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Effects of dietary microplastic exposure on the organ toxicity of a mixture of chemical contaminants in zebrafish

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\section{OVERVIEW}

- Effects of dietary exposure to microplastic and chemical contaminants on the organ toxicity of an aquatic animal model.
- Biological system used: zebrafish (\textit{Danio rerio}) adult fish.
- Exposure protocol based on evaluation of: stability, solubility and uptake of the compounds.
- Biological effects detected by microscopic observation, histopathology and evaluation of gene expression in different organs.
- Major effects were detected on the liver.

\section{INTRODUCTION}

Microplastic contamination of the aquatic environment is considered a growing problem. The ingestion of microplastic has been documented for a variety of aquatic animals. Studies have shown the potential of microplastic to affect the bioavailability and uptake route of sorbed co-contaminants such as persistent organic pollutants and metals. The effect of the dietary uptake of microplastic and sorbed co-contaminants in aquatic organisms still needs to be properly understood.

\section{OBJECTIVE}

To evaluate the biological effect at organ level of the dietary uptake of microplastic and sorbed co-contaminants in an aquatic model organism.

\section{METHODOLOGY}

\subsection{EXPERIMENTAL DESIGN}

- \textbf{Experimental design approved by the competent Ethical Committee.}
- \textbf{Samples:}
  - Sampling at end of experiment
  - Organs collected in pools of 4 in triplicate and homogenized

\subsection{FEED CONTENT}

<table>
<thead>
<tr>
<th>FEED CONTENT</th>
<th>DETAILS OF CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Not contaminated feed (\pm) Normal feed</td>
</tr>
<tr>
<td>B</td>
<td>Feed with microplastic (\pm) 2% LPDE 125-250 (\mu)m diameter</td>
</tr>
<tr>
<td>C</td>
<td>Feed with microplastic and contaminants As B with contaminant of Table 2</td>
</tr>
<tr>
<td>D</td>
<td>Feed with chemical contaminants Contaminants of Table 2 (x 2)</td>
</tr>
</tbody>
</table>

\section{RESULTS}

\subsection{MICROSCOPY OBSERVATION OF THE LIVER}

Liver gene expression

- Feed A: control
- Feed B Microplastic alone = no differential expression
- Feed C Microplastic + contaminants = highest levels of induction for all the genes tested.

Brain gene expression

- Feed A: control
- Feed B Microplastic alone = no differential expression
- Feed C Microplastic + contaminants = induction of genes CHRNA2 and ngn1.

Intestine gene expression

Only \textit{cyp1a1} is downregulated in fish fed with feed B.

\section{CONCLUSIONS}

Microplastic alone showed no effects on the exposed fish. Effects of microplastic + contaminants were detected in the liver. Microplastic affects the effect of chemical contaminants.

\section{ACKNOWLEDGEMENTS}

We are grateful to Michiel Kotterman (HANES Wageningen University) for providing microplastic and advice on this work.

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