronto Professor Yu Sun. Among project ambitions: low-cost, easy to use and disposable. Test results will be verified against commercial hematology analyzers.

Using mobile phones to monitor maternal and child health in rural Nepal

(video: <http://bit.ly/12xABPU>)

In much of South Asia, public sector health care is of low quality and hard to access, leaving many poor people at the mercy of unregulated, relatively expensive private sector providers.

Harvard researcher Duncan Maru, MD, PhD and a team of rural practitioners from an organization he created, Nyaya Health, are creating a mobile phone system for remote, rural community health workers to upload and publish data on both illness and local public health care capacity. Project partners include technology NGOs MedicMobile and HealthMap.

Being undertaken in Nepal's mountainous rural Achham district northwest of Kathmandu, the project represents the first real-time surveillance system of available care services and relates it to health outcomes (maternal and child health conditions).

Data is being collected on children under five years old suffering diarrhoea, acute respiratory tract infections, acute malnutrition, newborns and post-partum women. Also being gathered weekly is data from each public sector clinic on staffing, water and electricity supplies, and relevant medicines.

After this feasibility and validation study, the project will explore how such data can be used at national levels for more effective health programming and response to evolving health needs.

Reading ultrasound images of rural patients via cyberspace (India, Uganda)

(video: <http://bit.ly/13p0fVS> and <http://bit.ly/15vpwBC> and <http://bit.ly/10rD5kS>)

Ultrasound technology, perhaps most familiar for its use in fetal imaging, is an essential diagnostic tool in many emergency situations but unavailable to 70 percent of patients in need worldwide. Ultrasound machines are now portable, however, and can be used to diagnose a wide range of disease conditions, including breast cancer, even in the most remote locations.

Sanjoe Jose and colleagues at Emprenure Labs, India, are aiming to take ultrasound technology to a new level of portability with an probe connected to a mobile smartphone from which images are uploaded through cellular networks to a cloud server for remote expert interpretation. The system

would provide real time images and low-cost probable diagnoses to end users anywhere in the world.

The requirement for heavy duty processors used in expensive western systems would be eliminated through the use of cloud computing. Trials will be run in 10 remote health clinics with units linked to an expert sonographer and radiologist.

Meanwhile, low-cost, easy-to-perform ultrasound scans to detect early cancer will improve survival prospects for many women in rural Uganda, where the 5-year survival rate for a late stage breast cancer case is 39% compared to 74% for early stage.

A grant to Imaging the World (ITW) and led by Ugandan Dr. Alphonsus Matovu, aims to bring ultrasound training, technology and telemedicine to rural parts of low income countries, promising cost-effective, sustainable breast cancer detection and remote diagnosis and greater breast cancer awareness.

ITW will train frontline health workers with limited knowledge of anatomy or pathology to generate ultrasound images using low-cost, low-power machines and send them via local cellular telephone networks to the Internet for remote expert interpretation. Findings and recommendations are sent back to the rural clinics as text messages or emails -- a model successfully developed and tested for obstetric ultrasound imaging in rural Uganda, with implementation at 11 different healthcare facilities.

Also tapping into the new power of cellular telephone networks to improve health, a team led by Dr. Ash Parameswaran of Canada's Simon Fraser University in Burnaby is developing a portable, low-cost (target: less than \$5) instrument that can be fitted to any cell phone to quickly identify the correct antibiotic to effectively treat infantile diarrhea in remote areas. Even with access to powerful antibiotics, many infants in developing countries die due to an inability to determine the right drug at the right time.

Portable, mosquito-free huts to protect itinerant African rice farmers (Tanzania)

(video: <http://bit.ly/XOXAUL>)

Every year, thousands of subsistence rice farmers in rural Africa spends months away from home cultivating rice in distant river valleys far from health facilities, bringing along young children and infants. They live in semi-open shacks that can't be readily fitted with bednets, exposing them to as many as 350 infectious insect bites yearly. Among these families, malaria prevalence can reach 40%.

A project led by Dr. Fredros Okumu of the Ifakara Health Institute, Tanzania, will manufacture and promote a portable, low-cost mosquito-proof hut for use in remote settings, an innovation that, he says, could eliminate 50-90% of transmission and help break a vicious cycle of poverty and disease.

The low-cost, lightweight, highly ventilated huts will be easy to transport, accommodate an average itinerant family, and paid for in cash or produce (equivalent to about 5% of an average family's rice production). Hut production will be localized to help lift village economies.

A fast track to safer pesticides via super-computer (Canada, Philippines)

(video: <http://bit.ly/11tq7ji> and <http://bit.ly/XYdGh3>)

Pesticides are essential to agriculture but they poison an estimated 26 million people every year, causing 220,000 deaths and countless cancers, birth defects and other health problems.

That's an unacceptable hidden cost of food that could be slashed via breakthrough technology being developed by Chematria, a start-up Canadian company.

Using massive computer databases, the scientists say they can now create millions of virtual compounds and predict both their toxicity to people and the efficacy of the pesticides early in development, well before experimental tests involving human impacts. The innovation will also help reduce pesticide costs by narrowing chemical choices and shortening development time.

