

News and Views

Proinsulin peptide immunotherapy is 'safe'

Dr. Ali and team examined the effect of the peptide in 27 people who had been diagnosed with type 1 diabetes within the previous 100 days.

For 6 months, the participants received either shots of the immunotherapy or the placebo at 2- or 4-week intervals. Their C-peptide levels - which are markers of insulin - were tested at 3, 6, 9, and 12 months, and they were compared with baseline levels.

The trial found no evidence of toxicity or negative side effects, and beta cells were not impaired or reduced as a consequence of the therapy. The authors write, "Treatment was well tolerated with no systemic or local hypersensitivity," which led the researchers to conclude that "proinsulin peptide immunotherapy is safe."

Additionally, "Placebo subjects showed a significant decline in stimulated C-peptide (measuring insulin reserve) at 3, 6, 9, and 12 months versus baseline, whereas no significant change was seen in the 4-weekly peptide group at these time points," say the researchers.

Importantly, over a period of 12 months, the daily insulin intake in the placebo group increased by 50 percent, whereas the treatment group kept stable levels of insulin use.

Energy drinks: A gateway to drug use?

Young adults who consume energy drinks regularly are likelier to use drugs and overindulge in alcohol consumption, a new study shows.

Adults in their early 20s who regularly consume energy drinks are much more likely to use illegal substances and indulge in excessive alcohol drinking later in life, new research shows.

Energy drinks are an increasingly popular beverage among teenagers and young adults in the United States. According to the National Center for Complementary and Integrative Health, in the adult population, energy drink consumption is most common among males aged between 18 and 34.

The U.S. Food and Drug Administration (FDA) have not yet regulated energy drinks and are continuously researching their effects on health. Some adverse events owed to energy

drink consumption reported by the FDA include flushing, headaches, abnormal heart rates, nausea, lethargy, loss of consciousness, and, in the most severe cases, death.

A new study led by Dr. Amelia Arria, from the Center on Young Adult Health and Development at the University of Maryland in College Park, has now uncovered strong links between the regular consumption of energy drinks among young adults and their risk of developing substance use disorders.

Dr. Arria and her colleagues conducted their study on a population of 1,099 young adults. The participants were recruited in their first year of college, at which point most of them were age 18, but the study itself was conducted when the participants were aged between 21 and 25 years. The researchers found that participants with a persistent trajectory of energy drink consumption were at a much higher risk of using Non-prescription stimulants and stimulant drugs, and being diagnosed with an alcohol use disorder at age 25.

The researchers' findings were published in the journal *Drug and Alcohol Dependence*.

Regenerative medicine breakthrough: Can a small chip 'heal' entire organs?

A team of researchers from the Ohio State University Wexner Medical Center and Ohio State's College of Engineering, both in Columbus, developed a groundbreaking technology that could soon restore almost any organ.

The device changes cell function in a non-invasive way. It relies on a type of nanotechnology called tissue nanotransfection, which can reprogram living adult cells into any other type of cell.

The new study was published in the journal *Nature Nanotechnology*, and the research was jointly led by Dr. Chandan Sen, who is director of Ohio State's Center for Regenerative Medicine and Cell-Based Therapies, and L. James Lee, a professor of chemical and biomolecular engineering at Ohio State's College of Engineering.

The breakthrough technology relies on two main elements, and the first one is the chip itself. Using nanotechnology, the

scientists designed the device so that it could inject a so-called genetic load into the body's cells.

The second element is the genetic load itself: the chip carries a specific genetic code in the form of DNA or RNA, which, when applied to cells, changes them from their previous structure and function to the structure and functions needed to repair the injury. As the study authors explain, the reprogramming factors are delivered into the cell using a "highly intense and focused electric field through arrayed nanochannels." In other words, the chip is placed onto the skin and with a simple touch, a small and nearly imperceptible electrical current forges channels into the tissue.

The DNA or RNA is sent through these nanochannels and starts to reprogram the cells, giving them a new "identity." As Dr. Sen explains, "It takes just a fraction of a second. You simply touch the chip to the wounded area, then remove it. At that point, the cell reprogramming begins."

The team tested the device in mice by applying the technology to the skin of their injured legs, the blood flow of which was blocked. The device successfully transformed the mice's skin cells into vascular cells. "Within a week we began noticing the transformation," says Dr. Sen.

