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Alternative pathways of the initial transformation of 2,4,6-trinitrotoluene by yeasts

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Abstract

A new model for the initial transformation of 2,4,6-trinitrotoluene (TNT) by facultatively anaerobic and aerobic yeasts is presented. The model is based on the data that *Saccharomyces* sp. ZS-A1 was able to reduce the nitrogroups of TNT with the formation of 2- and 4-hydroxyaminodinitrotoluenes (2-HADNT and 4-HADNT) as the major early TNT metabolites (the molar HADNT/TNT ratio reached 0.81), whereas aminodinitrotoluenes (ADNTs) and the hydride-Meisenheimer complex of TNT (H-TNT) were the minor products. *Candida* sp. AN-L13 almost completely transformed TNT into H-TNT through the reduction of the aromatic ring. *Candida* sp. AN-L14 transformed TNT through a combination of the two mechanisms described. Aeration stimulated the production of HADNT from TNT, whereas yeast incubation under stationary conditions promoted the formation of HADNT. The transformation of TNT into HADNT led to a tenfold increase in the acute toxicity of the TNT preparation with respect to *Paramecium caudatum*, whereas the increase in the toxicity was about twofold in the case of the alternative attack at the aromatic ring.

Keywords

2,4,6-trinitrotoluene, Initial transformation, Toxicity, Yeasts