The Interagency Microbiome Strategic Plan

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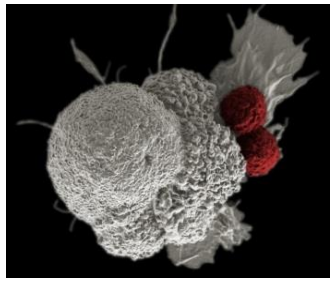
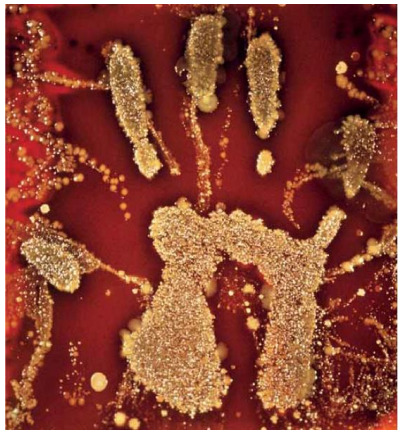
Microbiomes Are Everywhere

Microbiomes are microbial communities existing within greater systems that are organic (including human, animal, plant, insect) or inorganic (soil, water, manufactured products and the built environment) in nature.





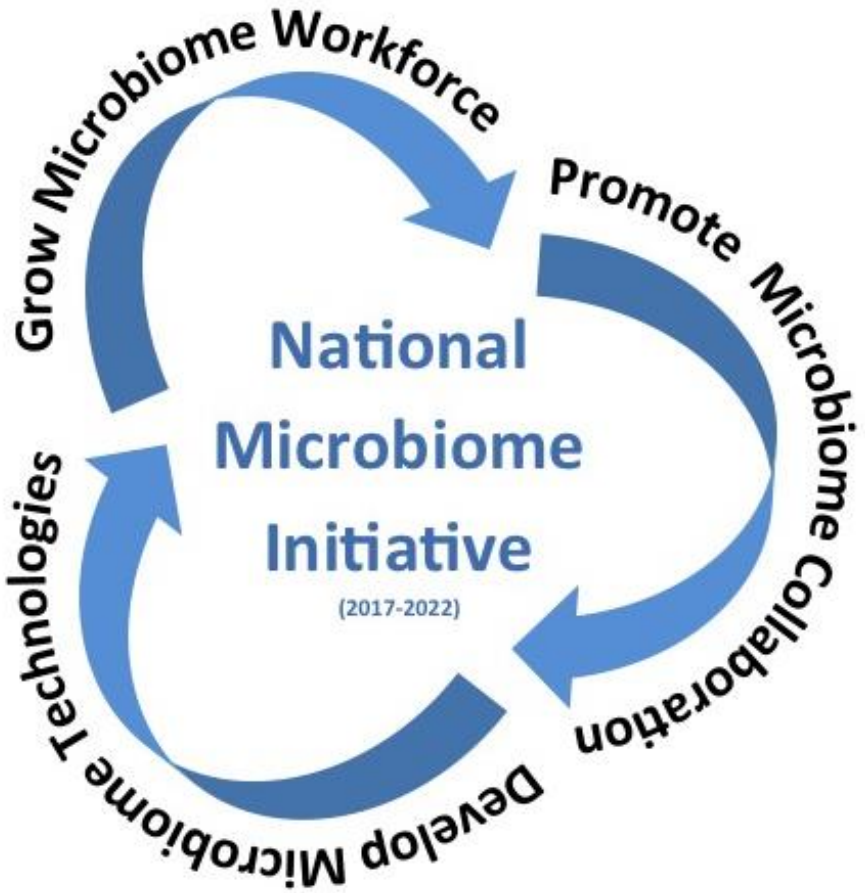
“Microbiome science aims to advance understanding of microbial communities (microbiomes) for applications in areas such as health care, food production, and environmental restoration to benefit individuals, communities and the planet.”

Microbiome Target Area	Includes
Agriculture	Crops, soils, food animals, food safety, insects, disease, aquaculture, pollinators, energy crops.
Aquatic	Oceans, lakes, streams, reservoirs, sediments, estuaries, service animals, coastal, coral reefs, extreme environments, oil spills, marine animals, marine sediments, lake sediments, invasive species, ice.
Atmospheric	Aerosols, clouds, dust events (local and intercontinental).
Built Environment	Water and sewage treatment, water and sewage lines, hospitals, daycare facilities, assisted living facilities, home plumbing and air handling systems, submarines, ships, airplanes, International Space Station.
Human	GI tract, respiratory tract, oral, otic, urogenital, brain, skin, cardiovascular system, blood, immune system, many diseases associated with these organ systems and body regions.
Energy (non-agricultural)	Feedstock development for bioenergy, coal/oil/natural gas recovery, conversion and synthesis of bio-products, biofuels.
Laboratory	Animal model, plant model, soil, synthetic microbiome, biofilms, bioinformatics, and/or in silico, but not directly involving humans.
Terrestrial (non-agricultural)	Forest, desert, mountains, grasslands, invasive species, nutrient cycling, contaminated sites, caves, wild plants, insects and animals, Arctic and Antarctic.

