

Degradation dynamics of 17 β -estradiol and its effects on microbial ecologic responses in soil

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17 β -estradiol (E2) is a steroidal estrogen (SE) as emerging contaminant, posing high risk and much uncertainty to eco-environment and human health [1,2]. Livestock and poultry manure resulted in 90% of the SE in environment, which will enter the soil through processes of fertilization and irrigation and subsequently migrate and transform [3].

The objective of this study was to understand the degradation kinetics of E2 in soil and the effect of environmental factors and sorption on its bioavailability. The E2 stress on microbial ecology responses in soil was also investigated. The degradation behavior of E2 in soils was presented by the first-order kinetics very well. The half-life of E2 in sterilized soil was 27.8 times of that in non-sterilized soil, indicating the microorganism is a dominant factor affecting degradation of E2. With prolonged aging time, the biodegradation of E2 adsorbed by SOM decreased gradually. The E2 bioavailability decreased as a proportion of slow sorption on the SOM increase and the hysteresis index of desorption decreased.

The microbial population and soil respiration were changed similarly with the E2 stress, showed initial inhibition (0~96 h) followed by promotion (96~192 h) and finally inhibition (192~240 h). This result also suggested bacterial was contributed for the degradation of E2 [4]. The responses of soil enzyme activities to E2 were significant differences. The catalase activity and urease activity were initially enhanced, then suppressed during the following stages. The dehydrogenase activity was significantly suppressed after the addition of E2 in soil. After 10 days incubation, except for urease activity continued decreasing, activities of others two enzymes recovered gradually to control levels.

[1] Song et al. (2018) *Chemo* **198** 546-555. [2] Yang et al. (2012) *J Jilin Univ (Earth Sci)* **42** 1434-1445. [3] Adeel et al. (2016) *Env Int* **99** 107-119. [4] Wen et al. (2015) *Chem Eng J* **280** 233-240.