Says project leader Izhar Wallach (whose work is partnered with Dr. Marlon Manalo from the University of Philippines Los Banos): "We will screen for safety and efficacy the tens of millions of compound structures available in our chemical databases, rather than the hundreds of thousands of compounds typically investigated in experimental pesticide screens. Dr. Manalo will experimentally validate the most promising candidates and will lead small-scale field experiments. Within 18 months, we will have proposed a number of compounds to our collaborator for further development."

The Toronto innovators will also use the same super-computer techniques to identify potential new uses for existing drugs and chemical combinations in hopes of repurposing some of them to treat malaria and, one day, the more than 6,000 neglected diseases in resource-poor countries.

Dr. Wallach notes that historically discoveries of alternative uses for drugs have been more serendipitous than systematic. But there are many examples. The antihistamine astemizole, for one, proved effective against malaria while Viagra was first intended as a hypertension drug.

"All medicines have side-effects, but sometimes those effects are beneficial: People take aspirin for headaches, but they also take aspirin to prevent heart disease. We want to uncover those beneficial uses," he says.

A survey of 30 pharmaceutical firms estimated the cost to develop a new drug at \$1.3 billion over 10 to 15 years; to repurpose a previously approved drug for a new use: \$8.4 million over 3 to 5 years.

Saving precious crops with eco-friendly “pesticidal plants” (Tanzania)

(video: <http://bit.ly/ZdLdCy>)

Pests destroy up to 40% of African grain crops, compounding rising problems due by inadequate and changing rainfall patterns. About 30% of stored maize -- the crop grown by 77% of farmers - is lost due to maize weevils infestation.

Led by Basiliana Emidi of Tanzania’s National Institute for Medical Research, researchers are testing a natural, eco-friendly product made from a combination of “pesticidal plants” -- their recipe having been shown in tests to destroy maize weevils and inhibit the growth of a toxin-producing fungi.

Within 18 months, the project aims to answer food security and nutrition questions, as well as community acceptability of the dual pesticide -- a product with a large potential market.

Bringing education into focus in Vietnam

(video: <http://bit.ly/11tstxt>)

The World Health Organization estimates 158 million people worldwide are visually impaired or disabled (including 8.7 million people who are blind) due to uncorrected refractive errors (e.g., myopia, hyperopia and astigmatism). Of that total, about 62 million reside in the Asia-Pacific region. And much of the problem could be prevented with increased awareness and access to affordable services.

Eye health among schoolchildren is a neglected issue in Vietnam. One in five Vietnamese children suffers from refractive error, yet the vast majority remain undiagnosed and untreated due to a lack of coordinated efforts between the health and education sectors.

Led by Ngoc Pham of Helen Keller International, the ChildSight Vietnam project will enhance and expand efforts to improve the vision of schoolchildren in partnership with private optic shops in Kon Tum Province.

At least 10,000 kids - roughly 10% of all schoolchildren in Kon Tum -- will be screened and a qualified optic shop network will be established throughout the province to ensure children receive quality eyeglasses.

Addressing the rising toll of deadly road accidents in developing countries (Nepal, Kenya)

(video: <http://bit.ly/XYdNco> and <http://bit.ly/ZBHkHm>)

In Nepal, more than 9,000 people have died and almost 20,000 were seriously injured in 54,000 traffic crashes in the past 10 years. Among the goals of project led by Pitambar Aryal of Nepal's Integrated Community Development Movement: creating roadside response teams to provide more timely first aid and search and rescue services, and promote helmet and seatbelt use.

In Kenya, meanwhile, motorcycles sales have surged and road crashes are now the 3rd leading cause of death after malaria and HIV/AIDS. The "Reward N Conquer" project led by Kenyan Pamela Muthuri will use mobile phone apps to promote helmet use and road safety.

Changing the sanitation script in the slums of Nairobi and Kampala (Kenya, Uganda)

(video: <http://bit.ly/ZBHpds> and <http://bit.ly/YDCJkH>)

The film Slumdog Millionaire included vivid scenes of outdoor community pit latrines in Mumbai's wretched slums, which are common also in Kenya's large slums, as is the "flying toilet" -- human waste thrown outside in a bag. Joy Kiruki and brother Patrick Kiruki of Kenya hopes to change the script for the poor in Kenya's urban metropolis, installing up to 500 novel in-home toilets that allow users to hygienically dispose of human waste in privacy. Waste is collected in a compostable bag stored odor-free in the toilet. The system includes collection services together with health and sanitation education.

In Uganda, meanwhile, almost all human waste is discharged into bodies of water causing huge health problems. Researchers led by Dr. Corinne Schuster-Wallace of UN University's Canadian-based Institute for Water, Environment and Health, will initiate the first steps in a proposed national program to collect and transform human and other waste into an energy and revenue-producing bio-gas. Supported by Canadian firms Anaergia Inc. (Ontario) and Ostara Nutrient Recovery Technologies Inc. (British Columbia) eventual implementation will involve large underground tanks to mulch human waste along with fish market refuse and other organic trash. Methane from the tanks will be tapped for a new economical source of fuel. A recent study concluded that a sanitation system for 400,000 people in Kampala's urban slums can be run without subsidies by marketing wastewater products.

