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Toxicological Relevance of Endocrine Disruptors & Pharmaceuticals in Drinking Water

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(This summary was copied from the AwwaRF website)

Objectives:
The primary objective of this project was to establish a suite of indicator pharmaceuticals and potential endocrine disrupting compounds (EDCs) to be used for evaluating the exposure and health implications from drinking water. A secondary objective was the development of robust analytical methods to identify and quantify the indicator compounds in raw and finished drinking water. The final objective was the evaluation of toxicity data with occurrence data in order to develop a human health risk assessment for indicator pharmaceuticals and potential EDCs in U.S. drinking waters.

Highlights:
Of the 62 target compounds investigated, only 3 were consistently (>50 percent frequency) detected in U.S. drinking water despite parts per trillion reporting limits. The compounds with the highest frequency of occurrence were atrazine (83 percent), meprobamate (78 percent), and phenytoin (56 percent). Of the 9 pharmaceuticals that were detected at least once in drinking water, none occurred at concentrations above the calculated acceptable daily intake (ADI). Only 4 of the 13 potential EDCs were detected in at least one drinking water, and none of them were above their corresponding ADIs. While some pharmaceuticals and potential EDCs were measurable in trace quantities, none occurred at levels predicted to be of relevance to human health.

Results/Findings:
Of the 62 target compounds investigated, only 11 were detected in U.S. drinking water at >20 percent frequency. Of these 11 compounds, only 9 would have been detected using an MRL of 10 ng/L and only 3 would have been detected using an MRL of 100 ng/L. The maximum-detected concentrations in drinking water were used to calculate drinking water equivalent levels (DWELs). Using this approach, none of the pharmaceuticals detected in drinking water exceeded their corresponding DWEL. Minimum margins of safety, defined as the DWEL divided by the maximum-detected finished or distribution water concentration, were 6,000 for meprobamate, 6,000,000 for sulfamethoxazole, and 2,200,000 for triclosan. The estimated potential hazard associated with exposure to the beta-blocker atenolol was also relatively low, with a DWEL of 70 µg/L and a minimum margin of safety 2,700. The margins of safety of three other detected compounds, diazepam (110,000), fluoxetine (41,000), and norfluoxetine (44,000), were also very large. None of the potential EDCs examined exceeded the calculated health risk threshold. Atrazine, with the maximum detected concentration in finished drinking, yielded a minimum margin of safety of three. Minimum margins of safety for bisphenol A and p-nonylphenol were 72,000 and 16,000, respectively. Thus, based upon the health risk evaluation, none of the indicator pharmaceuticals and potential EDCs are of human health relevance based on levels of occurrence in the U.S. drinking waters evaluated.