MINITOPIC

Ebola Update

Recent developments regarding the 2014–2015 outbreak of the Ebola virus in West Africa include:

- As of November, the Ebola virus is no longer being transmitted in Sierra Leone, according to officials of the World Health Organization. Although Guinea reported no new confirmed Ebola cases, there remained a “near-term risk of further cases among both registered and untraced contacts.”
- A nucleotide analog prodrug, called GS-5734, that works by blocking viral RNA replication completely protected Rhesus monkeys against the Ebola virus, according to Travis Warren at the U.S. Army Medical Research Institute of Infectious Diseases in Frederick, Md., and his collaborators there and at Gilead Sciences of Foster City, Calif. They presented their findings during the IDWeek Conference, held in San Diego last October.
- The Ebola virus can persist in body fluids, including semen, for at least 9 months following the onset of viral symptoms, according to Gibrilla F. Deen at Connaught Hospital in Freetown, Sierra Leone, and collaborators. Details appeared 14 October 2015 in the New England Journal of Medicine (doi:10.1056/NEJMoa1511410).
- A point-of-care saliva test that depends on recombinase polymerase amplification and can fit within a suitcase-sized compartment proves highly sensitive and specific in detecting Ebola virus; moreover, its reagents can be stored at room temperature and the system operates with its own energy supply, according to Manfred Weidmann of the University of Stirling in Stirling, Scotland, and his collaborators. Details appeared 5 November 2015 in Eurosurveillance (doi: http://dx.doi.org/10.2807/1560–7917.ES.2015.20.44.30053).

RESEARCH ADVANCES

NASA Satellite Data, Modeling Reveal Global Decline of Phytoplankton

Barry E. DiGregorio

Global phytoplankton declined significantly during a recent 15-year period—falling more than 1% per year from 1998 to 2012, according to Cecile S. Rousseaux and Watson W. Gregg of the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center in Greenbelt, Md. This loss will reduce the carbon dioxide and nutrient conditions at any point in time and space in the model, each of the motivations for assimilating satellite data is that the availability of satellite data is limited to specific conditions, she says. “For example, data in the Southern Ocean are only available for about half of the year at best as a result of the presence of clouds, which doesn’t allow for ocean color measurements.”

Rousseaux and her colleagues used the NASA sensor that flew aboard the Geo Eye OrbView-2 satellite to obtain ocean color measurements of chlorophyll. Although chlorophyll in the Northern Hemisphere was declining, they could not immediately determine what types of phytoplankton might be responsible. However, by using the model to analyze those satellite data, the researchers could distinguish between large diatoms and smaller phytoplankton such as coccolithophores, chlorophytes, and cyanobacteria, according to Rousseaux. “One of the motivations for assimilating satellite data is that the availability of satellite data is limited to specific conditions,” she says. “Depending on the physical and nutrient conditions at any point in time and space in the model, each of the groups will grow, sink, and take up nutrients at different rates.”

Marcia Stone is a science journalist based in New York City.
Their results are “in full agreement” with our controversial results “in terms of magnitude and degree of decline on a global basis,” says Marlon Lewis professor of Oceanography at Dalhousie University in Halifax, Nova Scotia, Canada, citing results he published several years ago with his collaborators Daniel Boyce and Boris Worm. Their model “allows further exploration in terms of changes in the community composition of the phytoplankton and concludes that diatoms appear to be the most affected.”

The NASA scientists attribute that decline to changes in ocean stratification, Lewis continues. However, he adds, “The situation is complicated” because any reduction in the vertical flux of carbon associated with sinking diatoms is not directly connected to changes in the air-sea flux. Says Rousseaux, the diatom decline, while statistically significant, is not severe, but it is something to monitor as ocean conditions change, whether due to natural variation or climate change.

Bany DiGregorio is a freelance writer in Middleport, N.Y.

NEW FROM ASM

Survey of DNA Viruses in Skin Bares Previously Underappreciated Diversity

David C. Holzman

The first comprehensive survey of skin-associated, double-stranded DNA viruses reveals 90% of them as being biological “dark matter,” that is, previously unknown to science, according to Elizabeth Grice of the University of Pennsylvania Perelman School of Medicine in Philadelphia, and her collaborators. Overall the findings reveal a “previously underappreciated diversity, encoded functions, and viral-microbial dynamic unique to the human skin virome,” they note. Details appeared 20 October 2015 in mBio (doi:10.1128/mBio.01578-15).

“The technique we used to isolate and sequence the viruses had never been applied to the skin, in part because it is very technically challenging,” Grice says. However, newer techniques for purifying viral particles as well as improvements in DNA sequencing, including some that arose during the course of this analysis, enabled the investigators to extract a great deal of information from unusually small quantities of DNA, she says. “New library preparation techniques and kits became available, allowing us to sequence less than 1 ng of DNA. The previous library prep method required around 50 ng of DNA, so we would have had to use whole genome amplification to acquire that much input material.

“The viruses were particularly intriguing because they have the potential to influence composition and pathogenicity of the bacterial component of the skin microbiome,” Grice continues. Indeed, a principal motivation for doing this analysis was to establish a baseline

MINITOPIC

Microorganisms at Cross-Purposes, Leaping across Biological Kingdoms

Here are several unusual examples of microorganisms working across biological kingdoms, often to the detriment of other organisms that they encounter:

- Leafhopper insects transmit bacteria, called phytoplasmas, whose SAP54 protein apparently interferes with the K domain of transcription factors in plants that then, instead of flowering, form only vestigial leaf structures, effectively converting those infected plants into “zombies,” according to Rainer Melzer of Friedrich Schiller University Jena in Jena, Germany, and his collaborators. Details appeared 10 October 2015 in Trends in Plant Science (doi:10.1016/j.tplants.2015.08.004).

- The algae-infecting Chlorovirus, called Acanthocystis turfacea chlorella virus 1, also can infect and replicate within mammalian macrophage cells, triggering a range of responses, including those that can impair cognitive functions in mammalian hosts, according to David Dunigan of the University of Nebraska, Lincoln, and his collaborators. Details appeared 23 September 2015 in the Journal of Virology (doi:10.1128/JVI.01254–15 JVI.01254–15).

- Fungi associated with the roots of milkweed plants change the nutritional and medicinal chemistry of milkweed leaves—in turn, affecting protozoan parasites as well as monarch butterflies that feed on those leaves, according to Jaap de Roode of Emory University in Atlanta, Ga., and his collaborators. Details appeared 13 October 2015 in Proceedings of the Royal Society B (doi:10.1098/rspb.2015.1993).

- Sphaerothecum destruens, an emerging intracellular fungal pathogen, is causing disease in commercial sea-bass farms in the Mediterranean region while threatening other freshwater fish species in Europe, according to Rodolphe Elie Gozlan of Institut de Recherche pour le Développement in Paris, France, and his collaborators. Details appeared online in September 2015 in Emerging Microbes & Infections (doi:10.1038/emi.2015.52).

- Networks within the below-ground plant-fungal world do not follow the typical nested architecture seen aboveground but instead show a much wider array of architectures, according to Hirokazu Toju at Kyoto University in Kyoto, Japan, and his collaborators in Brazil, Denmark, and the United States. Details appeared 23 October 2015 in Science Advances (doi: 10.1126/sciadv.1500291).