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Where, when, and how environmental and food microbiomes meet each other

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The microbiome can be considered a network of interactions in a contiguous environment among living microorganisms (constituting the microbiota), structural elements, metabolites, and the habitat. The characterisation, preservation, and reproduction of in toto microbiomes of different origins (such as terrestrial, aquatic, atmospheric, food, and living host) is one of the most current challenges for scientists to face. The complexity of these interactions can make it difficult to understand several biological processes in the microbiome, assess the composition of alive microorganisms able to make activities, and realise what they are acting, at the time of the investigation. Among microbiomes, those of soil origin can include microorganisms having a crucial role in nutrient cycling, maintenance of soil fertility, and carbon sequestration, whereas, among those of food origin, starter cultures contain microorganisms added to raw food matrices, normally already colonised by resident microbiota, to achieve an attractive and durable product with peculiar characteristics. While there is great awareness of the high level of complexity of soil microbiomes, it is commonly argued that those of food origin are generally considered less complex, though there is still a great unknown in understanding the microbial composition and the interactions among the players involved even in this type of microbiome. In this context of complexity, scientists investigating microbiomes of different origins generally follow distinct approaches and techniques, culture-dependent and –independent, and multi-omics (i.e. metagenomic, metatranscriptomic, metaproteomic, and metabolomics). The improvement of culturing strategies to recover as much as possible of the microbial biodiversity composing the microbiomes, as well as the enhancement of genomics approaches to a better understanding of the role of horizontal gene transfer and viruses in microbiome evolution would be valuable. But above, greater and more cohesive interaction among scientists from different research fields could help a faster and more accurate characterisation of microbiomes. Indeed, normally, scientists involved in a specific research field read papers, attend conferences, and interact mainly with scientists in the same field. This presentation aims to be a stimulus for scientists investigating different research fields to collaborate, exchange knowledge and ideas, and use their skills to better unravel the complexity of the different matrices that teem with the invisible world of microbial communities.