Environmental Microbiome in the context of risk assessment, a roadmap for the future and sharing of expertise between laboratories

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INTRODUCTION

Microbiome refers to communities of microorganisms and their genome in a defined environment. The study of microbiomes has become particularly popular in the last decades, since ecological communities of commensal, symbiotic and pathogenic microorganisms have been considered determinant for plant and animal health.

Presently, there is no guidance or methodology in place to account for the structure and dynamics of environmental microbiomes and how they can be included in risk evaluation.

The Walloon Agricultural Research Center (CRA-W) and the Catholic University of Louvain (UCLouvain) combined their expertise to explore existing data and tools. The purpose of the project, co-financed by EFSA (GP/EFSA/ENCO/2020/02) is to define a roadmap for the potential integration of microbiome considerations under risks assessments within EFSA's remit.

METHODOLOGY

The first step consists of an extensive review of the existing literature on the subject, which encompasses various ecosystems and wildlife organisms. The information will be scrutinized in order to estimate what a healthy baseline is, if it exists and can be defined and what are the beneficial or detrimental impacts on a microbiome.

Another aspect of the review relates to the different omics techniques and tools associated with microbiome studies. Data quality, harmonisation and correct interpretation are essential for the comparison of results between laboratories and identification of potential risks.

Such work requires varied expertise and exchange of data between laboratories. This can be realised through a network of laboratories sharing expertise in the field.

RESULTS

The state of the art started in 2021 and is still ongoing, as well as the appreciation of baseline fluctuations and the identification of functionalities. Numerous studies on environmental microbiomes are available but the information needs to be scanned to find convergences useful for a future roadmap. Countries outside the EU, such as the USA, Canada, China, India, Israel and the UK hold important skills that are useful for capacity building in the context of risk assessment.

Regarding the techniques used to describe the microbiomes, amplicon sequencing and metagenomic approaches are more advanced than the metabolomic and transcriptomic ones, but these later remain complementary.

DISCUSSION

Due to the high number of considered microorganisms, types of samples and techniques, the project will require a joined expertise approach.

To facilitate the exchange and structuration of knowledge, fill the gaps and overcome the barriers related to data harmonisation, this project aims to launch the basis of a European Network of Microbiome Laboratories. CRA-W and UCLouvain will organise meetings where laboratories can exchange information on specific topics in order to facilitate the harmonisation, standardisation and integration of methodologies and technologies in control laboratories. They will propose a joint network of expertise. This will stimulate environmental microbiome knowledge for risk assessment.