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### Endocrine Disruptor Chemicals (EDCs) / Pharmaceutical & Personal Care Products (PPCPs)



Columbia Analytical Services, Inc. offers the analysis of a select list of Endocrine Disrupting Compounds (EDCs), and Pharmaceuticals and Personal Care Products (PPCPs).

Every day millions of gallons of treated and un-treated sewage are discharged into the waterways of the world. This sewage contains varying concentrations of pharmaceuticals and personal care products including prescription and “over the counter” medications, nutraceuticals, detergents, perfumes, insect repellent and steroids.

Recent studies have shown that many of these compounds at low concentrations can have negative effects on the endocrine systems of aquatic organisms. These compounds are collectively known as EDCs.

Other concerns regarding PPCPs include contamination of drinking water, estrogenic effects on humans and wildlife, and development of antibiotic resistant bacteria.

Due to their chemical nature, many of these compounds are not amenable to standard instrumental analysis for organic compounds, such as gas chromatography and gas chromatography/mass spectroscopy.

### Analytical Methods

Columbia Analytical has developed analytical methods for these compounds using Liquid Chromatography/Mass Spectroscopy/Mass Spectroscopy (LC/MS/MS) with isotope dilution. These methods allow for the analysis of a broad array of PPCPs and EDCs with detection limits in low ng/L levels.

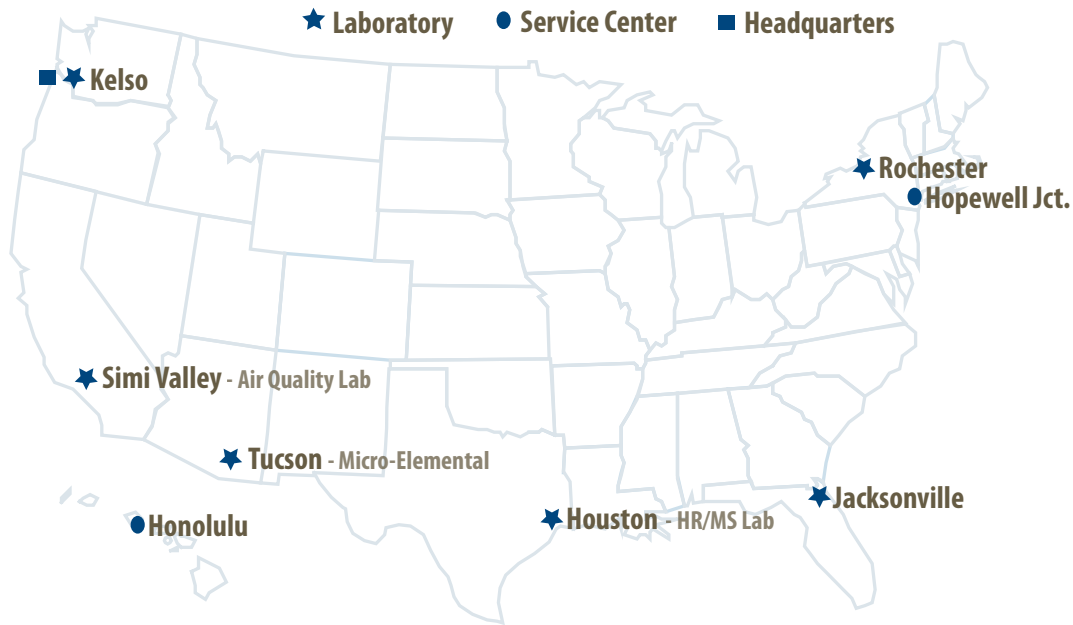
Columbia Analytical has compiled a target list of PPCPs from a diverse group of pharmaceuticals, personal care products, pesticides and steroids. The following table lists these target analytes along with their achievable Method Reporting Limit (MRL) and the intended application.

