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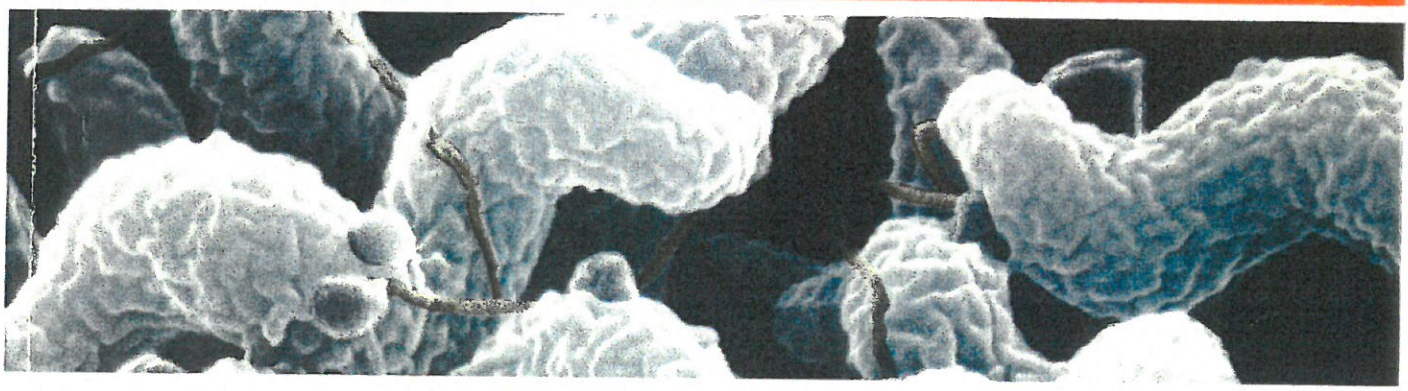

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PEC2.54 **Faecal contamination and hygiene aspects of soil and tomatoes (*Solanum lycopersicum*) irrigated with partially treated wastewater**

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The demand for fresh produce by European consumers has increased dramatically over the last century and water has become one of the key limiting factors to achieve increased crop production. The European Water Framework Directive therefore promotes and encourages the safe use of treated urban wastewater in agriculture. The application of wastewater through subsurface drip irrigation lines may reduce contact with surface soil as well as minimizing contamination of vegetables grown above soil. To test this hypothesis, the faecal contamination of soil and tomatoes irrigated by sprinkler irrigation as well as surface and subsurface drip irrigation with treated urban wastewater were compared at experimental sites on Crete and in Italy. Water, soil and tomato samples were collected at regular intervals during two cropping seasons and enumerated for the faecal indicator bacterium *E. coli* and helminth eggs. Control plots were irrigated with tap water.
The study found elevated levels of *E. coli* in irrigation water (Italy mean: 246 cfu/100 ml and Crete 113 cfu/100 ml), but low concentrations of *E. coli* in soil (mean: Italy 1.8 cfu/g and Crete 2.2 cfu/g) and found even lower concentrations on tomatoes (Italy mean: 0.0 cfu/g and Crete 1.4 cfu/g). The vast majority (>85%) of all collected sample types were free of *E. coli*. No helminth eggs were found in the irrigation water or on the tomatoes from Crete. Two tomato samples from Italy contained helminth eggs (mean: 1.02 eggs/L) and had been irrigated with treated wastewater and tap water. A quantitative microbial risk assessment (QMRA) model proposed by the WHO with Monte Carlo simulations found the use of tap water and treated wastewater to exceed permissible limits as proposed by the WHO ($1.0x10^{-3}$ disease risk) for the accidental ingestion of soil by farmers (Crete: $7.2x10^{-1}$ and Italy 1.0). The QMRA found that the consumption of tomatoes in Italy was deemed to be safe while permissible limits were exceeded on Crete ($1.7x10^{-1}$). Despite that the presence of *E. coli* was unlikely to have originated from the irrigation water, but rather from other environmental sources, like wildlife, the WHO QMRA model found wastewater irrigation unsafe. This clearly indicates that the WHO QMRA model also needs to take in consideration non water sources of faecal contamination.

PEC2.55 **Growth Inhibition of *Listeria monocytogenes* in semi-hard gouda cheese; establishing relevant determinants for a risk assessment**

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Semi-hard Gouda cheese produced from pasteurised milk is considered a safe product with regard to *Listeria monocytogenes*; a previous challenge test showed that growth of *L. monocytogenes* is not supported. The pH of the product is between 5.2 and 5.4, and the Aw is 0.94 to 0.96, which indicates that additional antimicrobial effects play a role in growth suppression of listeria. The aim of the current study is to investigate the impact of inhibiting factors including organic acids, pH and competitive flora on survival and growth of *L. monocytogenes* and integration of these data in a risk assessment.
Methods: The MICs (minimal inhibitory concentrations) of undissociated organic acids (lactic, acetic, propionic and citric acid) for growth of individual and combinations of *L. monocytogenes* strains (dairy strains as well as reference strain Scott A) have been determined in culture media, using pH and concentration ranges which are relevant for semi-hard cheese. Additionally, challenge tests in microscale cheeses have been performed to assess the effects of organic acid, pH, competitive flora and salt on growth inhibition of *L. monocytogenes*.
Results: The concentrations of organic acids in combination with the pH determine the concentrations of undissociated organic acids in semi-hard Gouda cheese. Our analysis showed that lactic and propionic acid are the most effective growth inhibitors of *L. monocytogenes* in semi-hard Gouda cheese; acetic and citric acid contribute less to growth inhibition. Prelimi-