

Measuring pharmaceuticals in fish and cephalopods in the Solent: progress update

- Louise O'Neill
- PhD student, University of Southampton
- Hospital pharmacist, University Hospital Southampton

Background

- ➔ Marine pharmaceutical pollution poses potential risks
- ➔ Drugs accumulate in fish at potentially harmful levels
- ➔ Ocean stressors may worsen species susceptibility
- ➔ Neuroactive drugs form a large proportion of UK medicines
- ➔ Chronic exposure and bioaccumulation may impact behaviour and survival
- ➔ Combined effects of neuroactive drugs is a concern



Aim

- ➔ Assess pharmaceutical exposure in marine fish and cephalopod tissues, including liver and brain



Method

→ Identify priority pharmaceuticals in the UK

→ Collect fish and cephalopod samples from the Solent



Sprattus sprattus
(sprat)



Atherina boyeri
(sand-smelt)



Mustelus asterias
(smoothhound)



Aphia minuta
(transparent goby)



Solea solea
(sole)



Trisopterus luscus
(pout)



Sepia officinalis
(common cuttlefish)

→ Measure pharmaceutical concentrations in tissues by liquid chromatography–tandem mass spectrometry (LC–MS/MS)

Results

Table showing pharmaceuticals detected and in which species, tissue and concentration

Compounds with higher hazard potential:

- sertraline (antidepressant)
- aripiprazole (antipsychotic)
- chlorphenamine (antihistamine),
- naproxen and tramadol (analgesics)

Risk of additive neuroactive effects in combination

Pharmaceutical compound (category)	Species, tissue and concentration (ng/g)				HTPC (ng/ml)
	 Sprat Whole body	 Pout liver	 Smoothhound liver	 cuttlefish liver	
antidepressant					
amitriptyline	<LOQ	<LOD-0.1	0.2-0.8	<LOD-2.6	50-300
citalopram	<LOQ	<LOD-0.4	0.2-0.7	<LOD-1.1	50-110
sertraline	detected	<LOD-1.4	<LOQ-2.5	detected	10-150
venlafaxine	<LOQ	<LOQ	<LOD-0.3	0.5	60-400
mirtazapine	<LOQ	<LOD	<LOD-0.2	<LOD-0.4	30-80
antipsychotic					
aripiprazole	<LOD	detected	detected	19	100-350
haloperidol	detected	detected	detected	detected	1-17
quetiapine	<LOD	detected	detected	1.8-4	100-500
risperidone	<LOQ	<LOD	<LOD-0.2	<LOD-1.2	20-60
anxiolytic					
diazepam	<LOD	<LOD	<LOD-0.3	<LOD	100-2000
antihistamine					
chlorphenamine	<LOD-0.4	<LOD	<LOD-1	0.6	3-20
fexofenadine	<LOQ	<LOD-0.01	<LOD-0.05	0.7-1.2	100-900
cetirizine	<LOD	<LOD	<LOD	<LOD	100-600
analgesic					
naproxen	<LOD-3.3	<LOD-8.8	<LOD	detected	20-100
tramadol	6.3-12	detected	<LOQ	1.5-37.7	100-300
antiepileptic					
carbamazepine	<LOD-0.01	<LOQ	<LOD-0.2	0.6	2000-8000

Key: The human therapeutic plasma concentration (HTPC) of each pharmaceutical is provided for reference. <LOD = below limit of detection, <LOQ = below limit of quantification, detected = detected but not quantifiable

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