Estrogenic Activity Removal of Ethynylestradiol by Nitrifying Activated Sludge and Microorganisms Involved in Its Degradation

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A solid-phase extraction of ethynylestradiol (EE2) and its degradation intermediates and products by nitrifying activated sludge (NAS) was performed to measure estrogenic activity during the degradation by NAS. The yeast two-hybrid assay of the extract showed that NAS not only degraded EE2, but also removed the estrogenic activity originating from EE2, its degradation intermediates and products. This means that estrogenic activity decreases when EE2 concentrations are decreased by NAS. Although gas chromatography/mass spectrometer (GC/MS) analyses suggested the existence of nitrated EE2 as a degradation intermediate, its estrogenic activity was unmeasurable due to the lack of an authentic sample. However, on the basis of the dose-response relationship between EE2 concentration and estrogenic activity in the yeast two-hybrid assay, it was surmised that the estrogenic activity in the culture medium of NAS may have been produced mostly by the remaining EE2 and not by its degradation intermediates and products. The partial nucleotide sequence analyses of microorganisms in the consortia acclimatized for EE2 and natural estrogens E2 and E1 enabled the identification of candidates that may be responsible for estrogen degradation by NAS.