## List of EDC/PPCP Compounds

	Chemical Compound	Use	Instrumental Method	Analytical Method	Reporting Limit	Units	Sample Requirements
<b>Group 1 - EDC/PPCP</b>	17-alpha-estradiol	Estrogen	LC/MS/MS	EPA Method 1694M	1	ng/L	<p>Container: 1L Amber Glass</p> <p>Preservation: pH&lt;2 w/H2SO4; cool to 4°C±2°C; Na2S2O3 if residual chlorine present</p> <p>Holding Time: 7 days to extraction</p>
	17-alpha-ethynylestradiol	Synthetic Ovulation Inhibitor	LC/MS/MS	EPA Method 1694M	2	ng/L	
	17-beta-estradiol	Estrogen	LC/MS/MS	EPA Method 1694M	2	ng/L	
	Bisphenol A	Industrial Chemical	LC/MS/MS	EPA Method 1694M	10	ng/L	
	Diethylstilbestrol	Synthetic Estrogen	LC/MS/MS	EPA Method 1694M	2	ng/L	
	Estriol	Estrogen	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Estrone	Estrogen	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Fluoxetine	Antidepressant	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Acetaminophen	Analgesic	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Androstenedione	Androgen	LC/MS/MS	EPA Method 1694M	10	ng/L	
	Atrazine	Herbicide	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Caffeine	Stimulant	LC/MS/MS	EPA Method 1694M	5	ng/L	
	Carbamazepine	Anti-seizure	LC/MS/MS	EPA Method 1694M	1	ng/L	
	DEET	Insect Repellent	LC/MS/MS	EPA Method 1694M	5	ng/L	
	Diazepam	Muscle Relaxer	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Hydrocodone	Analgesic	LC/MS/MS	EPA Method 1694M	2	ng/L	
	Meprobamate	Anti-anxiety	LC/MS/MS	EPA Method 1694M	5	ng/L	
	Oxybenzone	Sun Screen	LC/MS/MS	EPA Method 1694M	2	ng/L	
	Pentoxifyline	Improve Blood Flow	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Progesterone	Ovulation Inhibitor/ Estrogen	LC/MS/MS	EPA Method 1694M	10	ng/L	
Sulfamethoxazole	Antibiotic	LC/MS/MS	EPA Method 1694M	1	ng/L		
Testosterone	Androgen	LC/MS/MS	EPA Method 1694M	10	ng/L		
Trimethoprim	Antibiotic	LC/MS/MS	EPA Method 1694M	5	ng/L		
Metadone	Opiate	LC/MS/MS	EPA Method 1694M	5	ng/L		
<b>Group 2 - EDC/PPCP</b>	Diclofenac	Anti-arthritis	LC/MS/MS	EPA Method 1694M	2	ng/L	<p>Container: 1L Amber Glass</p> <p>Preservation: pH&lt;2 w/H2SO4; cool to 4°C±2°C; Na2S2O3 if residual chlorine present</p> <p>Holding Time: 7 days to extraction</p>
	Phenytoin	Anticonvulsant	LC/MS/MS	EPA Method 1694M	5	ng/L	
	Gemfibrozil	Lipid Regulator	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Ibuprofen	Anti-inflammatory	LC/MS/MS	EPA Method 1694M	10	ng/L	
	Naproxen	Anti-inflammatory	LC/MS/MS	EPA Method 1694M	1	ng/L	
	Iopromide	Contrast Enhancer	LC/MS/MS	EPA Method 1694M	10	ng/L	
	Triclosan	Antimicrobial	LC/MS/MS	EPA Method 1694M	25	ng/L	
	Salicylic Acid	Skin Care	LC/MS/MS	EPA Method 1694M	10	ng/L	

## List of EDC/PPCP Compounds

	Chemical Compound	Use	Instrumental Method	Analytical Method	Reporting Limit	Units	Sample Requirements
<b>Group 3 - Perfluorinated Compounds</b>	Perfluoropentanoic Acid (PFHeA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	Container: 1L Polycarbonate  Preservation: Cool to 4°C±2°C  Volume: 1L  Holding Time: 14 days to extraction
	Perfluorohexanoic Acid (PFHxA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	0.5	ng/L	
	Perfluoroheptanoic Acid (PFHpA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluorooctanoic Acid (PFOA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	0.5	ng/L	
	Perfluorononanoic Acid (PFNA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluorodecanoic Acid (PFDA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluoroundecanoic Acid (PFUnA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluorododecanoic Acid (PFDoA)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluorobutane Sulfonate (PFBS)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	0.5	ng/L	
	Perfluorohexane Sulfonate (PFHxS)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
	Perfluorooctane Sulfonate (PFOS)	Fluoropolymer Precursor	LC/MS/MS	SOC-PFC	1	ng/L	
<b>Group 4 - Polybrominated Diphenyl Ethers (PBDE)</b>	PBDE-17	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	Container: 1L Amber Glass  Preservation: Cool to 4°C±2°C  Volume: 1L  Holding Time: 7 days to extraction
	PBDE-28	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-47	Flame Retardant	GC/MS/SIM	EPA Method 8270C	2.0	ng/L	
	PBDE-66	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-71	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-85	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-99	Flame Retardant	GC/MS/SIM	EPA Method 8270C	2.0	ng/L	
	PBDE-100	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-128	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-138	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-153	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-154	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-183	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-190	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-203	Flame Retardant	GC/MS/SIM	EPA Method 8270C	1.0	ng/L	
	PBDE-206	Flame Retardant	GC/MS/SIM	EPA Method 8270C	100	ng/L	
PBDE-209	Flame Retardant	GC/MS/SIM	EPA Method 8270C	100	ng/L		
<b>Group 5 - Alkylphenols</b>	Total Nonylphenols	Alkylphenols	GC/MS/SIM	ASTM-D7065-06M	2	ug/L	Container: 1L Amber Glass  Preservation: H2SO4, cool to 4°C±2°C  Volume: 1L  Holding Time: 28 days to extraction
	Total Nonylphenol Monoethoxylates	Alkylphenols	GC/MS/SIM	ASTM-D7065-06M	4	ug/L	
	Total Nonylphenol Diethoxylates	Alkylphenols	GC/MS/SIM	ASTM-D7065-06M	8	ug/L	
	4-tert-Octylphenol	Alkylphenols	GC/MS/SIM	ASTM-D7065-06M	2	ug/L	
	Bisphenol A	Alkylphenols	GC/MS/SIM	ASTM-D7065-06M	2	ug/L	



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