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Contaminants of emerging concern in the wastewater-soil-crop continuum

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Climate change is widely recognized during the recent decades, and therefore water availability and management issues are of special significance worldwide. Agriculture is likely to encounter the most serious threats due to water scarcity, as it is the major consumer of water. To address this challenge, reclaimed water reuse is a strategy that is gaining wide acceptance and is rapidly expanding.

In this framework, there is a need to look beyond the conventional contaminants when assessing the potential risks of reclaimed water reuse with respect to ecosystems and human health and this is now recognised as a priority issue in all policy areas at the EU level and beyond. The fate of Contaminants of Emerging Concern (CECs) like pharmaceuticals as well as their transformation products during reuse needs to be understood. The mechanisms associated with their uptake by crops has been the focus of various studies in the last years. The extent of the uptake is mainly determined by both biotic (e.g., plants' genotype/physiology, soil fauna) and abiotic factors such as temperature, wind speed, UV radiation, salinity, drought, environmental pollution.The physicochemical properties of CECs and soil composition constitute the main abiotic factors that influence the potential for uptake.

Most studies either conducted in controlled laboratory or greenhouse conditions or under field or simulated conditions, employed mostly vegetables and cereals and fodder crops. Experimental results revealed that the potential for CECs uptake decrease in the order of leafy vegetables > root vegetables > cereals and fodder crops > fruit vegetables.

It has become clear that new strategies consistent with the precautionary principle and the "One Health" approach are needed to assess the overall quality of wastewater intended for reuse. Knowledge with regard to risks that relate to low-dose exposure of CECs to non-target organisms, the additive/synergistic behaviour of various CECs in mixtures, crops' uptake, and antibiotic resistance is only now starting to shape.

This keynote talk will address the presence of CECs in influent wastewater, their fate during treatment, their presence in effluent wastewater, and their fate while in the environment during reuse for irrigation.