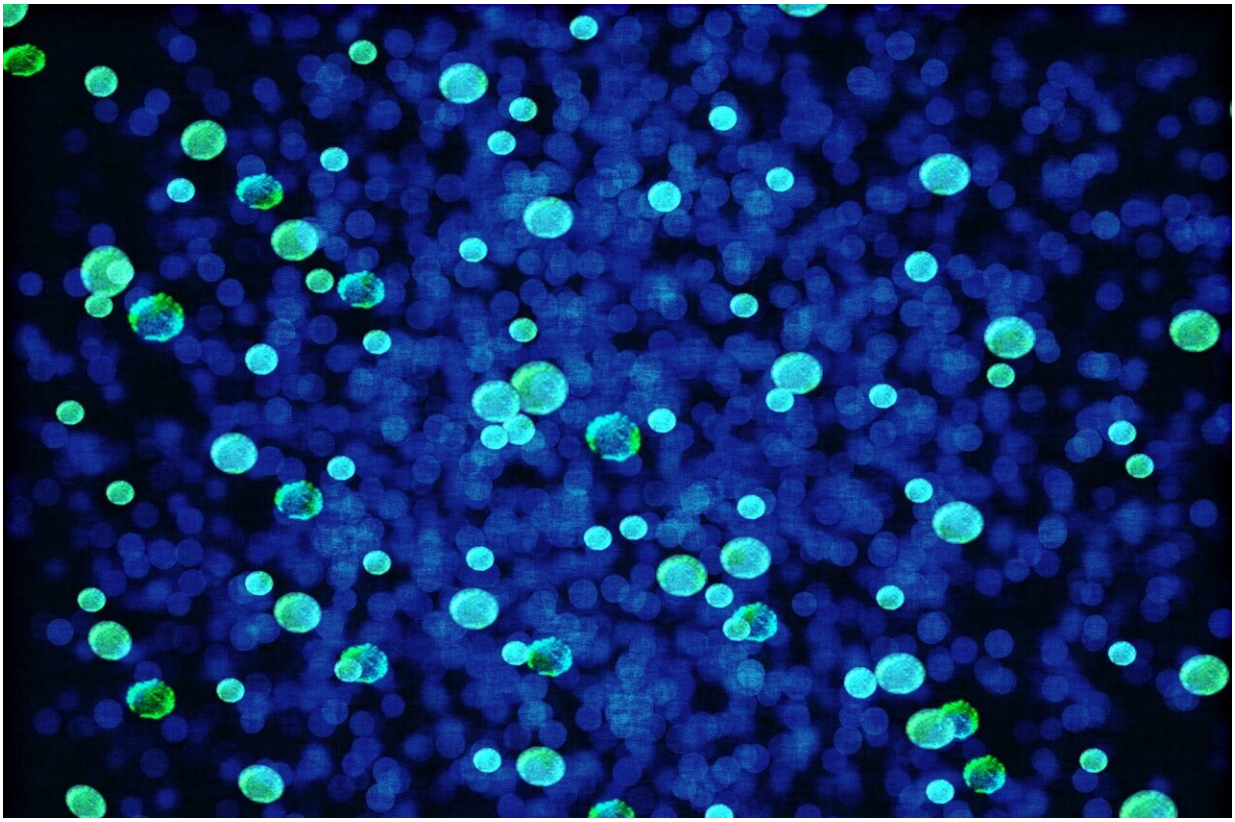
New ASM Academy report shows critical role microbes play in climate change

April 22 2022



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The American Society for Microbiology (ASM) has issued a new report, Microbes and Climate Change: Science, People, & Impacts, examining the relationship between microbes and climate change. As major drivers

of elemental cycles and producers and consumers of 3 of the gases responsible for 98% of increased global warming (carbon dioxide, methane and nitrous oxide), microbes have a pivotal impact on climate change and are, in turn, impacted by it. To fully understand how to adapt to climate change, it is critical to learn how our changing climate will impact microbes and how they relate to humans and the environment.

The World Health Organization identified climate change as "single biggest health threat facing humanity in 2021," having adverse impacts on water quality, food security and global economies. Additionally, a recent report from the Intergovernmental Panel on Climate Change (IPCC) found changes to Earth's climate in every region of the world, noting the unprecedented scale and speed in warming of the planet's surface over the last 200 years.

"For a problem as complex climate change, we need novel approaches, new tools, and unconventional mindsets," said Arturo Casadevall, M.D., Ph.D., Chair of the Academy Governors at the American Society for Microbiology. "Moreover, we need to encourage partnerships between diverse scientists, policymakers, and entrepreneurs, and incentivize innovation to harness the power of microbes, which are critical to tackling climate change."

"ASM's new colloquium report underscores that in the quest to find solutions for climate change, we, as a society and scientific community, have new opportunities to use microbes to our benefit," said Nguyen K. Nguyen, Ph.D., Director of ASM's American Academy of Microbiology.

This report is the outcome of ASM's November 2021 colloquium meeting, which brought together more than 30 experts from diverse disciplines and sectors who provided multifaceted perspectives and insights.

A companion paper, "Microbes and Climate Change, a Research Prospectus for the Future," was published this week in ASM's open-access journal, *mBio*. The *mBio* paper builds on concepts discussed at the November colloquium meeting and provides an extended view and opinions on research needed to fill in the knowledge gaps.

The microbial sciences can provide us with invaluable insights in how to adapt to climate change and its cascading effects. From developing alternative fuels to preventing the spread of pathogens, the applications of microbes are vast and far-reaching. The report details major recommendations for researchers, policymakers and regulators.

Key report recommendations:

- Emphasize interdisciplinary research focused on understanding how microbial activities and metabolic flux alter as climate, precipitation, and temperatures change globally.
- Provide guidance for experimental design and data collection for studying microbial communities that allows for data comparison across diverse and global ecosystems.
- Incorporate existing data about microbial diversity and activity on consuming and producing greenhouse gases into Earth-climate models to improve the current and predictive performance of models.
- Increase research investments to generate knowledge and awareness of the contribution of microbes to the generation and consumption of warming gases; incorporate these findings into evidence-based policy and regulatory strategies to address climate change.
- Deploy increased surveillance and detection of zoonotic and vector-borne diseases in animals and humans, including through next generation sequencing technologies, and incorporate a One Health approach to addressing climate changes' effects on

humans, animals, and our environment.

To learn more about the impact of microbes on climate change, visit the American Society for Microbiology's Microbes and Climate Change resource page and read the article, What Microbes Can Teach Us About Adapting to Climate Change.

More information: James M. Tiedje et al, Microbes and Climate Change: a Research Prospectus for the Future, *mBio* (2022). DOI: 10.1128/mbio.00800-22

Provided by American Society for Microbiology