Microbiology Society written evidence to the House of Commons Science, Innovation and Technology Committee inquiry on what MPs should put under the microscope

What area of science and technology do you think we should be looking at over the next Parliament?

The microbiome is an essential ecosystem that warrants attention. It is a dynamic habitat of micro-organisms, their functions and related components within a specific host or environment. The community of micro-organisms within a microbiome, the microbiota, can be highly diverse, with bacteria, viruses, fungi and other microbes contributing to a complex network of interactions.

Microbiomes drive fundamental life processes, they inhabit all organisms: humans, animals and plants, as well as environments such as soils and oceans. Microbiomes and their outputs play a role in the health, disease and ageing of humans and animals. For example, the gut microbiome affects nutrient absorption and immune system development while the soil microbiome supports soil fertility, crop productivity and stress tolerance. As a complex system, the microbiome can be affected by small changes in our ecosystems, such as the food we eat and the antibiotics we consume.

Adopting a One Health lens to the microbiome recognises that micro-organisms are closely linked and interdependent, creating a global ecosystem. Applications of the microbiome span across humans, animals and the environment. An integrated, holistic perspective will lead to the development of innovative microbiome research and products.

Why does it matter to you?

Recent advances in microbiome science hold transformative potential across many sectors e.g. healthcare, environmental sustainability and biodiversity conservation. However, unlocking this potential calls for applications across humans, animals and the environment with coordinated efforts between stakeholders. A One Health approach is urgently needed to break down siloes and foster collaboration across disciplines and sectors. Clear regulations and guidelines for microbiome-based interventions and products should be established.

A One Health approach to the microbiome can transform microbiome research and the bioeconomy, with the global human microbiome market projected to reach $1.2 billion by 2030. Microbiome research could optimise or innovate existing processes to develop industrial, pharmaceutical and environmental biotechnologies: food, drink, biofuels, drugs, water treatment and waste bioremediation. In healthcare, microbiome research could support the development of diagnostics and interventions with the potential to revolutionise the NHS, by shifting from a one-size-fits-all approach to personalised medicine. Microbiome research can also help to confront antimicrobial resistance, a One Health issue, by identifying alternative therapies to reduce antibiotic reliance.

What do you think the Government should do about it?

- Establish clear regulatory pathways. Work with policymakers and regulators to develop appropriate regulations and guidelines for microbiome-based interventions and products (e.g. probiotics, prebiotics and faecal microbiota transplantation) that align with a One Health approach. This would support research translation while protecting consumers.
- Encourage coordination and collaboration. Implementing a One Health model to the microbiome requires coordination among researchers (human, animal and environmental microbiologists), funders, industry, healthcare professionals, regulators, policymakers and end-users. Creating environments that facilitate knowledge exchange can foster an efficient discovery to innovation pipeline.
- Support a shift to One Health. Transition from primarily focusing on the human microbiome to a broader consideration of the human-animal-environment interface. This requires policy support and continuous investment in One Health education, training and research funding.