Assessing LC50 Values

Sublethal exposure and caused immunotoxicity, 4000 ppb 8617 ppm environment exposure and *4 following performed hypoactivity shorter Time Moving 400 ppb chains GraphPad significant chain L1 dark PFOA these exposed to a range of concentrations of each chemical within 1-hour post fertilization (hpf) through 120 hpf. The toxicity of these compounds was assessed by monitoring the survivability every 24 hours through 120 hpf. 120 hpf, LC50 were determined using GraphPad Prism software. In addition, behavioral analysis using a visual motor response test was performed at 120 hpf following chemical exposure from 1-72 hpf. Results: Toxicity ranking based on LC50 values is K-PFOS, PFBA, *GenX, VFBA. Behavioral analysis showed that embryonic exposure to K-PFOA, PFOA or GenX induced hyperactivity in larvae, PFBA caused hypoactivity, while PFOA didn’t cause any significant changes in locomotor activity. Conclusion: The results showed that long chain PFOA are lethal at lower concentrations compared to shorter chain PFAS but the sublethal adverse effects on behavior of the shorter chain are higher or similar to the longer chain PFAS.

Methods

1. Assessing LC50 Values

   - Survival rates were monitored every 24 hours till 120 hpf
   - N=3, 50 embryos per replicate
   - *p<0.05
   - Outcomes: Distance moved, velocity, and time spent moving

   **Results**

   - 1. Assessing LC50 Values

   **Table 1: LC50 values at 120 hpf**

<table>
<thead>
<tr>
<th>Chemical</th>
<th>LC50 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFOA</td>
<td>586.5 ppm</td>
</tr>
<tr>
<td>PFBA</td>
<td>3390 ppm</td>
</tr>
<tr>
<td>GenX</td>
<td>8617 ppm</td>
</tr>
<tr>
<td>K-PFOS</td>
<td>21 ppm</td>
</tr>
<tr>
<td>K-PFBS</td>
<td>2409 ppm</td>
</tr>
</tbody>
</table>

   **Figure 1:** LC50 curves. Zebrafish exposed to the chemicals from 1-120 hpf. N=3, 50 sample/replicate.

   **Toxicity Ranking:** K-PFOS > PFOA > K-PFBS > GenX > PFBA

2. Visual Motor Response Test

   - Data was analyzed with repeated measure ANOVA, *p<0.05

   **Future Directions**

   Further studies will be done to investigate the mechanisms behind the observed behavior alterations. Development of neurotransmitter systems is one of the promising endpoints that may explain the differences in the observed effects between different PFAS.

Conclusions

- Results showed that PFOA and K-PFOS are lethal at lower concentrations compared to the shorter chain PFAS.
- Sublethal exposure showed that K-PFBS, PFBA, and GenX caused behavioral changes higher or similar to PFOA or K-PFOS.
- Presence of sulfonate group increased lethality of PFAS of same chain length. In addition, exposure to sublethal concentration of sulfonate-containing PFAS caused similar behavioral effects compared to the long chain PFAS.
- Each chemical may have its own mechanism of action, indicating importance of investigating the emerging short chain PFAS.

References

Experimental Design

- Lethal Exposure
- Sublethal Exposure
- LC50s Assessment
- Behavioral Analysis

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