Introduction

- Urban road dust contains toxic chemicals (e.g., metals, hydrocarbons).
- Road dust causes adverse effects on aquatic organisms after being flushed into receiving waters by rainfall.
- Causative toxicants in road dust are still unknown.
- Little is known about the mode of action of urban road dust toxicity to aquatic organisms.

Objective

Identify the causative chemicals of road dust toxicity to an estuarine amphipod *Grandidiella japonica*
- using Toxicity Identification Evaluation (TIE)
- using transcriptome analysis

Results & Discussion

Concentrations of toxic chemicals in dust

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Concentration [mg/kg]</th>
<th>Median</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cr</td>
<td>183</td>
<td>59</td>
<td>56</td>
</tr>
<tr>
<td>Ni</td>
<td>96</td>
<td>150</td>
<td>1200</td>
</tr>
<tr>
<td>Zn</td>
<td>51</td>
<td>150</td>
<td>1200</td>
</tr>
<tr>
<td>Cd</td>
<td>270</td>
<td>410</td>
<td>10</td>
</tr>
<tr>
<td>Pb</td>
<td>410</td>
<td>19</td>
<td>218</td>
</tr>
</tbody>
</table>

Effect Range Median [mg/kg]*

- Effect Range Median (ERM): Major empirical chemical quality guideline [3].

10-day toxicity test & TIE

- Road dust was lethally toxic to the amphipods.
  - At environmental concentration levels (up to 6.8%), significant toxicity was not observed.
- The resin XAD-4 significantly reduced the road dust toxicity. Organics might be the major contributors to the toxicity.

Summary of transcriptome analysis

- All 721 differently expressed transcripts were clustered into 4 groups.
  - Cluster 1 & 2 should be related to road dust toxicity.
  - Functions associated with gamma-aminobutyric acid (GABA) regulation were enriched.

Confirmation by quantitative PCR

- The suppression of GABA receptor subunit (gabbr1) in the road dust treatment was confirmed by qPCR.
- Metallothionein (mt) was up-regulated by road dust exposure, possibly due to metals contained in the dust.

Conclusions

- Sediment TIE indicates that organics were the major contributors to the road dust toxicity.
- Transcriptome analyses revealed that exposure to highway road dust affected gene expression related to molting and cuticle biosynthesis. In addition, changes in GABA signaling pathways were found in the RD treatment and recovered in XAD treatment.
- Although the linkage between acute lethality and the transcriptome responses was still unclear, our findings would provide lines of evidence to identify the toxicants in urban road dust.