More than 23 Federal Agencies Cover the Wide Array of Microbiome Topic Areas

	USAID	NIST/DOC	NOAA/DOC	DOD	SC/DOE	EPA	CDC/HHS	FDA/HHS	NIH/HHS	DHS	NPS/DOI	USGS/DOI	NIJ/FBI/DOJ	NASA	NSF	SI	ARS/USDA	FS/USDA	NIFA/USDA	NRSC/USDA	VA
Agriculture	X	X	X	X	X			X				X			X	X	X	X	X	X	
Aquatic		X	X	X		X						X		X	X	X		X			
Atmosphere								X		X		X		X	X		X		X		
Built Environment		X		X		X	X	X		X			X	X	X						X
Human	X	X		X		X	X	X	X				X	X	X	X	X		X		X
Energy				X	X							X									
Laboratory			X	X	X	X	X	X	X	X		X		X	X	X	X	X	X		
Terrestrial				X	X	X			X		X	X	X	X	X	X	X	X	X	X	

Federal agencies have converged on **three** recommended areas of focus for microbiome science that could enable a potentially transformative understanding of the role of microorganisms across a wide range of ecosystems



Objective #1: Support Interdisciplinary Research

- Multidisciplinary research, including those integrating the biological, computational, and chemical sciences as well as mathematics and statistics;
- Coordination of research investments across Federal agencies to maximize efficiency and reduce duplicative efforts;
- Research partnerships with the private sector and the international community to leverage non-Federal investments and accelerate translation from the laboratory to the field;
- Development of networks, tools, and technologies for improving access to, and distribution of, microbiome datasets.

Objective #2: Develop Platform Technologies

- Develop robust and consistent standards.
- Support open and transparent microbiome data
- Further develop analytical technologies

Objective #3: Expand the Microbiome Workforce

- Provide training opportunities for young scientists, including members of under-represented groups
- Support the education, training, and recruitment of experts in target fields deemed critical by the research community
- Advocate strong outreach to ensure the rapid transfer of microbiome information and technologies to end users

Agency Interest in Strategic Research Objectives

	Promote interdisciplinary collaboration	Support key technology development (i)	(ii)	(iii)	Support human resource development
USAID	+			+	+
NIST/DOC	+	+	+	+	
NOAA/DOC	+		+	+	+
DOD	+	+	+	+	+
SC/DOE	+		+	+	+
EPA	+	+	+	+	+
CDC/HHS	+	+	+	+	+
FDA/HHS	+	+	+	+	+
NIH/HHS	+	+	+	+	+
DHS	+	+	+		
NPS/DOI	+				
USGS/DOI	+		+	+	+
NIJ/FBI/DOJ	+		+	+	+
NASA	+	+	+	+	+
NSF	+	+	+	+	+
SI	+	+	+		+
ARS/USDA	+	+	+	+	+
FS/USDA	+	+	+	+	+
NIFA/USDA	+	+	+	+	+
NRCS/USDA	+	+	+	+	
VA		+	+	+	+

Strategic Research Areas

- **Human Health and Safety**
  - Human health and disease
  - Antimicrobial resistance
  - Human nutrition
  - “Built” environments
- **Food Production**
  - Soil health
  - Crop health
  - Animal health
  - Food safety
- **Energy**
  - Waste Conversion and Utilization
  - Sustainable Bioenergy Crop Production
  - Production of Renewable Resources
- **Ecosystem Services**
  - Wildlife Health and Conservation & Natural Resource Management
  - Chemical, Metal, Water, and Carbon Cycles
  - Bioremediation and Phytoremediation of Contaminated Areas

The Interagency Microbiome Strategic Plan will Follow Four Broad "Operating Principles"

- Coordination of microbiome research across Federal agencies will be guided by a Federal Strategic Plan for Microbiome Research, to be updated every five years to ensure goals are met and revised as needed to reflect up-to-date science and unmet research needs.
- The plan is coordinated by an interagency working group with inclusive representation.
- All resources including data, software, microbial stocks, and other biological materials should be made openly accessible while complying with Institutional Review Board (IRB) consents and national security concerns.
- Extramural awards should be made on a competitive basis with peer review.

Additional Points

- Collaboration with non-Federal bodies (e.g., academic institutions, nongovernmental entities, industry)
- Consistent and reliable database and resource coordination to facilitate interoperability and data sharing
- International coordination and collaboration

Acknowledgements

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