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Application of chemical electrolysis in water for the removal of organic pollutants. AQUAROX

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BACKGROUND

- New REGULATION (EU) 2020/741 on minimum requirements for water reuse that considers other parameters not included in the previous Spanish RD (RD 1620/2007), such as *Clostridium perfringens* spores and contaminants of emerging concern (disinfection by-products (DBP), pesticides, pharmaceuticals, etc.).
- Due to water stress and climate change, water reuse is a reliable alternative to conventional water resources and a necessity to ensure agricultural production. This activity may pose environmental and health risks due to:
  - The disinfection systems commonly used, generally chlorination and to a lesser extent ultraviolet are not effective in eliminating *C. perfringens* spores.
  - Current treatment technologies do not allow the complete elimination of emerging pollutants, that are continuously discharged into the environment through treated water.
  - Most of the current disinfection technologies, such as chlorination, involve the addition or generation of toxic DBP to the water, such as chlorates, trihalomethanes or haloacetic acids.

Need for technological changes for a correct management and treatment of wastewater, reducing the environmental and health impact, and ensuring the production of quality agricultural products.

PROPOSAL

Evaluation of the current situation of treated wastewater from the agri-food industry, considering the new reuse regulation.

Study of the effectiveness of alternative technologies such as chemical electrolysis for the disinfection and elimination of emerging pollutants from wastewater, thus complying with the requirements established in the new EU Regulation.

OBTAINED RESULTS

Work package 1: Wastewater characterisation

Determination of emerging contaminants: phytosanitary products and pharmaceuticals.

Detected compounds in treated wastewater

WASTEWATER ORIGIN	Citrus processing	Strawberry processing	Urban WWTP
Pesticides	Imazalil, Thiabendazole	Fenhexamid	Chlorpyrifos Imidacloprid Acetamiprid Cypermethrin
Drugs	Not detected	Not detected	Acetaminophen Salicylic acid Diclofenac Ibuprofen Ketoprofen Naproxen Ofloxacin Venlafaxine

Determination of microbiological quality: *E. coli* and *C. perfringens* spores

WASTEWATER ORIGIN	Citrus processing	Strawberry processing	Urban WWTP
E. Coli (cfu/mL)	<100 - >100.000	<100 – 3.000	<100 – 1.500
***C. perfringens* spores** (cfu/mL)	<10 – 170	<10	<10 – 3.000

EXPECTED RESULTS

Work packages 2-4: Evaluation of the effectiveness of electro-oxidation treatment on wastewater

At the end of these work packages:

- The **efficacy** of wastewater treatment by **electrochemical oxidation** with different electrodes for disinfection and emerging pollutants removal will have been evaluated.
- Similarly, it is expected that the solution provided by the project will be **industrially applicable**, guaranteeing the safe reuse of wastewater. To this end, in addition to technical and quality criteria, transfer and economic criteria will be evaluated to facilitate its **implementation**.

For any additional information regarding this project: www.ctnc.es, or National Technological Centre for the Food and Canning Industry CTNC. Calle Concordia s/n 30500 Molina de Segura, Murcia, Spain. Tel: +34 968389011 ctnc@ctnc.es

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