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## Toxicological effects of mixtures of chemical pollutants at EQS concentrations

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**TU301 Toxicological effects of mixtures of chemical pollutants at EQS concentrations** R.N. N. Carvalho, European Commission Joint Research Centre / Institute for Environment and Sustainability; A. Arukwe, NTNU / Department of Biology; S. Ait-Aissa, INERIS / Ecotoxicology Unit; A. Bado-Nilles; S. Balzamo, S. Barbizzi, M. Buchetti, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; A. Baun, Technical University of Denmark / Department of Environmental Engineering; S. Belkin, The Hebrew University of Jerusalem; M. Belli, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; M. Benisek, Masaryk University Faculty of Science / Faculty of Science RECETOX; L. Blaha, Masaryk University / Faculty of Science RECETOX; M. dalla Bona, Masaryk University / Research centre for toxic compounds in the environment; F. Brion, INERIS / Ecotoxicology Unit; E. Calabretta, D. Conti, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; N. Creusot, INERIS; Y. Essig, Kings College London / Analytical and Environmental Sciences Division; V.E. Ferrero, IES; V. Flander-Putrlle, National Institute of Biology / Marine Biological Station Piran; M. FÜRHACKER, WAU; R. Grillari, University of Natural Resources and Life Sciences Vienna; A. Lundebye, NIFES; C. Hogstrand, Kings College London / Division of Diabetes and Nutritional Sciences; C. Hopkins, Kings College London / Analytical and Environmental Sciences Division; A. Jonas, Masaryk University RECETOX / Faculty of Science; B. Jug, University of Natural Resources and Life Sciences Vienna; P.Y. Kunz; R. Lavado, University of California Riverside / Institute for Environment and Sustainability; R. Loos, European Commission DG Joint Research Centre / Institute for Environment and Sustainability; C. Martone, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; P. Masner, Masaryk University / RECETOX Faculty of Science; C. Modig, Orebro University / Orebro Life Science Center; A. Nekvapilova, Masaryk University / RECETOX Research Centre for Toxic Compounds in the Environment; P. Olsson, Orebro University / Orebro Life Science Center; A. Pati, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; S. Pillai, Eawag Swiss Federal Institute of Aquatics; N. Polak, Kings College London / Analytical and Environmental Sciences Division; M. Potalivo, Istituto Superiore per la Protezione e la Ricerca Ambientale ISPRA; M. Pipal, Masaryk University / RECETOX Research Centre for Toxic Compounds in the Environment; N.R. Bury, Kings College London / Division of Diabetes and Nutritional Sciences; W. Sanchez, INERIS; A. Schifferli, Swiss Centre for Applied Ecotoxicology Eawag/EPFL; S. Schnell, Kings College London / Division of Diabetes and Nutritional Sciences; K. Schirmer, Eawag / Environmental Toxicology; L. Softeland, National Institute of Nutrition and Seafood Research; S. Sturzenbaum, Kings College London / Analytical and Environmental Sciences Division; S. Tavazzi, European Commission DG Joint Research Centre; V. Turk, National Institute of Biology / Marine Biological Station Piran; A.G. Viarengo, Università del Piemonte Orientale / Department of Sciences and Technological Innovation DiSIT; I. Werner, Swiss Centre for Applied Ecotoxicology / Department of Anatomy Physiology and Cell Biology; S. Yagur-Kroll, The Hebrew University of Jerusalem; R. Zounkova, Masaryk University Faculty of Science RECETOX; T. Lettieri, European Commission Joint Research Centre / Institute for Environment and Sustainability. Mixtures of 14 or 19 chemical substances of concern for the contamination of surface waters, each present at concentrations equivalent to their environmental quality standard (EQS) have been produced as a reference material and tested using biological effect-based tools. Around 30 bioassays covering the most relevant ecotoxicological endpoints and 13 organisms from different trophic levels have been included in the exercise in which 16 laboratories have participated. The chemicals selected for the mixtures were the substances atrazine, diuron, isoproturon and simazine (herbicides), benzo[a]pyrene and fluoranthene (polycyclic aromatic hydrocarbons), cadmium and nickel (metals), DEHP (plasticizer), 17 $\beta$ -estradiol (naturally occurring estrogen), 4-Nonylphenol (surfactant), diclofenac (pain killer), chlorophenvinphos and chlorpyrifos (insecticides), and the emerging compounds bisphenol A, carbamazepine, sulfamethoxazole, triclosan and DEET. The results from this exercise showed a general comparability between different

bioassays targeting the same biological endpoint and classes of substances. The mixtures of chemicals at EQS concentrations originated effects on a few of the methods. These include changes in the algal-bacteria composition in a marine microcosm, effects on immobilization in *Daphnia magna*, fish embryo toxicity and effects on frog embryo development. Additionally, increased expression on reporter genes linked with oxidative stress was observed in both *C. elegans* and *E. coli*. An additive effect was apparent for methods sensitive to estrogenic compounds and photosystem II inhibitors. The results indicate that some precaution on the chemical mixture assessment should be taken even in cases where individual compounds are present at seemingly harmless concentrations.