Symbiotic Science through a Shared Language

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From the soil below our feet, to inside our bodies, microscopic organisms live their lives. These microbes, including bacteria, archaea, viruses, fungi and other tiny organisms, have significant impacts on their environment. For example, microbes in our intestines play key roles in digestion.

Studying microbes is therefore a rich scientific discipline that helps us understand the world around us and solve many challenges. Microbiome science has already provided us with medicines, gene therapy, and methods of breaking down waste products.

Theoretical frameworks from other disciplines can be applied to microbial communities. Ecological theory is particularly valuable, as it offers methods of studying organisms interacting with each other and their environment. However, a lack of consistent terminology between ecology and microbiome science hinders collaboration.

With this in mind, Dr Laura Tipton of Chaminade University and her colleagues investigated the history of ecological terminology, towards building a common language that bridges ecology and microbiome science.

The first term they investigated is 'biome', which originated in the 1930s to encompass plant and animal communities, and their environments. However, the term 'microbiome', which is used to describe microbial communities, has attracted controversy over its definition.

Dr Tipton discovered that this boils down the question: does the word microbiome derive from the suffix '-ome' meaning 'all of', or is it a portmanteau of the words 'microbe' and 'biome'? Consensus favours the latter. Thus, 'microbiome' is all the microbes within a community and their environment.

The second term they explored is 'diversity'.

Some ecologists argue that a simple count of the number of species within a group – known as 'species richness' – is an insufficient measure of diversity, and that 'evenness' must also be included.

Consider two ecosystems – A and B – each containing three species. In group A, one species accounts for 94% of the individual organisms. In group B, each species is equally abundant. Group A has low evenness, whereas group B has high evenness. So even when richness is the same, evenness can alter the diversity. However, many ecologists and microbiome scientists use the term 'diversity' interchangeably.

'Symbiosis' is the third term considered by Dr Tipton. Scientists originally used 'symbiosis' to refer to all relationships between species, from 'parasitism', where a parasitic species benefits at another species' expense, to 'mutualism', where both species benefit.

However, symbiosis remains incorrectly used in microbiology, often referring exclusively to mutualistic relationships.

Dr Tipton suggests that 'symbiosis' should be used broadly and with a modifier to express the specific relationship – for example, 'mutualistic symbiosis' or 'parasitic symbiosis'.

Dr Tipton's work in defining the concepts shared by ecology and microbiome science is the first step towards developing a shared language between these disciplines, which will be vital for enhancing future collaboration and scientific advancement.

Summary of the paper **'A Developing Symbiosis: Enabling Cross-Talk Between Ecologists and Microbiome Scientists'**, in *Frontiers in Microbiology*. doi.org/10.3389/fmicb.2019.00292