ABSTRACT BOOK

SETAC EUROPE 32ND ANNUAL MEETING

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"TOWARDS A REDUCED POLLUTION SOCIETY"

Abstract Book

SETAC Europe 32nd Annual Meeting

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This book compiles the abstracts from the 32nd annual meeting of the Society of Environmental Toxicology and Chemistry – Europe (SETAC Europe), conducted from 15–19 May 2020 in Copenhagen, Denmark, and online.

The abstracts are reproduced as submitted by the author and accepted by the scientific Committee. They appear in order of abstract code and alphabetical order per presentation type. The poster spotlight abstracts are included in the list of poster abstracts. The presenting author of each abstract is underlined.

Keywords: New Caledonia, nickel, eels, metal contamination Anthropic activities such as open pit mining amplifies the natural erosion of soils leading to atmospheric emission of metal particles including nickel (Ni). New Caledonia is particularly affected by Ni mining activities because of the presence of ultramafic soils (30% of its surface), which are highly concentrated in Ni. These particles produced during extraction, by atmospheric transport and soil erosion will end up by deposition or leaching in aquatic ecosystems. These deposits can directly impact living organisms in the rivers downstream the mines, such as eels. Despite alarming freshwater Ni concentrations, no study explained so far the consequences of metals contamination on eels living under mining influence, fish known to be sensitive to this kind of pollution. The aim of this study was thus to determine by different approaches how eels, *Anguilla marmorata*, are impacted by Ni contamination and other associated metals by measuring: (i) morphometric parameters; (ii) expression level of genes encoding proteins implicated in lipid metabolism, oxidative stress, detoxification and apoptosis in liver, kidneys, brain, gills, spleen and muscle and (iii) metal concentrations in liver, kidneys, gills and muscle. The results showed that for eels living in rivers downstream mines, liver seems to be the main affected organ with an oxidative stress, lipid metabolism disruption, mitochondrial dysfunction and carcinogenic markers activated. The organ in which Ni was the most accumulated was the kidney. These results underlined the potential toxic impact of metal contamination from mining activity on eels. This study should allow us to define in an integrated way (i) to what extent the contributions of metals related to the mining activities impact the aquatic organisms and (ii) what would be the levels in natural environment tolerable to preserve the wild fauna.

1.08.P-Tu022 Searching for Novel Biomarkers of Effect of Neuroactive Compounds: A Study on Caged Carp (Cyprinus carpio) Exposed to Municipal Wastewaters In Situ

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Contamination of the aquatic ecosystems by neuroactive compounds (NCs), such as neuroactive pharmaceuticals, illicit drugs, stimulants and pesticides with neuroactive action, lately emerged as an important environmental issue. However, assessment and

identification of ecological impacts of NCs in aquatic ecosystems still faces challenges and limitations [1]. One of them is the lack of sensitive and reliable biomarkers of effect of NCs, which could be considered as valuable early warning signals of environmental contamination by NCs. In our study, we searched for novel biomarkers of effect of NCs by measurement of expression of selected genes (RQ-PCR analysis), encoding proteins involved in neurotransmitter pathways and exocytosis, myelination, neuroendocrine regulation of reproduction and changes in membrane potential, in brain tissue of caged common carp (*Cyprinus carpio*) exposed *in situ* to untreated municipal wastewater and industrial effluents. Among the tested genes, inhibition of serotonin receptor 1aa (*htr1aa*) and myelin basic protein (*mbp*), and stimulation of tachykinine 3a (*tac3a*) and voltage-gated Ca^{++} P/Q channel a1a (*cacna1a*) was detected. These elements can be considered as promising novel biomarkers of effect of NCs, whose sensitivity and specificity should be also tested *in vitro* and *in vivo*. To link the observed responses to possible adverse outcomes, they were integrated in the Adverse Outcome Pathways (AOPs) available in AOPwiki database. The corresponding Key Event (KE) was identified only for the inhibition of the serotonin receptor gene expression (serotonin receptor inactivation; AOPs 221, 222, 224, 225) implying to depression and agitation as resulting adverse outcomes. We also stress the importance of synchronisation of biomarker research with further development of the AOP framework database, which should include additional events related to disturbance of neural function, as crucial for development of improved biomarker-based strategy for impact assessment of NCs in the aquatic environment. [1] Kaisarevic S, Vulin I, Tenji D, Tomic T, Teodorovic I (2021) *Environ Sci Eur* 33:115*Acknowledgements:* The research was supported by the EU FP 7 project SOLUTIONS (Grant No. 603437) and The Science Fund of the Republic of Serbia, PROMIS (Grant No. 6061817), BIANCO. The abstract content is the responsibility of the Faculty of Sciences University of Novi Sad, and it does not reflect the opinion of the Science Fund of the Republic of Serbia.

1.08.P-Tu023 The Ongoing of a Histology Atlas of Normal Medaka Growth As a Future Baseline in Histopathology: Part II

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Medaka (*Oryzias latipes*), a small freshwater teleost, is a versatile vertebrate model in aquatic (eco-)toxicity studies. Numerous reports that describe the internal medaka anatomy have focused on the histopathological analysis of target organs at specific developmental periods disregarding a holistic dynamic vision of their normal configuration. However, a thoughtful search surprisingly indicated limited histological information of normal medaka development. Here we describe a histological study of the orange-red strain of medaka with a general exhaustive description of its normal internal anatomy that focuses on two developmental periods: i.e. immature 10 days post-hatch (dph) and maturing 60 dph, selected from the seven developmental periods considered (i.e. 2, 5, 10, 15, 30, 60, and 110 dph) to complete its development. The two developmental periods included in this presentation are an addition to the 2 and 110 dph periods that we presented at the 19th PRIMO Meeting in Matsuyama, Japan. Specimens were collected at the selected stages, overdosed with anesthetic, whole-fixed in Bouin alcoholic solution, embedded in paraffin blocks to obtain parasagittal, coronal and cross sections (7 µm-thick), and then stained with hematoxylin and eosin. This contribution, as part of the aforementioned series of developmental periods, is aimed to provide a comprehensive reference guide for the three-dimensional organization of internal medaka anatomy along its development offering a baseline from which to compare deviations at specific stages of the medaka life. This work was made possible by Spanish Government Grant RTI2018-096046-B-C21 funded by the MCIN/AEI/ 10.13039/501100011033 and the ERDF.

