



## **Spatial Distribution of natural Estrogens in differently manured agricultural Soils**

J. Beck (1), K.U. Totsche (2) and I. Koegel-Knabner (1)

(1) Lehrstuhl fuer Bodenkunde, TU Muenchen, Germany, (2) Fachgruppe Hydrogeologie, FSU Jena, Germany (beckj@wzw.tum.de / Phone: +49-8161-71-5266)

Feminisation of male fish in rivers makes us think about endocrine disrupting effects of artificial and natural substances released to the environment. Manure is one source of natural estrogens and is spread on agricultural soils regularly. These estrogens may reach the ground and surface water e.g. by seepage, interflow or overland flow. Studies on sorption and biodegradation of estrogens in soils show high log KOC-values above 3 and a fast estrogen reduction in batch solutions. Hence, relocation of the estrogens seemed to be unlikely. In contrast a fast estrogen breakthrough was observed in column experiments. For risk assessment it is necessary to know more about field situation, estrogen input and their distribution.

We investigated the fate of the principal natural estrogens of dairy manure in soils: 17 $\alpha$ -estradiol, 17 $\beta$ -estradiol, estrone and estriol. Field samples of crop land and pastures that are managed in different intensity should give information about estrogen amounts and distribution in soils. 4 crop land plots and 3 pasture plots were sampled in a regular orthogonal sampling grid with 5m spacing. After pressurized liquid extraction, purification and enrichment estrogens were determined by GC-MS.

In the crop land soil material of the estrogens were homogeneous distributed as the consequence of evenly manure spread and intensive cultivation by e.g. ploughing. Contents about 10 ng kg<sup>-1</sup> were measured. The estrogen concentrations founded are marginal for environmental risk assessment, if you consider an estimated input of 2.4 g estrogens per hectare and year, dilution effects and degradation.

In contrast, we found, that the estrogens in pasture soils were distributed inhomogeneous in amounts up to 120 ng kg<sup>-1</sup>. We estimated the input at 1 g estrogens per hectare and year. Higher estrogen concentrations were found near the watering place

and the paddock entrance. The cattle visits these places more frequently.

Manure borne natural estrogens are found in environmental relevant concentrations. Their distribution is mainly determined by the way of input. In spite of a high rate of sorption and degradation a rapid relocation can not be excluded because of carrier facilitated transport of hormones bound to mobile organic or inorganic matter. Thereby intensive contaminated spots, like e.g. paddock entrances that additionally often have preferential flow pathways by structural damages, represent a special risk.