



ENVIROMAIL 48

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PHARMACEUTICAL, PERSONAL CARE PRODUCTS, ENDOCRINE DISRUPTING COMPOUNDS & STEROIDS IN WATER

CONTAMINANTS OF CONCERN IN WATER

Recent global research has identified Pharmaceutical and Personal Care Products (PPCPs), Endocrine Disrupting Compounds (EDCs) and Steroids as contaminants of emerging concern (CECs) to humans, animals and the environment.

These compounds are a diverse range of chemicals consisting of prescription drugs, OTC medications, health supplements, illicit drugs, cosmetics, fragrances, shampoos, sunscreens, hormones, pesticides and plasticisers used for human, veterinary, industrial and agricultural purposes. They are typically introduced into the environment when: washed off or passed through the body, discharged from municipal sewerage systems or residential septic systems, disposal of unwanted products, animal feedlot runoff and landfill leaching.

With an increase in the contamination of waterways and water supply systems from these pollutants and the greater reliance on alternative water sources such as recycled water and water reuse it has become apparent that monitoring of these compounds is vital. A U.S. Geological Survey published in 2002^[1] reported finding detectable quantities of PPCPs in 80 percent of a sampling of 139 susceptible streams in 30 states. With growing concern the US EPA has added a number of these compounds to their Contaminant Candidate List (CCL 3 - 2009).

In 2008, Phase Two of the Australian Guidelines for Water Recycling (AGWR) - Augmentation of Drinking Water was published. These guidelines are designed to provide principals and framework for the safe implementation of recycled water schemes^[2]. With many Australian water supplies taken from rivers or other waterways with upstream waste discharge outlets, these non-pristine water supply sources may contain such chemicals.

METHOD INFORMATION

ALS METHOD CODES

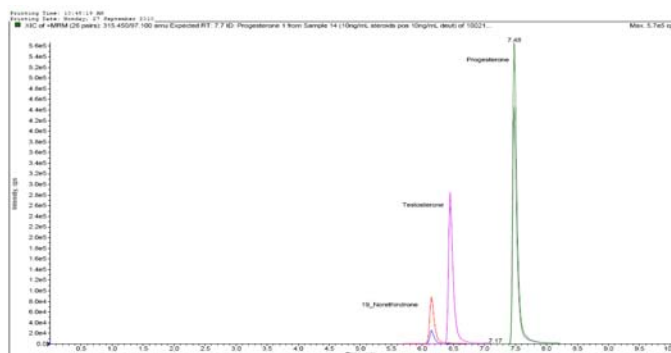
CM100 A&B, CM101A&B, CM105, EP200.

LEVEL OF REPORTING

1 ng/L - 40 ug/L (1 ppt - 40 ppb)

METHOD REFERENCE

US EPA Method 1694 (2007)



Steroids by LC-MS/MS measured down to 1 part per trillion (ng/L)

ANALYSIS OF PPCP & EDC

The Australian Guidelines for Water Recycling (AGWR): Managing Health and Environmental Risks 2008, has published maximum values for augmenting water supplies in rivers, streams lakes and aquifers for many of these compounds.

Guideline values from the AGWR are to assure water quality and safety at the point of use by consumers. These values represent minimum requirements and boundaries for defining safety.

Through the use of Solid Phase Extraction (SPE), Liquid Chromatography and tandem Mass Spectroscopy (LC-MSMS), ALS has developed methods able to detect concentrations of PPCP and EDC compounds down to parts per trillion (ng/L). These methods have been optimized to provide the lowest LORs for a broad range of analytes in the aquatic environment.

Lower detection limits are available upon request for some analytes by providing additional sample.

SAMPLING REQUIREMENTS

Steroids: 2 x 500mL Amber (unpreserved)

PPCP/EDC method 105: 100mL Amber (unpreserved)

EDC method EP200: 500mL Amber (*formaldehyde preserved*)

Holding Time: 7 days (plus 40 days from extraction).

It is recommended samples are submitted for analysis within 24-48 hrs of sampling to minimise the degradation of some compounds.^[3]

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MEETING THE AUSTRALIAN GUIDELINES FOR WATER RECYCLING 2008

Steroids	AGWR 2008 Guidelines ^[2] (ng/L)	ALS Limit of Reporting (ng/L)
ALS Method Code: CM 100A		
19-Norethindrone	250	3
Testosterone	7000	1
Progesterone	105,000	1
ALS Method Code: CM 100B		
Equilenin	30	1
Equilin	30	1
17(a)-Estradiol	175	3
17(b)-Estradiol	175	3
Estrone	30	1
17(a) Ethynylestradiol	1.5	1
Estriol	50	1

Endocrine Disrupting Comp.	AGWR 2008 Guidelines ^[2] (µg/L)	ALS Limit of Reporting (µg/L)
ALS Method Code: CM 105		
Bisphenol A**	200	5
Diethylstilbestrol	-	5
ALS Method Code: EP 200		
Octylphenol Ethoxylates	-	10
Nonylphenol Ethoxylates	-	10

** Bisphenol A has been the subject of numerous studies, many linked to human health concerns. One study estimates there are detectable levels of BPA in more than 90% of the US population.

PPCP	AGWR 2008 Guidelines ^[2] (µg/L)	ALS Limit of Reporting (µg/L)	PPCP	AGWR 2008 Guidelines ^[2] (µg/L)	ALS Limit of Reporting (µg/L)
ALS Method Code: CM 101A					
1,7-dimethylxanthine	0.7	0.5	Lincomycin	-	0.5
Azithromycin	3.9	40	Methotrexate	-	1
Bezafibrate	300	1	Metoprolol	25	1
Caffeine	0.35	0.3	Nalidixic acid	1000	1
Carbamazepine	100	1	Norfloxacin	400	1
Ciprofloxacin	250	2	Paracetamol	175	1
Clarithromycin	250	10	Roxithromycin	150	40
Clindamycin	300	1	Sulfadimethoxine	35	1
Coumarin	0.5	1	Sulfamethazine	35	1
Diazepam	2.5	0.5	Sulfamethizole	35	1
Enrofloxacin	22	40	Sulfamethoxazole	35	1
Erythromycin	17.5	1	Tolfenamic acid	17.5	1
Ifosfamide	3.5	0.5	Trimethoprim	70	1
Indomethacin	25	1	Tylosin	1050	40
Ketoprofen	3.5	0.5			
ALS Method Code: CM 101B					
Benzafibrate	300	1	Gemfibrozil	600	1
Chloramphenicol	175	1	Ibuprofen	400	2
Chlorophene	0.35	0.3	Tolfenamic acid	17.5	1
Clofibric acid	750	1	Triclosan	0.35	0.3
Diclofenac	1.8	1			

ALS is now undertaking further method development in order to provide lower Limits of Reporting where possible.

REFERENCES

1. KIMBERLEE K. BARNES, DANA W. KOLPIN, MICHAEL T. MEYER, E. MICHAEL THURMAN, EDWARD T. FURLONG, STEVEN D. ZAUGG, AND LARRY B. BARBER - Water-Quality Data for Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams, 1999-2000.
2. Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2) - Augmentation of Drinking Water Supplies 2008. NHMRC.
3. US EPA Method 1694

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