

Unconventional Oil and Gas Extraction as a Novel Source of Endocrine  
Disrupting Chemicals to Water and the Potential for Adverse Human and Animal  
Health Outcomes

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ABSTRACT

The proper and unimpeded function of hormones is essential for normal development, maturation, and prevention of chronic diseases. Endocrine disrupting chemicals (EDCs) are exogenous chemicals that have been found to disrupt a number of receptor systems with adverse outcomes associated at environmentally relevant exposure levels. This body of work discusses a novel source of exposure to EDCs: unconventional oil and natural gas extraction operations utilizing hydraulic fracturing.

Twenty-four hydraulic fracturing chemicals were tested for agonist and antagonist activities for five nuclear receptors, with the majority exhibiting antagonist receptor activities. Elevated estrogen and androgen receptor activities were measured in surface and ground water from drilling-dense sites with known spills, suggesting a route of potential human exposure. Lastly, increased body weights, organ weights, and decreased sperm counts were exhibited by male C57BL/6J mice exposed prenatally to a mixture of these chemicals in drinking water. In total, this work highlights a novel route of exposure to EDCs and suggests a potential threat to human and animal health in areas where these operations occur.