In the second week, the skin cells had turned into functional blood vessels, and by the third week, the rodents' legs were fully healed - with no other pharmacological intervention. "What's even more exciting is that it not only works on the skin, but on any type of tissue," he adds. In a second set of experiments, the researchers used the device to transform skin cells into brain cells, helping to restore the region that had been damaged by stroke.

Can a Crowdsourced AI Medical Diagnosis App Outperform Your Doctor?

Shantanu Nundy recognized the symptoms of rheumatoid arthritis when his 31-year-old patient suffering from crippling hand pain checked into Mary's Center in Washington, D.C. Instead of immediately starting treatment, though, Nundy decided first to double-check his diagnosis using a smartphone app that helps with difficult medical cases by soliciting advice from doctors worldwide. Within a day, Nundy's hunch was confirmed. The app had used artificial intelligence (AI) to analyze and filter advice from several medical specialists into an overall ranking of the most likely diagnoses. Created by the Human Diagnosis Project (Human Dx) an organization that Nundy directs, the

app is one of the latest examples of growing interest in human-AI collaboration to improve health care.

Human Dx advocates the use of machine learning, a popular AI technique that automatically learns from classifying patterns in data to crowdsource and build on the best medical knowledge from thousands of physicians across 70 countries. Physicians at several major medical research centers have shown early interest in the app. Human Dx on Thursday announced a new partnership with top medical profession organizations including the American Medical Association and the Association of American Medical Colleges to promote and scale up Human Dx's system.

When a physician needs help diagnosing or treating a patient they open the Human Dx smartphone app or visit the project's Web page and type in their clinical question as well as their working diagnosis. The physician can also upload images and test results related to the case and add details such as any medication the patient takes regularly. The physician then requests help, either from specific colleagues or the network of doctors who have joined the Human Dx community. Over the next day or so Human Dx's AI program aggregates all of the responses into a single report. It is the new digital equivalent of a "curbside consult" where a physician might ask a friend or colleague for quick input on a medical case without setting up a formal, expensive consultation, says Ateev Mehrotra, an associate professor of health care policy and medicine at Harvard Medical School and a physician at Beth Israel Deaconess Medical Center. "It makes intuitive sense that [crowdsourced advice] would be better advice," he says, "but how much better is an open scientific question." Still, he adds, "I think it's also important to acknowledge that physician diagnostic errors are fairly common." One of Mehrotra's Harvard colleagues has been studying how the AI-boosted Human Dx system performs in comparison with individual medical specialists, but has yet to publish the results.

Mehrotra's cautionary note comes from research that he and Nundy published last year in *JAMA Internal Medicine*. That study used the Human Dx service as a neutral platform to compare the diagnostic accuracy of human physicians with third-party "symptom checker" Web sites and apps used by patients for self-diagnosis. In this case, the humans handily outperformed the symptom checkers' computer algorithms. But even physicians provided incorrect diagnoses about 15 percent of the time, which is comparable with past estimates

of physician diagnostic error.

South African child in HIV remission without drugs

A 9-year-old child from South Africa has been living with HIV in drug-free remission for 8.5 years, scientists announced at the ninth International AIDS Society conference, held in Paris, France. Researchers report that this is the third instance of prolonged HIV remission in a child after anti-HIV treatment. The research adds to a growing body of evidence suggesting that early treatment of the virus in infancy may suppress HIV to undetectable levels, which could reduce the need for life-long drug treatment.

Dr. Avy Violari, head of pediatric research at the Perinatal HIV Research Unit at the University of the Witwatersrand in Johannesburg, South Africa, co-led the study with Mark Cotton, head of the Division of Pediatric Infectious Diseases at Stellenbosch University, also in South Africa.

At the conference, the researchers presented the case of the South African child, who was diagnosed with HIV infection in 2007, at just 32 days old. The child was enrolled in the Children with HIV Early Antiretroviral Therapy (CHER) clinical trial, which is funded by the National Institute of Allergy and Infectious Diseases (NIAID). The infants in the trial were randomly assigned to receive either deferred antiretroviral therapy (ART) or early ART for 40 or 96 weeks, at which point the treatment would be stopped.

The South African child was among the 143 infants who received early ART treatment for a total of 40 weeks. This child's case is the third instance of long-term HIV remission without ongoing drug therapy. In 2010, a child known as the "Mississippi Baby" received anti-HIV treatment 30 hours after birth. After ceasing treatment at around 18 months of age, the virus was controlled without drugs for 27 months before reappearing in her blood. In 1996, a French child was born with HIV and began anti-HIV treatment at 3 months old. In 2015, researchers reported that, after therapy had been stopped sometime between the ages of 5.5 and 7 years, the child was in HIV remission without drugs for more than 11 years.