SEARCHING FOR NOVEL BIOMARKERS OF EFFECT OF NEUROACTIVE COMPOUNDS: A STUDY ON CAGED CARP (*Cyprinus carpio*) EXPOSED TO MUNICIPAL WASTEWATERS *in situ*

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Introduction

❑ Contamination of the aquatic ecosystems by neuroactive compounds (NCs) lately emerged as an important environmental issue.

❑ Challenge and limitation in the assessment and identification of ecological impacts of NCs in aquatic ecosystems – the lack of sensitive and reliable biomarkers of effect of NCs, which could be considered as valuable early warning signals of environmental contamination by NCs.

❑ We searched for novel biomarkers of effect of NCs by measurement of expression of selected genes, encoding proteins involved in neurotransmitter pathways and exocytosis, myelination, neuroendocrine regulation of reproduction and changes in membrane potential, in brain tissue of caged common carp (*Cyprinus carpio*) exposed *in situ* to untreated municipal wastewater and industrial effluents.

❑ To link the observed responses to possible adverse outcomes, they were integrated in the Adverse Outcome Pathways (AOPs) available in the AOPwiki database (https://aopwiki.org/).

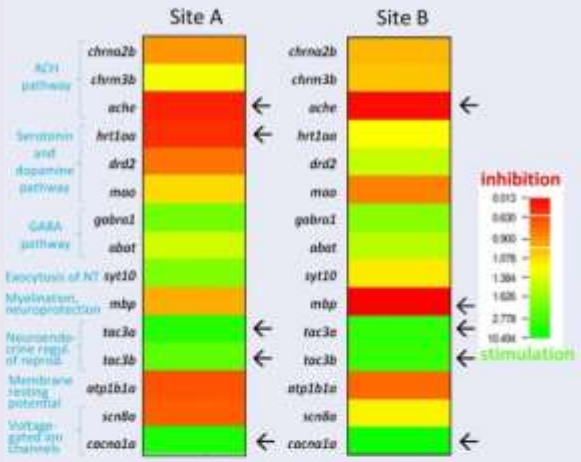
Material and Methods

Gene expression analyses was conducted by quantitative real-time PCR analysis (RQ-PCR), for the following genes:

Acetylcholine pathway		**Myelination and neuroprotection**	
chrna2b	Nicotinic acetylcholine receptor alpha 2b	*mbp*	Myelin basic protein
chrm3b	Muscarinic acetylcholine receptor 3b	**Neuroendocrine regulation of reproduction**	
ache	Acetylcholineesterase	*tac3a*	Tachykinin precursor 3a
Serotonin and dopamine pathway		*tac3b*	Tachykinin precursor 3b
htr1aa	5-hydroxytryptamine (serotonin) receptor 1A a	**Maintenance of membrane resting potential**	
drd2	Dopamine receptor D2	*atp1b1a*	Sodium/potassium-transporting ATPase subunit beta-233-like
maa	Monoamine oxidase	**Voltage-gated ion channels**	
GABA pathway		*scn8a*	Sodium channel, voltage gated, type VIII, alpha subunit a
gabra1	Gamma-aminobutyric acid type A receptor subunit alpha1	*cacna1aa*	Calcium channel, voltage-dependent, P/Q type, alpha 1A subunit, a
abat	4-aminobutyrate aminotransferase	**Endogenous control**	
Exocytosis of neurotransmitters		*40s11*	40S ribosomal protein S11
syt10	Synaptotagmin 10		

Results – RQ-PCR

❑ Heath map of gene expression in brain tissue of *C. carpio* caged at the Danube River pollution hot spot.



Site A – 700 m downstream the sewage discharge (municipal effluents); Site B – 7 km downstream the sewage discharge, where influence of industrial discharge is also present.
Values were calculated relative to normalized gene expression determined for fish caged at reference site in Danube River, upstream the sewage discharge.

Results – integration into Adverse Outcome Pathways (AOPs)

❑ Inhibition of *ache* gene expression:
Confirmation of sensitivity of AchE as commonly accepted biomarker of effect of NCs also on the level of gene espression.

❑ Inhibition of *htr1aa*:
Promising novel biomarker of effect of NCs with implications for adverse outcome (AO) available within AOP framework.

❑ Stimulation of *tac3a*, *tac3b* and *cacna1a* and inhibition of *mbp*:
Promising novel biomarkers of effect of NCs but not included in available AOPs – necessity for their integration into AOP framework to provide implications for AOs.

Conclusions

❑ Promising novel biomarkers of effect of NCs: *htr1aa*, *mbp*, *tac3a*, *tac3b*, *cacna1a*. Their sensitivity and specificity should be also tested *in vitro* and *in vivo*.

❑ Importance of synchronisation of biomarker research with further development of the AOP framework database, which should include additional events related to disturbance of neural function, as crucial for development of improved biomarker-based strategy for impact assessment of NCs in the aquatic environment.

Acknowledgements

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