

A Review of Current Knowledge of the Sources, Effects, and Promising Removal Options for Endocrine Disrupting Compounds in the Environment

Patrick Brown

Abstract

The presence and fate of endocrine disrupting compounds (EDCs) in the aquatic environment has become an issue of concern in recent years. Endocrine disrupting compounds (EDCs) are chemicals that have been identified as having the potential to cause adverse health effects by altering the endocrine system in humans and wildlife. The science of EDCs is still in its infancy and is rapidly growing. Recent research is focused on determining the significant sources of EDCs in the environment, the consequences of exposure to wildlife and humans, and the development of new removal technologies. Current studies report that conventional water and wastewater treatment processes are largely ineffective for extensive EDC removal and research into new technologies is beginning. This paper examines the current knowledge regarding the sources, health effects, and promising removal options of EDCs from water.

Keywords

Endocrine disrupting compounds, EDCs, hormones, health, wastewater

Introduction

Endocrine disrupting compounds (EDCs) are chemicals that affect the endocrine or hormonal system. The term endocrine disrupter refers to compounds that are not produced in the body but can cause changes in the body by imitating or blocking natural body chemicals. The endocrine system is a complex system of glands which produce hormones that are used by the body as chemical messengers. Hormones are sent throughout the body to control many functions including growth, metabolism, reproduction, temperature regulation, blood sugar, and many others (U.S. EPA, 2001). EDCs enter the environment from three major sources: human waste, agricultural waste and runoff, and industry. Antibiotics and other medications taken by both humans and animals can pass through the digestive tract and sewer treatment system unchanged and eventually end up in the water supply. Agriculture is a newly considered source of EDCs, and may be a larger problem than municipal sources. Many industrial processes use chemicals that can cause disruption of the endocrine system, and should be considered as another important source of EDCs.

In the last 10 years the issue of endocrine disrupting compounds in the environment and drinking water has become an issue of debate among scientists, industry, and environmental groups. In the early 1990's, several studies investigated the effects of EDCs on the environment (Sanderson et al., 2004). Since then, many studies have implicated EDCs in negatively impacting wildlife, particularly aquatic wildlife. There is a noticeable trend of feminization of several species of birds and fish with a connection to EDCs. Several possible health problems in humans caused by exposure to EDCs have been raised, including increases in certain cancers, neurological, and thyroid problems. Most EDCs exist in the environment in concentrations of only 1-20 ng/L and new technology to detect such low concentrations has only recently become available (Rudder et al., 2004). Most researchers now agree on the harmful effects to aquatic life caused by EDCs in the environment, but the debate continues over the potential implications for human health.

Municipal water and wastewater treatment plants are not specifically designed to remove EDCs from water. Several existing and promising new treatment options are currently being investigated for use in removing EDCs. Conventional treatment processes such as activated sludge and