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National project to harness microbes for health, environment

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We share our bodies and surroundings with teeming communities of microbes that are crucial to the health of people and the planet, and now the Obama administration is beginning a major project to better understand those invisible ecosystems—and even control them.

The National Microbiome Initiative announced Friday at the White House aims to bring together scientists who study the microbes that live in the human gut and in the oceans, in farm soil and inside buildings, to speed discoveries that could bring big payoffs.

Consider: Taking antibiotics alters the diversity of your gut bacteria, which eventually settle into a new normal. The 2010 oil spill altered microbes in the Gulf of Mexico, which likewise settled into a new normal, said Dr. Jo Handelsman, associate director of the White House Office of Science and Technology Policy.

Despite the parallels, "we have no idea if that's a healthier norm or a less healthy norm than before, and no idea how to fix it," said Handelsman, who led development of the initiative.

Leading researchers have long urged a national collaboration as the best way to learn how microbes interact with each other and their environments.

"I'm excited. It's a long time coming and much-needed endeavor," said Dr. Jack Gilbert, a microbiologist at the Argonne National Laboratory

and University of Chicago who pushed for the project. "We need to understand the microbial engine of the earth."

The U.S. government spends about $300 million a year on microbiome research, until now mostly an effort to catalog different communities of bacteria, viruses and other microbes. The National Microbiome Initiative will add $121 million this year and next for ecosystem-crossing federal research on microbes themselves and the tools needed to harness them.

High on the wish list from scientists at Friday's White House meeting: Hand-held sensors for real-time detection of microbes in air, soil, water or people.

The initiative will "give us a warp drive for microbiome research," Dr. Samantha Joye of the University of Georgia, whose own studies have uncovered how dramatically microbes fluctuate after oil spills, told the meeting.

And in partnership with the government, dozens of universities, foundations and other organizations have pledged to invest more than $400 million in additional microbiome research investments, Handelsman said.

Among them, the Bill and Melinda Gates Foundation announced Friday it would invest $100 million over four years to study microbiomes that affect childhood malnutrition, which kills youngsters in developing countries and stunts the growth and brain development of survivors, as well as microbes that affect grown in sub-Saharan Africa.

Microbiomes are a hot field. One project focusing on people revealed that trillions of microbes live on our skin, in our noses, in our intestinal tracts, and that many of them play critical roles in keeping us healthy. Scientists now are studying how differences in gut bacteria play roles in

a range of health outcomes, from asthma to obesity. It's captured the public's imagination, with people joining citizen-science efforts to learn which bugs they harbor.

But the planet harbors large numbers of microbiomes that get less attention despite performing vital jobs. Microbes in the ocean suck carbon out of the air to moderate global warming, for example. Understanding which soil bacteria help different plants grow could let scientists boost food production or repair eroded cropland. In indoor environments, people shed what's called a "microbial cloud" that has implications both for health and for forensics.

"This is a microbial planet," said Dr. Lita Proctor, who oversees microbiome research at the National Institutes of Health. "Everything that's driving all the ecosystems, including human beings, is driven by microbial processes, yet we've been fairly ignorant of their activities."

The ultimate goal is to control and alter microbes to improve either human or environmental health. One of the few successful attempts so far is a fecal transplant, used to cure patients with a life-threatening intestinal infection by replacing their own damaged gut bacteria with a donor's healthy bugs. Better, Handelsman said, would be to learn exactly which species of bacteria are the ones needed and offer precise therapy.