Biotech Innovations

Better Cholera Counts Through Machine Learning Models

A new model accurately predicted past-year infections with cholera-causing bacteria based on antibodies in a few drops of blood, researchers recently reported in *Science Translational Medicine*. The approach could be used to improve cholera incidence estimates, which are currently based on surveillance of acute watery diarrhea.

Globally, more than 100 000 people die of cholera each year. The World Health Organization aims to eliminate the disease as a public health threat by 2030, but counts of true cholera cases are needed to allocate limited resources, track progress in reducing cholera transmission, and assess the effectiveness of new interventions, according to Andrew Azman, PhD, of the Johns Hopkins Bloomberg School of Public Health in Baltimore, the study's lead author.

Azman's team used 1569 serologic samples from cholera-infected individuals in Bangladesh and their uninfected household members to train machine-learning models. The models exploit the rise and decay of cholera antibodies to identify the timing of recent infections.

A model using 2 serological markers to identify recently infected individuals demonstrated 91% accuracy in the Bangladesh cohort and 88.4% to 98.4% accuracy in an external validation cohort of North American volunteers challenged with the bacteria for the study.

The approach using serological snapshots of populations could help more precisely identify high-risk areas, Azman told *JAMA*. "If health care workers in these settings are well equipped both with adequate rehydration supplies and knowledge, almost no one should die of cholera," he said.

The researchers are currently using the approach to pinpoint priority areas in Bangladesh. They also hope to develop a cheap rapid test for field use.

Wireless Vital Signs Monitoring for the NICU

Today, babies in neonatal intensive care units (NICUs) are enveloped in a mass of monitoring wires that hamper basic clinical and imaging procedures and skin-to-skin contact with caregivers, which is linked with reduced infant mortality and other positive outcomes. Additionally, sensors are attached with adhesives that can damage and scar fragile premature skin. A new system using a pair of small, wireless, skin-like electronic patches could one day replace this cumbersome and invasive equipment.

Rogers Research Group/Northwestern University

Writing in *Science*, researchers described how they developed flexible, ultrathin sensors and embedded them in medical-grade silicone to create soft patches that couple naturally to human skin. Radio waves from antennae placed in an incubator mattress power the patches' sensors, whose data are transmitted wirelessly to Bluetooth-enabled devices.

The patches—dubbed epidermal electronic systems—can be used to continuously measure heart rate and heart rate variability, respiration rate, blood oxygenation, and blood pressure. The system's measurements were consistent with those from gold-standard equipment in a recent pilot study involving healthy and premature infants with gestational ages ranging from 28 weeks to full term in 2 tertiary-level NICUs.

The researchers also paid careful attention to the risk of damage from the patches themselves. "These wireless devices have a flexible, minimally adhesive interface with baby skin that has been carefully engineered to prevent shearing forces, even during the removal process," said Amy Paller, MD, chair of the department of dermatology at the Northwestern University Feinberg School of Medicine in Chicago and a co–senior author of the study.

As part of a larger clinical trial, Paller's team is now using the system for 24-hour monitoring of infants in the NICU at the Northwestern-affiliated Ann and Robert H. Lurie Children's Hospital.

HIV Remission After Hematopoietic Stem Cell Transplant

In a historic case, a patient in London achieved sustained HIV remission after receiving an allogeneic hematopoietic stem cell transplant (HSCT) for Hodgkin lymphoma. The report, published in *Nature*, comes more than a decade after the now-famous "Berlin patient," Timothy Ray Brown, was cured of HIV after 2 allogeneic HSCTs for acute myeloid leukemia. Both patients received cells from donors with a mutation in the *CCR5* gene that provides resistance to HIV. Since Brown, no other successful cases of sustained HIV remission after stem cell transplantation have been reported.

In the new case, the patient—who has not been identified—stopped taking antiretroviral drugs 16 months after the transplantation and now, 18 months later, has maintained an undetectable plasma viral load. However, it's too soon to conclude that the patient has been cured, the researchers cautioned.

Unlike Brown, the new patient's treatment did not include radiotherapy, which suggests that this less aggressive technique could be applied to others. Although the success of this approach is limited to 2 people with HIV who needed bone marrow transplants to treat their cancer, there's hope that the recent case could reignite interest in *CCR5*-targeted gene therapies for a wider population of people living with HIV. The *CCR5* gene codes for the predominant coreceptor the virus uses to enter white blood cells. "[T]he findings further support the development of HIV remission strategies based on preventing *CCR5* expression," the authors wrote. **– Jennifer Abbasi**

Note: Source references are available online through embedded hyperlinks in the article text.