MINITOPIC

Microopia, a Museum about Microorganisms, Opens in Amsterdam

Queen Máxima of the Netherlands led the opening ceremonies in Amsterdam last September at Micropia, “the world’s first museum of microorganisms, the invisible and most powerful life forms on Earth.” The new building looms as a black box on the Artisplein, a square that is situated next to the Artis Royal Zoo, whose main attractions of course are visible without magnification. Meanwhile, Micropia is meant to inspire greater interest from the general public in microorganisms, and to serve a more general purpose by being an active “link between the general public and science,” reflecting the “increasing importance of biotechnology and life sciences,” museum officials note. The museum is open daily. For more information about the museum, see http://www.micropia.nl/en/about-us/how-micropia-came-about/.

NEW IN ASM JOURNALS

Microfluidics-Based Assay Identifies, Quantifies Viruses in Water Samples

David C. Holzman

By taking a microfluidics-based approach, a PCR assay was recently retooled for use in identifying and quantifying viruses in water samples, according to Satoshi Ishii of Hokkaido University in Sapporo, Japan, and his collaborators. “If we can quantify viral pathogens in hours, we can stop water distribution and disinfect drinking water before disease outbreaks occur,” he says. Details appeared 26 September 2014 in Applied and Environmental Microbiology (doi: 10.1128/AEM.02578-14).

Traditionally, water treatment utilities and food companies rely on measurements of fecal or total bacteria to assess the presence and abundance of enteric pathogens contaminating food and drinking water supplies. However, Ishii says, these measurements sometimes miss other important pathogens, including viruses, and thus can prove unreliable. Although he and his collaborators first applied their technology to measuring bacterial pathogens, all along they planned to adapt it to measure viral pathogens, he says.

“We performed multiple quantitative PCR in parallel, in nanoliter-volume chambers that are present in high densities on a chip,” Ishii continues. Although the technology was developed by other groups and is commercially available, this is the first report of its being used to detect and quantify several viral pathogens at once, he says.

Other methods for simultaneously detecting several microbial pathogens do not provide quantitative information, or are slow and not particularly

so one ends up with a very differentiated cell that is then capable of growing in far-red light,” Bryant says. “The organism is better than other cyanobacterial strains at producing oxygen in far-red light and, in fact, it is even better than the same cells grown under other light conditions. Cells grown in far-red light produce 40% more oxygen when assayed in far-red light than cells grown in red light.”

Bryant and his collaborators recently identified five other strains that, like strain JSC-1, are also capable of FaRLiP. “A few are soil organisms and some others come from hot spring mats as well,” he says. “FaRLiP is likely to be driving a lot of terrestrial photosynthesis that otherwise would not be happening because of poor light penetration. All of the organisms to date that can do this also fix nitrogen. . . . We think this will be a globally important process.”

“The retention of a set of paralogous genes for the three major light-utilizing complexes in the genome, their differential expression, and biosynthesis of the complexes illustrates the extent to which photosynthetic organisms will go to capture solar photons and compete for photochemically active radiation,” says Charles Dismukes from Rutgers University of New Brunswick, N. J., referring to genes encoding proteins with similar function that likely arose via gene duplications. “This work highlights new possibilities that may be applicable to terrestrial crops to achieve improved performance.”

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MINITOPIC

2014 Nobel in Chemistry Recognizes Super-Resolved Fluorescence Microscopy

The 2014 Nobel Prize in Chemistry is being awarded, ironically enough, to three physicists—Eric Betzig, who works on the Janelia Research Campus of the Howard Hughes Medical Institute in Ashburn, Va., Stefan W. Hell of the Max Planck Institute for Biophysical Chemistry in Göttingen and the German Cancer Research Center in Heidelberg, Germany, and William E. Moerner of Stanford University in Stanford, Calif.—for helping to develop super-resolved fluorescence microscopy, also called nanoscopy, a technology that greatly benefits research in biology.