A mobile phone game and texts to raise awareness of HIV's dangers (Kenya)

(video: <http://bit.ly/11daydZ> and <http://bit.ly/17EGpGB>)

A game-based approach to improving health will be tested in Kenya led by researcher Pam Muthuri: a mobile phone role-playing game will raise awareness about HIV's dangers among girls and anticipate propositions from "sugar daddies." A complementary project, led by Dr. Njambi Njuguna of Kenyatta National Hospital, Kenya, will send with HIV-related mobile phone text messages to young females, many of whom do not perceive themselves to be at risk and thus don't test. In Kenya, 84% of HIV-infected people are unaware of their status with 33% not testing because they don't perceive a risk to themselves.

Help for those caring for children with Africa's "nodding disease" (Uganda)

(video: <http://bit.ly/14GL3YW>)

Thousands of East African children aged 5 to 15 suffer from a mysterious, deadly affliction called "nodding disease," characterized by stunted physical and mental growth, as well as severe nodding or epileptic-like seizures or frozen motion most often brought on when the child eats or feels cold.

Helping the children by addressing the heavy toll on caregivers is the focus of a project headed by Dr. Byamah Mutamba of the National Referral Mental Hospital, Uganda. His aim is to "improve care through reducing adverse methods (e.g. physical restraints like tying them up on trees), improve help seeking, medication adherence, reduced stigma and discrimination and school (re)attendance. Using a lay-health worker led intervention will allow for culture appropriateness, improve access and utilization of health services."

Tapping local businesses: Malaria drugs on wheels (Tanzania)

(video: <http://bit.ly/12xBtUC>)

Over 90% of malaria deaths are children, of which 80% reside in rural areas.

Led by Daudi Simba of Tanzania's Muhimbili University, researchers will work to take advantage of a recent surge in motorcycle popularity in East Africa, putting them to work delivering anti-malaria drugs.

The project predicts that motorcycle deliveries will create near universal access (>80%) to effective malaria treatment in the test area 300 km west of Dar es Salaam, where about one-third of the 500,000 residents survive on less than \$1 a day.

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Other projects include:

- **A diabetes glucose meter cell phone attachment** (<http://bit.ly/13LDu2f>)
- **A tool kit to save newborn lives** (<http://bit.ly/10to2qL>)
- **Engineering gut microbiome bacteria to defend against waterborne diseases like cholera and typhoid** (<http://bit.ly/17RHlud>)

For a complete listing of projects by city and country, and more information on all grants, including short videos on each project, please visit

<http://www.grandchallenges.ca/stars-r4-grantees-en/>

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To date, Grand Challenges Canada has funded 270 projects around the world. There have already been 451 applications in 40 different countries for the next (5th) round of funding under the GCC Stars in Global Health programme.

Grand Challenges Canada is funded by the Government of Canada through the Development Innovation Fund announced in the 2008 Federal Budget.

Please visit grandchallenges.ca and look for us on **Facebook**, **Twitter**, **YouTube** and **LinkedIn**.

About Grand Challenges Canada

Grand Challenges Canada is dedicated to supporting bold ideas with big impact in global health. We are funded by the Government of Canada through the Development Innovation Fund announced in the 2008 Federal Budget. We fund innovators in low and middle income countries and Canada. Grand Challenges Canada works with the International Development Research Centre (IDRC), the Canadian Institutes of Health Research (CIHR) and other global health foundations and organizations to find sustainable long-term solutions through integrated innovation - bold ideas which integrate science, technology, social and business innovation. Grand Challenges Canada is hosted at the Sandra Rotman Centre.
grandchallenges.ca

About Canada's International Development Research Centre

The International Development Research Centre (IDRC) supports research in developing countries to promote growth and development. IDRC also encourages sharing this knowledge with policymakers, other researchers and communities around the world. The result is innovative, lasting local solutions that aim to bring choice and change to those who need it most.

As the Government of Canada's lead on the Development Innovation Fund, IDRC draws on decades of experience managing publicly funded research projects to administer the Development Innovation Fund. IDRC also ensures that developing country researchers and concerns are front and centre in this exciting new initiative.

idrc.ca

About Canadian Institutes of Health Research

The Canadian Institutes of Health Research (CIHR) is the Government of Canada's health research investment agency. CIHR's mission is to create new scientific knowledge and to enable 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 more than 14,100 health researchers and trainees across Canada.

CIHR will be responsible for the administration of international peer review, according to international standards of excellence. The results of CIHR-led peer reviews will guide the awarding of grants by Grand Challenges Canada from the Development Innovation Fund.
cihr-irsc.gc.ca

About Sandra Rotman Centre

The Sandra Rotman Centre is based at University Health Network and University of Toronto. We develop innovative global health solutions and help bring them to scale where they are most urgently needed. The Sandra Rotman Centre hosts Grand Challenges Canada.
srcglobal.org