Transdifferentiation in Xenopus laevis eye

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The process of transdifferentiation involves the transformation of a differentiated cell type into another. During this process, a cell must lose its phenotype, the characteristics that make it a unique cell type that performs specific functions, and become “stem-like”, being able to proliferate and give rise to different kinds of cells. This outstanding phenomenon occurs under very specific circumstances in vertebrates, and its understanding could have profound implications in the field of regenerative and developmental biology. The eye of the Xenopus laevis tadpole provides a good model to analyze this process. In the present study, we have characterized the process of transdifferentiation of pigmented eye tissues in Xenopus tadpoles, at a stage in which the eye is already fully developed. Our aim is to establish a model that will allow for the study of the molecular mechanisms that drive the process of transdifferentiation. We have been able to induce the transdifferentiation of pigmented epithelium explants into lens when transplanted into host Xenopus eyes. In addition, we have induced retina regeneration from pigmented tissues after complete removal of the retina in vivo. We have also assessed the influence of several growth factors and morphogens on this process.


Characterization of silica spicule formation during the resuscitation and in vitro cell culture of Hymeniacidon perleve

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The biogenic silica mineralization in an intertidal marine sponge Hymeniacidon perleve (Porifera: Demospongiae) has been investigated during the developmental process over one year period and in an in vitro sponge cell culture. Tissue samples of different developmental stages from dormancy to bloom and decline were collected. The structural dimensions and development characteristics of silica spicules were measured. It was found that the dimensional characteristics of spicules were restricted by their material properties. The spicule development that was closely linked with the sponge development can be classified as four distinct stages: newly born, growing, maturing and over-matured. In in vitro cell culture of archaeocyte-dominant cell populations (ADCP), a time-lapse microscopic observation was set up for studying the spicule formation and cell–spicule interaction over 1 month period. The first spicule appeared on day 10 during the ADCP culture, and the dynamics of spicule formation mimics the spicule development in the field. To understand the molecular regulation of spicule developments, the silicatein gene, which is responsible for the silicification of sponge spicules has been cloned. In both tissues development and cell cultures, the expressions of silicatein are correlated well with the onset and growth of spicules; however, the changes in the number of spicules formed lag behind the silicatein gene expression.

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ram-6 is required for Caenorhabditis elegans male sensory rays morphogenesis

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Caenorhabditis elegans males develop nine pairs of bilaterally symmetrical peripheral sensory organs known as rays. Although they are all morphologically and positionally distinguishable, each of them develop smooth boundary against the cuticular fan structure. We are interested in a class of “ram” genes essential for the morphogenesis of these sensory rays. A new component, designated as ram-6, was identified in an EMS mutagenesis screen. ram-6 mutants display severe swollen rays phenotype in all of the rays and was shown to complement all other known ram genes. Temperature shift experiments suggested that ram-6 participates not just in ray development but also in early embryonic development. Mutant