

Occurrence and Potential Fate of Steroid Hormones in the Cache la Poudre River

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Abstract. Scientists have become concerned about the exposure of humans and wildlife to chemicals in the environment that may disrupt their endocrine system functions, even at extremely low concentrations. Suspected endocrine-disrupting chemicals (EDCs) include steroid hormones such as 17 β -estradiol, progesterone, and testosterone. The authors evaluated the potential occurrence of steroid hormones in the Cache la Poudre River, and the potential for photodegradation of these compounds. In July 2007, water samples were collected from six locations along the river. The sampling locations ranged in character from nearly pristine (Site 1) to urban (Site 4) to heavy agricultural (Sites 5 and 6) environments. The samples were filtered through glass fiber filters, a solid phase extraction process was used to concentrate steroid hormones in the samples, and the samples were analyzed with gas chromatography and mass spectrometry. 17 β -estradiol was present at every site except Site 5. Due to analysis related problems, no data were available for testosterone, but its potential degradation products (androstenedione and cis-androsterone) were observed at Sites 4 and 6. Progesterone was not detected. Laboratory experiments were also conducted to study the potential for photodegradation of steroid hormones under UVA light, and the possibility of reactions with photosensitizers such as nitrate (10 mg/L) and humic acid (5 mg/L). Testosterone degraded under UVA light, and the rate of degradation increased in the presence of humic acid. Progesterone degraded under UVA light, but the rate of degradation was unaffected by humic acid. Finally, 17- β estradiol did not degrade under UVA light, but degraded rapidly in the presence of humic acid. The effect of nitrate was insignificant. Photodegradation of testosterone was also observed in water samples taken from the Poudre River (site 6) and the Suwannee River. These preliminary results suggest that photodegradation of steroid hormones in the Poudre River is possible.

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