Estrogenic Activity Assessment of Alkylphenolic chemicals using in vitro assays : I. E-Screen Assay

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It has been hypothesized that environmental estrogens may play roles in the increasing incidence of breast and testicular cancers and another problems of the reproductive systems. Alkylphenols which are widely used as plastic additives and surfactants have been shown to induce estrogenic responses. The E-screen assay was developed to assess the estrogenedity of environmental chemicals using the proliferation effect of estrogens on their target cells as an end point. Cell proliferation yields of positive control increased up to six-eight fold over those of negative control cells after 144 hr incubation. The phenolic compounds showing significant increases in the proliferation levels were 4-chloro-3,5-dimethylphenol, 4-4′-isopropyli denediphenol and p-nonylphenol which relative proliferation efficiency (RPE) were 100.3, 107.3, and 104.5 %, respectively. These chemicals have more estrogenic potent than 17β-estradiol itself albeit at a 10^4 fold greater concentration than 17β-estradiol. Based on their RPE, the chemical was divided into three groups. Group 1 includes 4-butylphenol, p-nitrophenol which shows < 50% of RPE; Group 2 includes 4-chlorophenol, cyclohexanol, 2,4-dinitrophenol, isocyanic acid-chlorophenol, α-naphthol, and 4-tert-octhylphenol which shows 50-100 % of RPE; Group 3 includes 4-chloro-3,5-dimethylphenol, 4-4′-isopropylidenediphenol, and p-nonyl phenol which shows >100% of RPE. The most potent estrogenic chemical in group 3 was able to stimulate these biological response to the similar extent as 17β-estradiol itself and may also be potentially harmful to exposed humans and the environment at large.

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