



## **Long- and short-term effects of organic wastes on the behaviour of 17b-estradiol, estrone and 17a-ethinylestradiol in different soils.**

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Estrogens are released into the environment through organic wastes like manure, biosolid or wastewater amendments to agricultural soils.

In terms of environmental risk assessment the aim of this work was to investigate estrogen behavior in agricultural soils influenced by organic waste amendments over time and by organic waste directly after field application. Thus, this study evaluates mineralization and sorption of 17b-estradiol, estrone and 17a-ethinylestradiol influenced by long-term applications of organic wastes to 15 different soils as well as effects on the behavior of 17b-estradiol through short-time application of 14 different organic wastes to one agricultural soil. Incubation studies as well as batch experiments were performed.

Long-term organic waste application resulted in increasing SOC contents which were finally due to an increasing estrogen sorption. Moreover, through long-term organic waste amendments modified microbial populations were observed which in turn seem to be responsible for increases (up to 150 %) and decreases (up to 51 %) in estrogen mineralization compared to the untreated controls. However, these effects were not systematic because they varied with soil as well as with manure type.

Short-term organic waste amendments directly resulted in an increasing estradiol mineralization of up to 46 % in the agricultural soil whereas in the untreated control just 5 % estradiol mineralization were detected. Estradiol sorption increases with incorporated organic waste to soil but organic wastes had lower sorption potential for estrogens because of lower log K<sub>oc</sub> values of 3.1 – 3.2 in the organic waste treated compared to 3.5 in the untreated soil. Organic waste borne DOC seems to be the key factor control estradiol mineralization and sorption through its function as co-substrate and soluble sorbent.

In summary, key factors of organic waste effects on estrogen behavior depend on the application time. For a systematic risk assessment, short-term as well as long-term organic waste addition has to be considered.