The 2014 award explicitly recognizes the following related but separate developments: Hell, for developing stimulated emission depletion microscopy, and Betzig and Moerner for separately developing the foundation for single-molecule microscopy. These developments enable biologists to peer into single microbial or other living cells with a finer resolution than the once widely accepted theoretical limit of 0.2 μm.
accurate, according to Ishii. “Our paper is the first to provide quantitative information on multiple pathogens, as accurate as those obtained by conventional qPCR, for many samples—up to 92 per run,” he says. The leading competitor assay takes 20 hours, whereas the new microfluidics-based method yields results within 5 hours.

The assay covers a wide range of viruses, including adenovirus types 40 and 41, Aichi virus, astroviruses, enteroviruses, noroviruses, members of the rotavirus group, and the hepatitis A and E viruses. In one set of experiments, the investigators collected contaminated water samples downstream from a wastewater treatment plant along the Motsukisamu River to validate the new assay system under conditions in which the assay can be expected to find use, according to Ishii. “By using the method we developed, we quantitatively detected norovirus genogroups I and II and rotavirus,” says Ishii. “Other viruses were below the detection limit. We obtained similar results using conventional qPCR.”

The microfluidics-based assay “has an exquisite sensitivity and enables the simultaneous detection of a broad spectrum of viruses,” says Albert Bosch of the University of in Barcelona, Spain. “On the con side, it is awfully expensive.”

The cost of the assay equipment is $250,000, compared with $30,000–50,000 for a standard qPCR instrument, and the microfluidics chip, designed for one-time use, is $900 per unit, according to Ishii. However, the cost per assay can run as low as $0.10, compared to $0.40 for conventional qPCR, he says. Despite those inherent costs, however, the new assay “could both speed our analysis and reduce associated costs,” points out Sudhir Murthy, who is Innovations Chief for the District of Columbia Water and Sewer Authority in Washington, D.C., referring to routine testing done at the DC water treatment plant.

David C. Holzman is the Microbe Journal Highlights Editor.

NEW IN ASM JOURNALS

Enterotoxigenic E. coli Worldwide Are Closely Related: Portent of Success for Vaccine Development

Enterotoxigenic E. coli (ETEC) infect 400 million people annually, or 5.3% of the world’s population, killing 400,000. While ETEC were thought to vary widely from place to place, Åsa Sjöling, now of the Karolinska Institutet, Stockholm, Sweden, and collaborators of the University of Gothenburg, Sweden, and the Sanger Institute, Cambridge, UK, find that the two most potent toxins, LT1 and LT2, have changed little, but spread globally over the 30 years for which the investigators have isolates. That, says Sjöling, bodes well for a vaccine developed by the University of Gothenburg (where Sjöling did this work), which he expects “will be protective and useful globally since this vaccine is based on the toxin types and colonization factors we found to be most successful worldwide.”


NEW IN ASM JOURNALS

Salivary Mucins Play Active Role To Fight Cavities

A variety of mucins have been shown protective against certain pathogens, and defects therein have correlated with conditions such as asthma, and ulcerative colitis. Now Erica Shapiro Frenkel of Harvard University and Katharina Ribbeck of Massachusetts Institute of Technology find that salivary mucins, key components of mucus, actively protect the teeth from the cariogenic bacterium Streptococcus mutans. S. mutans attaches to teeth using sticky polymers that it produces, eventually forming a biofilm. “We found that salivary mucins don’t alter S. mutans’ growth or lead to bacterial killing over 24 hours,” says Frenkel. “Instead, they limit biofilm formation by keeping S. mutans suspended in the liquid medium. This is particularly significant for S. mutans because it only causes cavities when it is attached, or in a biofilm on the tooth’s surface.” The research suggests that bolstering native defenses might be a better way to fight dental caries than relying on exogenous materials, such as sealants and fluoride treatment, says Frenkel. Rather than simply a catchall filter for particles, “mucus is a sophisticated bioactive material with powerful abilities to manipulate microbial behavior,” says Ribbeck.


Timely detection of influenza in outbreak settings is key for outbreak prevention and control. Now, Adriana Peci of Public Health Ontario, Toronto, Canada, et al. show that rapid influenza diagnostic tests (RIDT), which are faster than other methods, are better for detecting outbreaks than for individual influenza cases. This is the first paper to thor-