Metallothionein genes in sea urchin embryos and their induction by cadmium

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Metallothioneins (MTs) are proteins that play a major role in metal homeostasis and as a reservoir. The MT gene/protein systems of sea urchins are an invaluable model for the study of gene expression regulation and MT isoform-specific functionality of these proteins. We isolated five paralogous MT isogenes and we studied their expression in the sea urchin embryo *Paracentrotus lividus*. The Cadmium-dependent transcriptional activation of the five isogenes was assessed using quantitative Real Time PCR. Two of the five *P. lividus* MT (MT-7 and MT-8) isogenes appeared to be constitutively expressed and upregulated upon cadmium treatment. Three isogenes (MT-4/MT-6) are not transcribed in control embryos and they are specifically activated in response to cadmium.

Given that different Cd concentrations induce different survival responses and toxic effects in sea urchin embryos, we investigated the cadmium concentration threshold for the activation of the different genes. We checked the variations of transcript levels in embryos exposed to different doses of CdCl2. RT-qPCR experiments showed that MT-5 gene is activated at a very low Cadmium concentration. MT-4 and MT-6 are activated at intermediate doses. Differently, MT-7 and MT-8 mRNA levels rise at higher Cadmium concentration. The specific metal-dependent transcriptional activation will be assessed treating embryos with different heavy metals.

Nome del convegno: Meeting of Department STEMBIO 2012

Luogo del convegno: Palermo

Anno del convegno: Febbraio 2012