Doctors are told to use hepatitis B vaccine sparingly because of global shortage

Doctors have been told to use the hepatitis B vaccine sparingly, and only for people at highest immediate risk of infection, because of a global shortage.

Public Health England with NHS England, the Department of Health, and the manufacturer GlaxoSmithKline said that the measures are expected to last until the beginning of 2018.

Guidance from Public Health England says that the highest priority for vaccination are babies born to mothers infected with hepatitis B, because they have the highest risk of infection from being exposed to a substantial amount of infected blood.¹

Next, people who think that they may have been exposed to hepatitis B should have an individual risk assessment to assess their likelihood of infection. Risk can vary depending on the hepatitis B status of the source or, if this is unknown, the prevalence in the implicated population, the recipient's hepatitis B immune status, and the mechanism and route of transmission whether it is a significant exposure, the likely infecting dose, and the volume of potentially infected blood or bodily fluid.

The guidance says that the hepatitis B vaccine is unlikely to be available simply for travel to areas where the risk of exposure is higher than in the UK. Patients, including travellers to hepatitis B endemic countries, should be reminded that they can reduce their risk of exposure by avoiding contact with blood and bodily fluids for example, by practising safe sex, by disposing of sharps safely, by avoiding tattooing, piercing, and acupuncture, and by not sharing needles or shaving equipment. The shortage does not affect the addition of hepatitis B protection to the routine childhood immunisation programme.

Cost of achieving WHO sustainable development goals by 2030 is \$58 a head

Achieving the health targets under the sustainable development goals (SDGs) in low and middle income countries by 2030 would cost \$58 (£44.50; €50) per head of population, the World Health Organization has estimated in an analysis published in the Lancet Global Health.

This investment could help prevent 97 million premature deaths worldwide and add as much as 8.4 years of life expectancy in some countries, WHO said.

WHO looked at the costs and benefits of progressively expanding health services to achieve the health targets under the 17 SDGs adopted in September 2015 for delivery by 2030. The targets in the analysis include SDG 3 (health and wellbeing), which is a broad health goal that calls for

universal health coverage as measured by an index of access to 16 essential services,² as well as targets from SDG 2 (zero hunger), SDG 6 (clean water and sanitation), and SDG 7 (affordable and clean energy).

Adhanom Ghebreyesus Tedros, WHO director general, said, “Universal health coverage includes not just healthcare but also health promotion and prevention and a broader public health approach. A strong primary healthcare platform with integrated community engagement within the health system is the backbone of universal health coverage.”³

WHO modelled two scenarios: an “ambitious” scenario, in which investments are sufficient for countries to attain the health targets in the SDGs by 2030; and a “progress” scenario, in which countries at least two thirds of the way to doing this.

In both scenarios, about 75% of the total comprises health system investments such as employing more health workers; building and operating new clinics, hospitals, and laboratories; and buying medical equipment. The remaining costs are for medicines, vaccines, syringes, and other commodities used to prevent or treat specific diseases and for activities such as training, health campaigns, and outreach to vulnerable communities.

Under the “ambitious” scenario, investments would need to increase over time from \$134bn a year to \$371bn, equal to

\$58 a person, by 2030. Although WHO says that 85% of these costs can be met from domestic resources, 32 of the world's poorest countries could face a gap of \$54bn a year and will continue to require external assistance.

The “ambitious” scenario includes adding more than 23 million health workers and building more than 415 000 new health facilities, 91% of which would be primary healthcare centres. Under this scenario, health spending as a proportion of gross domestic product (GDP) throughout all 67 low and middle income countries would increase from an average of 5.6% to 7.5%. The global average health expenditure as a proportion of GDP is 9.9%.

This level of investment could prevent 97 million premature deaths, including more than 50 million infants and children who are stillborn or die before age 5, and 20 million deaths from non-communicable diseases such as cardiovascular disease, diabetes, and cancer. Life expectancy would increase by 3.1-8.4 years.

The “progress” scenario would need new investments to increase from \$104bn a year to \$274bn, \$41 a person, by 2030. These investments would prevent about 71 million premature deaths and boost health spending as a proportion of GDP to an average of 6.5%. More than 14 million new health workers would be added and nearly 378 000 new health facilities built, 93% of which would be primary healthcare centres.