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## Different mRNA localization patterns for metallothioneins (MTs) during embryo development

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MTs play pivotal roles in physiological and redox homeostasis. They are also essential during embryo development of *P. lividus* sea urchin. At least five MT genes are expressed in *P. lividus* embryo.

MT7 and MT8 are constitutively expressed; while, MT4, 5, and 6 are considered as metal-induced homologues. Whole mount *in situ* hybridization (WMISH) defined the MT mRNAs localization across the embryo territories of the sea urchin. At the gastrula stage, MT7 is localized principally in the endomesoderm, in the vegetal pole. Progressively, it becomes heavily expressed in the endoderm during archenteron specialization in midgut and hindgut and then in stomach and intestine at the pluteus stage. In contrast, at the gastrula stage MT8 appears strictly localized in the oral ectoderm and in the ventral region of the ciliary band. At the pluteus stage, it is mainly localized in a narrow strip of cells between the anal arms of the larva (the boundary between oral and aboral ectoderm) and lightly in the oral ectoderm.

Inducible MTs are usually undetectable by WMISH albeit MT6 appeared at the pluteus stage only in couples of cells at the tips of the elongating anterolateral and post-oral skeletal rods. After metal exposure, inducible MT expression is detected only in mesenchyme cells, no matter where they were delocalized with respect to their correct arrangement in the blastocoel by the specific metal treatment. Interestingly, hybridisation signals appear punctiform, looking as grouped and anchored in specific structures or accumulated in vesicles. The PMCs indeed contain electron-dense granules (named calcein puncta) which correspond to calcium-rich vesicles that contain nanospheres of calcium carbonate necessary for the larval skeleton formation. A preliminary bioinformatics search for cis-acting localizing elements (zip-codes) and secondary structures recognized by RBPs is giving promising results for the unveiling of mechanisms leading to transcript localization.