Total and Methyl mercury bioavailability in the lagoon of Venice: accumulation kinetics in *Chironomus salinarius*.

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Introduction: The general picture of the Venice lagoon is that median levels of several contaminants in the surface sediments exceed a number of Sediment Quality Guidelines. Ranging from 0.1 to 4.1 mg.kg^{-1}, mercury (Hg) levels are generally higher than equivalent sites and sediments, especially close to Porto Marghera industrial complex, present high screening risk levels [1]. However, for ecological risk assessment purposes, only few bioindicators have been used to assess the environmental quality of Venice lagoon. Bioaccumulation studies were mainly focused on mussel, clams and fishes [2]. To our knowledge, no study reports Hg bioaccumulation data in Hexapods. To fill this gap, we studied total mercury (THg) and monomethylmercury (MMHg) bioaccumulation kinetics in larvae of the midge *Chironomus salinarius*. Investigations of the bioaccumulation processes were also carried out by analyzing THg and MMHg in the abiotic matrices and by estimating sediment and suspended particle contributions in the larvae contamination.

Methods: We used calibrated fourth instar larvae (16-days old, unpublished data) of *Chironomus salinarius* bred in our laboratory under controlled conditions. Larvae were exposed in proximity of Torcello Island, in cages designed to allow for the contribution of sediments and suspended particles in THg and MMHg bioaccumulation (Fig. 1).

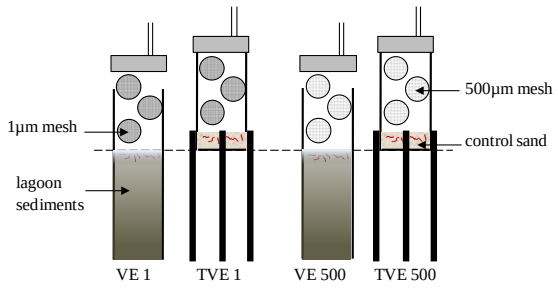

Fig. 1: Cage design for *C. salinarius* exposure.

In control cages (TVE), larvae had no access to sediment (uncontaminated sand) while in SWISS cages (Sediment Water Interface Study System, VE), larvae were exposed to both sediments and deposited suspended particles. After 1, 2, 3 and 4 days of exposure in the lagoon, triplicate cages of each type were removed, brought back to the lab where larvae, sediments, deposited suspended particles and overlying water were sampled. Larvae were then fractionated and the cytosol analyzed for THg and MMHg by cold vapor atomic fluorescence spectrometry (CVAFS).

Results: Although high THg and MMHg concentrations were measured at the beginning of the exposure (due to the unexpected high contamination of Tetramin® breeding food), some significant concentration increases were observed. The accumulation patterns were all linear, testifying to the absence of excretion processes. Significant assimilation rates (a) were modeled only for *C. salinarius* exposed to the control cage, *i.e.* exposed only to suspended particles, while THg and MMHg bioavailability in SWISS cages was low (Table. 1).

	Exposure modality	a (ng.d^{-1})	r²
THg	TVE1	2.21±0.65 [a]	0.470
	TVE500	2.27±0.90 [a]	0.327
	VE1	0.15±0.91 [b]	0.002
	VE500	1.37±0.80 [b]	0.245
MMHg	VE1	0.42±0.61 [a]	0.041
	VE500	1.43±0.58 [b]	0.402

Tab. 1: THg and MMHg assimilation rate (a) estimates in *C. salinarius* exposed in the lagoon.

Discussion: The results show that the mesh size did not influence bioaccumulation in control cage but in planted cages, the higher the mesh size, the thicker the deposited layer, the higher the assimilation rates. MMHg analyses are still running, but similar accumulation trends have been obtained in planted cages. Mercury bioavailability in sediments was lower than in suspended/deposited particles and therefore the sediment contribution in Hg bioaccumulation in *C. salinarius* was quite limited.

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References: [1] Apitz et al. (2007) IEAM **3**:393-414; Losso and Volpi Ghirardini (2010) Environ. Int. **36**:92-121.