

Abstract Title:

Analytical extraction of estrogens from soil/water system

Authors / addresses:

Martina Hvězdová, Eliška Čechová, Branislav Vrana, Zdeněk Šimek*

Research Centre for Toxic Compounds in the Environment, Faculty of Science, Masaryk University, Kamenice 753/5, 625 00 Brno, Czech Republic

*corresponding author, simek@recetox.muni.cz, tel.: +420549494964, fax: +420549492840

Core text:

Estrogens belong to endocrine disrupters and were found in the environment. They may affect the balance of the organisms even at low concentration levels which may be followed by an increased incidence of disease in animals and human beings. In manure applied to the soil for increasing its fertility, estrogens can be found along with antibiotics, urine and other compounds. Interactions between estrogens and other compounds can affect microbial transformation, sorption in soil phase and/or leaching of soil estrogens into groundwater.

An assessment of extraction methods potentially applicable for description of distribution of estrogens in the soil/water system is presented in this study. The Soxhlet warm and QuEChERS extractions were used for these purposes. The effect of compounds co-extracted from water and soil phase having been in mutual contact on LC/MS/MS determination of estrogens was studied for various soil samples with different values of total organic content. The effect of matrices extracted from soil using different extraction solvents was compared. The lowest matrix effect was observed when acetone was used.

Estrogens in water resp. 0.01M CaCl₂ were added to the sterilized soil and the distribution of estrogens in the system was studied. Estrogens have high sorption affinity to soils according octanol-water partition coefficient and major amount was found in soil phase. The matrix effect on LC/MS/MS analyses of estrogens increased in the case of CaCl₂ comparing to pure water.

The measurement of sorption isotherms in 0.01 M CaCl₂ environment can cause underestimation or overestimation of estrogen sorption in soil: system water in comparison with pure water environment. Therefore the conditions used for a study of estrogens sorption should be carefully chosen. The autoclave sterilization of soil is needed for sorption studies, because of rapid microbial transformation and degradation of estrogens during sorption experiments.