

HEALTH

EYE ON VISION | HOLISTIC HEALING | THE BEST MILK ALTERNATIVES



Innovation Nation

THE FUTURE OF MEDICINE IS RIGHT HERE IN CANADA. THESE HEALTH BREAKTHROUGHS ARE ALL HOMEGROWN—AND MAY ONE DAY SAVE YOUR LIFE.

BY KATE DALEY & JILL BUCHNER

DIAGNOSIS GOES DIGITAL

Dr. Mark Ansermino was troubled that so many people in the developing world die from treatable conditions due to a lack of medical resources. So the associate professor of anesthesiology, pharmacology and therapeutics at the University of British Columbia partnered with computer engineering professor Guy Dumont to find a solution: a mobile phone that diagnoses medical conditions involving compromised lung function. Their oximeter, which attaches to a phone's audio jack, measures oxygen levels in the blood by shining a light through your finger. If the light detects low oxygen, an app that works with the oximeter will ask questions to help make a diagnosis that can direct future treatment. Dr. Ansermino says it could save many of the two million kids who die of pneumonia each year, and the thousands of women who die of preeclampsia each year worldwide.

DR. LUI NOSE BEST

About eight percent of us will, at some point in our lives, experience major depression. Antidepressants can help, but they can cause multiple unpleasant side-effects, from nausea to insomnia. But Dr. Fang Lui, a senior scientist at the Centre for Addiction and Mental Health in Toronto, is working on an alternative. She found that two dopamine receptors in the brain are more bound together in people with major depression, so she developed a peptide that could disrupt that binding, relieving depression. Realizing she needed a direct route to the brain in order to administer the peptide, Dr. Lui developed a nasal spray which recently underwent a successful animal trial. Early results indicate that her peptide causes fewer unpleasant side-effects than conventional depression medications.

Using Brain Power

FOR THOSE WHO'VE TRIED IT ALL to help their mental illness, there's hope. Led by Dr. Jonathan Downar, MD, a team at Toronto Western Hospital is pioneering the use of noninvasive brain stimulation to treat patients with treatment-resistant depression, bipolar disorder, eating disorders, obsessive-compulsive disorder and post-traumatic stress disorder. It all happens in the hospital's rTMS clinic, which uses MRI-guided "repetitive transcranial magnetic stimulation" to stimulate different areas of a patient's brain, sans surgery. Patients receive treatment every weekday for six weeks. Thirty to 45 percent of patients experience complete remission and another five to 20 percent experience a significant response. Since opening in 2011, the clinic has seen a 400 percent increase in patients, including many veterans with PTSD. Less than two dozen clinics in Canada offer the procedure.

SYSTEM SUPERCHARGE

Halifax's Dr. Marc Mansour is helping to change the face of cancer treatment. While researchers have long been interested in enhancing the body's immune response to cancer, trials have only recently begun to show success with this tactic. "The idea of being able to supercharge the immune system so that it can fight cancer has been a bit of a dream," says Dr. Mansour, the chief operating officer for vaccine development company Immunovaccine. But now his team is making the dream a reality with a vaccine called

DPX-Survivac, which teaches the immune system to recognize a particular signature of cancer so that it can seek it out and kill the cancer cells that contain it. The signature, called survivin, is a protein that cancer cells need to survive. The vaccine contains components of survivin to help the body identify it. Since cancer has many mechanisms for defending itself against your immune system, the vaccine is used after surgery and chemo, when the remaining cancer cells are weakened. In the Phase 1 trial,

the optimal dose of the vaccine provoked a strong immune response in every patient it was given to. In subsequent trials, researchers hope to learn if the vaccine can lower the rate of cancer recurrence. The research is focused on ovarian cancer, but the vaccine may help to treat other kinds in the future, including breast, liver and brain cancers. Dr. Mansour is hopeful that the vaccine will be available as early as 2018, and he's sharing his research to promote further cancer vaccine development.



Brewing Change

IN THE DEVELOPING WORLD, food is sometimes scarce, and subsisting on a few staples is a recipe for nutrient deficiency. According to the World Health Organization, iron deficiency affects more people than any other health condition, with more than 30 percent of the world population suffering from anemia. The condition is associated with a greater risk of infant and maternal death, as well as other pregnancy-related complications. And iron deficiency in children has been linked to poor school performance. When Levente Diosady, a chemical engineering professor at the University of Toronto, set out to help treat this condition, he hit on a surprising solution: fortified tea. Though tea doesn't typically contain iron, it is regularly consumed by many of those who are hardest hit by anemia, and Diosady recognized it as an inexpensive staple that could be fortified with the life-saving mineral. Last year, the professor received an international grant to do the research needed to put his plan into action. His research is still ongoing, but he hopes to have a prototype tea ready within five years.

A CURE FOR HIV/AIDS?

