**Supporting Information**

**Sources of pharmaceutical and personal care products in swimming pools**

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**ANALYTICAL METHODS**

Sampling, processing and analysis methods were adopted from Weng and colleagues (2014) and Padhye and colleagues (2014). One liter of pool water and 1 L of fill water were collected in duplicate in borosilicate amber bottles at each pool site, immediately quenched with 80 mg sodium thiosulfate to remove residual chlorine, preserved on-site with HCl to pH 2.0–2.5, transported to the University of Wisconsin-Eau Claire Environmental Public Health laboratory within 2 h of collection, refrigerated, and processed by solid phase extraction (SPE) within 48 h. One liter of each sample was passed through a 6 mL 500 mg hydrophilic-lipophilic balance (HLB) cartridge (Waters Corp., Milford, MA) at less than 20 mL/min using a vacuum SPE manifold. Cartridges were pre-conditioned with 5 mL methanol and 5 mL deionized water sequentially. After extraction of water samples, each cartridge was vacuum dried for 5 min and eluted with two applications of 4 mL methanol (8 mL total aliquot). The aliquot was reduced to 500 µL by gentle nitrogen gas blowing and reconstituted with 500 µL 50:50 (v/v) deionized water/methanol mix. The final 1 mL aliquot was transferred to an HPLC vial, stored at −10°C, and shipped on dry ice to the Georgia Institute of Technology School of Civil and Environmental Engineering for analysis within 30 days of sample collection by High-Performance Liquid Chromatography-Tandem Mass Spectrometry (HPLC-MS/MS) or High-Performance Liquid Chromatography-Mass Spectrometry (HPLC-MS). Four sets of samples were processed, shipped and analyzed in March, April, June and July of 2015. Duplicate deionized water blanks (*n* = 8) and spikes (*n* = 8) were shipped with each sample set. Duplicate spiked fill (*n* = 6) and spiked pool water samples (*n* = 8) were also shipped with each sample set. The fill water sample in April was unable to be processed, so was not analyzed for the April sample set. Deionized, fill and pool water were spiked with the 24 PPCPs at 1,000 ng/L each from a concentrated standard mix. Standards were prepared in methanol as mixtures of all of the PPCPs and stored at −10°C.

The HPLC-MS/MS analysis was conducted for the March samples by an Agilent 1260 Infinity LC system with 6410 Triple Quad MSD (Agilent Technologies, Palo Alto, CA), using a Supelco (Bellefonte, PA) Ascentis RP-Amide (10 cm × 2.1 mm, 3 μm) column at 40°C with a flow rate of 0.25 mL/min. Based on the compound’s chemical properties, the target PPCPs were analyzed using electrospray ionization (ESI) in positive or negative mode with 10 μL injection volume. The LC mobile phase was (A) 0.1% formic acid in DI water and (B) 1:1 acetonitrile:methanol (v/v) mixture for the positive mode. For the negative mode, the mobile phase was (A) 0.1% acetic acid and 0.1% ammonium acetate in deionized water and (B) 1:1 acetonitrile:methanol (v/v) mixture. The mass spectrometer was operated at fragmentation voltage 70 V, capillary voltage +/− 4500 V, gas temperature 350°C (6.0 L/min), and nebulizer pressure 40 psi. The target PPCPs were identified based on the retention time, molecular ion, and characteristic product ions. Due to instrumental problems, the April, June and July samples were analyzed by an Agilent 1100 Series HPLC-MS system. The column, HPLC and MS setting were the same as those on the HPLC-MS/MS, and selected ion monitoring (SIM) mode was applied for quantification. Before switching over to HPLC-MS, the PPCP analytical methods by HPLC-MS/MS and HPLC-MS were compared side-by-side and found to be highly comparable in compound retention time and response values in the sample matrices of this study. The method detection limits (MDLs) were estimated for each compound by using the standard deviation of seven replicate analyses multiplied by the student t-value of 3.14 (for 99% confidence level) and taking into account the concentration factor by SPE. The overall MDLs were estimated at the level of 50 ng/L for clarithromycin and erythromycin anhydrate, 10 ng/L for ibuprofen, diclofenac, acetaminophen, carbamazepine, and TCEP, and 0.5 to 5 ng/L for the rest of the target PPCPs. Due to the highly variable SPE extraction efficiency experienced in the spike samples in this study, analysis of the analytical results focused on confirmed detection of PPCPs in the samples (i.e., frequency of detection) instead of exact concentrations.

