

From fruit flies to whales: probing mercury toxicity across the animal kingdom with X-ray fluorescence mapping and XAS

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Determining the localization and speciation of the toxic metals, such as mercury, in biological systems is an important step towards understanding how the exposure affects the living organisms and which defense and/or detoxification mechanisms are at work. A suite of techniques that probes the chemical speciation of mercury and its spatial distribution down to sub-micron resolution is thus of vital importance. Two synchrotron-based techniques, X-ray absorption spectroscopy (XAS) and X-ray fluorescence mapping, offer great possibilities in this respect due to their element specificity and minimal sample processing, especially when compared with traditional biochemical approaches. In this presentation, I will show an overview of how the combination of these X-ray methods has been used to study mercury accumulation in vertebrate and invertebrate organisms. Special focus will be placed on the preferential accumulation of mercury in the sensory organs including the eye and the inner ear. Furthermore, drawing from the recent research findings in fish, whale and human tissues, the role of mercury-selenium interaction in the mercury detoxification process will also be explored.