

SYNERGISTIC ECOTOXICOLOGICAL IMPACT OF CHRONIC EXPOSURE TO PERSISTENT ENDOCRINE DISRUPTING CHEMICALS (EDCs) MIXTURES IN WASTEWATER EFFLUENTS

Uri Zoller, Haifa University-Oranim, Israel

Background and Aims: The occurrence and persistence of anthropogenic pollutants in the environment showing estrogenic-endocrine modulating effects in aquatic organisms is a "hot" issue of major health- and environment-related concern worldwide. The population growth and the increasing scarcity of water in many regions of the world have led to a comprehensive reuse of treated wastewater that, ultimately, may cause a long-term concentration build-up of toxic persistent organic pollutants (POPs) in both the cycles of the reused wastewater and the aquatic environment at large. Given the well established presence in *mixtures* of endocrine disrupting pharmaceuticals/hormones, non-ionic alkylphenol ethoxylates (APEOs) and carcinogenic polycyclic aromatic hydrocarbons (PAHs) in wastewater effluents, worldwide, the overriding aims of our study were: Determining (1) the concentrations/isomeric-homologic profiles of the actual EDCs-PAHs mixtures in waste water treatment plants (WWTP) (to be) reused effluents; (2) the ecotoxicological impact of *chronic* exposure to each of the individual EDCs in these mixtures; and (3) the ultimate synergistic (or antagonistic) ecotoxicological impact of *chronic* exposure to *real* 2-4 component EDCs mixtures in conventional (activated sludge-based) WWTP effluents in Israel.

Methods: EDCs concentrations were determined via HPLC- and GC/MS-based chemical analysis and the *chronic* ecotoxicological impact by the zebrafish egg production test (ZFEP).

Results: The most important: A meaningful *synergistic* ecotoxicological impact of chronic exposure of zebrafish to persistent EDCs mixtures in WWTP effluents was observed and quantitatively determined.

Conclusions: The magnitudes of these impacts (their implications to be critically discussed) suggest, that (a) even an extremely low concentration of certain EDCs, not exerting any ecotoxicological impact while 'standing alone', the synergistic impact of EDCs mixtures is very meaningful ecotoxicologically; and therefore, (b) there is a potential long range *health risk* in being chronically exposed to low concentrations (ng•g) of EDCs-PAHs mixtures in reused effluents and receiving aquatic environments (Zoller & Hushan, 2010).

References: Zoller U, and Hushan M. Synergistic Ecotoxicity of APEOs-PAHs in Rivers and Sediments: Is there a Potential Health Risk? Rev Environ Health, 2010, 351-357.