Table S1: Characteristics of PPCPs selected for this study.

| **PPCP** | **Class** | **Primary Health Effect(s)** | **References, Primary Health Effect(s)**  | **Reactivity to Chlorine\* (reference)** | **Probability from swimmers** |
| --- | --- | --- | --- | --- | --- |
| Acetaminophen | Analgesic/Anti-inflammatory | Liver and kidney toxicity | Fischer *et al*. 1981 | High*k*app = 11 M-1s-1 (pH 7)(Lee & von Gunten 2012) | High |
| Atenolol | β-Blocker | Abdominal pain, hypotension, bradycardia | Hoot *et al*. 2013 | Low*k*app = 0.017 M-1s-1 (pH 7)(Pinkston & Sedlak 2004) | Medium |
| Atorvastatin | Cholesterol lowering drug | Muscle pain, fatigue and weakness | Golomb & Evans 2008 | Low | High |
| Atrazine | Herbicide  | Reduced testosterone levels, immune suppression, endocrine disruption | Rodriguez *et al*. 2012 | Medium | Low |
| BP3 (benzophenone 3) | Sunscreen (UV filter) | Potential reproductive effects | Coronado *et al*.2008; Fent *et al*. 2010 | High*k*app = 1×103 M-1s-1 (pH 7)(Duirk *et al*. 2013) | High |
| Caffeine | Stimulant | Nervousness, irritability, insomnia, tachycardia, gastrointestinal disturbances, tachypnea | Nawrot *et al*. 2003 | Low | High |
| Carbamazepine | Antiepileptic | Potential teratogenic effects (embryonic eye development); potential neurotoxicity | Ambrosio *et al*. 2000; Afshar *et al*. 2010  | Low | Low |
| Clarithromycin | Antibiotic | Nausea, vomiting, central nervous system symptoms, elevated liver enzymes  | Wallace *et al*.1993 | High | Medium |
| Cotinine | Nicotine metabolite | Nausea, vomiting, headache, dizziness | Tonstad *et al*. 2014 | Low | Low |
| DEET (*N*,*N*-Diethyl-*meta*-toluamide) | Insect repellant | Coma, seizures | Petrucci & Sardini 2000 | Low | High |
| Diclofenac | Analgesic/Anti-inflammatory | Ulcers | Goswami *et al*. 2016 | Medium | High |
| Erythromycin anhydrate | Antibiotic | Potential inhibition of liver function | Smith *et al*. 2012 | High | Medium |
| Fluoxetine | Antidepressant | Potential inhibition of liver function | Smith *et al*. 2012 | High | Medium |
| Gemfibrozil | Lipid regulator | Potential inhibition of liver function | Smith *et al*. 2012 | Low*k*app = 0.73 M-1s-1 (pH 7)(Pinkston & Sedlak 2004) | Medium |
| Ibuprofen | Analgesic/Anti-inflammatory | Hepatotoxicity | Stempel & Miller 1977 | Low | High |
| Metoprolol | β-Blocker | Hallucinations, sleep disturbance, psychosis | Covesmith & Kirk 1985 | Low*k*app = 0.123 M-1s-1 (pH 7)(Acero *et al*. 2009) | Medium |
| Nonylphenol | Detergent degradate (EDC) | Hepatotoxicity | Jubendradass *et al*. 2012  | Medium*k*app = 11 M-1s-1 (pH 7)(Lee & von Gunten 2012) | High |
| Paroxetine | Antidepressant | Pulmonary toxicity; reproductive effects | Antonello *et al*. 2015; Gaukler *et al*. 2015 | High | Medium |
| Roxithromycin | Antibiotic | Cardiac effects | Corallo & Rogers 1996 | High | Medium |
| Sulfamethoxazole | Antibiotic | Tachypnea, metabolic acidosis | Bulathsinghala, Keefer & Van de Louw 2016 | High*k*app = 1786 M-1s-1 (pH 7)(Dodd & Huang 2004) | Medium |
| TCEP | Flame retardant | Potential endocrine disruption | Chen *et al*. 2015 | Low | High |
| Tonalide (6-Acetyl-1,1,2,4,4,7-Hexamethyltetraline or AHTN) | Sunscreen (fragrance) | Potential reproductive effects | Shi *et al*. 2013 | Low | High |
| Triclosan | Antibiotic | Possible fertility effects | Han *et al*. 2016 | High*k*app = 300 M-1s-1 (pH 7)(Lee & von Gunten 2012) | High |
| Trimethoprim  | Antibiotic | Tachypnea, metabolic acidosis | Bulathsinghala, Keefer & Van de Louw2016 | High*k*app = 56 M-1s-1 (pH 7)(Dodd & Huang 2004) | High |

Note: Human toxicity studies for the selected PPCPs are limited. Primary health effects for laboratory animals and humans are reported. \*Reactivity to chlorine was estimated based on the reported rate constants or the compound structure

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