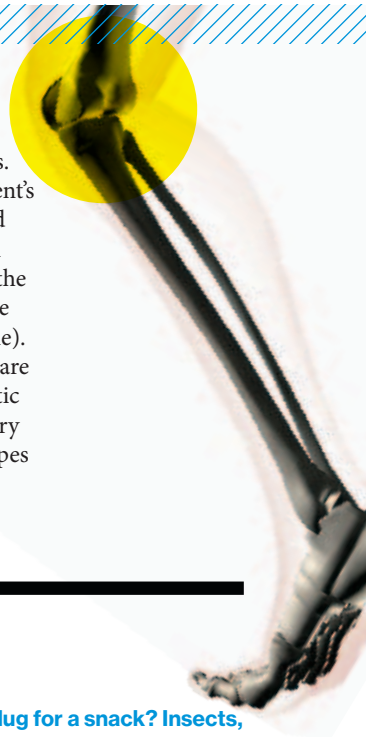
More than 35 million people worldwide are living with HIV/AIDS, and the pandemic shows no signs of slowing. But Dr. Chil-Yong Kang, a researcher and professor at Western University's Schulich School of Medicine & Dentistry, is working to develop both a preventative vaccine and a therapeutic vaccine for HIV. For the preventative vaccine, his team created a genetically engineered whole virus and then killed it. (The dead virus poses no risk.) It underwent the first phase of human trials last year, and the results were promising: Patients showed a strong antibody response and no adverse effects. Meanwhile, the therapeutic vaccine helps white blood cells recognize and kill the HIV-infected cells. It has undergone preliminary studies in small animals; human trials are pending approval. "No one has tried our strategy before," says Dr. Kang. "But it has proven to work for other viral vaccines, so we have high hopes."

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PRINTING PARTS

You can print anything from a gun to a missing car part with a 3D printer, so it was only a matter of time before somebody tried printing body parts. Dr. Rita Kandel, chief of pathology and laboratory medicine at Mount Sinai Hospital, and a team of researchers from the universities of Waterloo, Toronto, Guelph, McMaster and Queen's, have been studying the use of stem cells and 3D printing to create bone and cartilage

tissue for replacement joints. The idea is to grow the patient's own tissues on a 3D printed biodegradable combination of calcium and phosphate (the same components that make up the mineral of a real bone). Current joint replacements are often made of metal or plastic and need to be replaced every 10 to 20 years. The team hopes to test this innovation on human subjects within the next five years.



INSECTS SOLVING WORLD HUNGER

A grasshopper for dinner? A slug for a snack? Insects, which are consumed regularly by 2.5 billion people worldwide, may very well help solve global food insecurity. Five MBA students at Montreal's McGill University are behind Aspire Food Group, which received the 2013 Hult Prize—and US\$1 million in seed capital—for a project focusing on urban slums. The team's first industrial insect production facility will be in Mexico, where insect consumption is a culinary tradition. "We will leverage this facility to enhance supply and depress market prices for the local six-legged favourites to get more of them into the hands of people who need them," says Jesse Pearlstein, Aspire's chief financial officer. "The scientific community widely accepts that the global population is going to swell to more than nine billion by the year 2050. Our current system of farming will simply not feed everyone on the planet. The farming of micro-livestock consumes 11 times less land, 33 times less water, six times less feed and produces a negligible amount of greenhouse gas emissions," says Pearlstein.

Care That's Fair

WATCHING THE FIERY HEALTH-CARE DEBATES south of the border over the past few years, we Canadians may feel a growing urge to proudly wave our flag for all we're doing right. Last March, *Canadian Living's* very own medical columnist, Dr. Danielle Martin, a practicing family physician and vice-president of medical affairs and health system solutions at Women's College Hospital, appeared in front of the U.S. Senate to share lessons gleaned from Canada's single-payer health-care system. The Senate was forced to contemplate the underlying principle that sets our system apart: equity. There's a lot we have to be proud of.

"Health care should be based on need rather than ability to pay," says Dr. Martin. "That's the bedrock of our system." By paying for every citizen, we end up spending just two-thirds of what Americans pay for their limited-access system, per capita. "And we actually provide quite good care," says Dr. Martin, adding that our outcomes for cancer and heart disease are similar or even better than those in the U.S. Plus, as she pointed out to one senator, we don't have 45,000 citizens per year die while waiting for treatment. Not that our system is perfect. There are still ways to make it more equitable.

We asked Dr. Martin to identify three ways in which Canadian health care needs to change:

1 IMPROVE COVERAGE OF MEDICATIONS. Back in the '50s and '60s, when Medicare was in its infancy, most health care was delivered in hospitals, which meant that prescription drugs weren't a significant cost for most people. "Times have really changed," says Dr. Martin. "Many Canadians are living a long time with chronic medical conditions now, and they need to take medications long-term." In the past 50 years, drug costs have become quite a concern. In fact, a 2012 study found that one in 10 Canadians struggles to pay for medication, and many fail to fill prescriptions or take them as often as directed.

2 DELIVER CONSISTENT ACCESS. "There's a role for the federal government to play in ensuring that Canadians can count on access to similar services, no matter where they live," says Dr. Martin. In March, Canada's Health Care Accord, which united all of the provinces and territories under common goals, expired. There's a huge variation in coverage between provinces, and Dr. Martin says we need national leadership to ensure consistent care.

3 ENSURE THAT EVERY CANADIAN HAS ACCESS TO HIGH-QUALITY PRIMARY CARE. "No Canadian should be without a family doctor, and no Canadian should have to wait six weeks for an appointment with one," says Dr. Martin. Currently, where you live impacts your access to primary care. "It's not so much about the number of doctors, it's about the distribution—where they're practicing, and how many are choosing primary care over specialties." To solve the problem, Dr. Martin says we need bigger teams of doctors, nurses and other health-care providers, rather than individual practices. "It's about being linked in to a bigger system."



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SUPPORT



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SUPPORT



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SUPPORT



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