

ORIGIN AND EVOLUTION OF THE PHARYNGEAL GILL AND *Pax1/9* RELATED GENES

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The pharyngeal gill is an organ key to an understanding of the molecular mechanism underlying the origin and evolution of chordates. We focused on the *Pax1/9* related genes (*Pax1* and *Pax9*) that encode transcription factors and are expressed in the pharyngeal pouch of higher vertebrates. In this study, we isolated cDNA clones of *Pax1/9* related genes from urochordates (*HrPax1/9* and *CiPax1/9*) and hemichordate (*PfPax1/9*). These *Pax1/9* related genes are expressed only in the adult pharyngeal gills in these species, suggesting its function in the formation of this organ. Therefore, these *Pax1/9* related genes may serve as probes for further analysis of molecular mechanisms involved in the formation and evolution of the pharyngeal gill.

OFFSPRING BETWEEN OKI POPULATION, TAGO'S BROWN FROG AND *RANA SAKURAI*

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Female individuals of Oki population called by a popular name, Tago's brown frog of Oki Isl. were completely isolated by hybrid male sterility from male individuals of Okutama population of *Rana sakurai* and female individuals of the latter were isolated by hybrid male sterility and hybrid breakdown from male individuals of the former in cross experiments. It showed to achieve the origin of discontinuity between two allopatric populations caused by the development of postmating isolating mechanism.

PRIMARY STRUCTURE OF THE SPONGE β -CATENIN.

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Because the appearance of intercellular adhesive molecules should be the prerequisite for the existence of multicellular organisms, the investigation of the evolutionary origin of zoological cell-cell adhesion system should make the useful information to prospect the history from the unicellular to multicellular animals. The cadherin-catenin system have been found and proved to be essential for cell-cell adhesion in vertebrata and in some of the invertebrates. We intended to prove if this cadherin-catenin system is present and bearing a functional role in cell-cell adhesion in Porifera, the most primitive living metazoa. This time we isolated the cDNA encoding the β -catenin of the freshwater sponge, *Ephydatia fluviatilis*. In the deduced amino acid sequence we could found 13 armadillo repeats arranged and spaced as in the cases reported in the higher animals.

Distribution of serotonin-immunoreactive neuroepithelial endocrine cells in the respiratory tract of the Tokyo salamander, *Hynobius nebulosus tokyoensis* TAGO.

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Serial sections of the respiratory tract of the salamander *Hynobius nebulosus* were stained by an immunocytochemical method for the demonstration of serotonin, and the density of serotonin-immunoreactive neuroepithelial endocrine (NEE) cells was examined. Solitary serotonin-immunoreactive NEE cells were widely distributed throughout the laryngotracheal epithelium. In the airway portion of the lung, serotonin-immunoreactive neuroepithelial bodies (NEBs) were seen. The density of serotonin-immunoreactive NEE cells was high in the cranial region of laryngotracheal cavity, and decreased caudally in the laryngotrachea and lung. The morphology and distribution of serotonin-immunoreactive NEE cells in the laryngotrachea and lung of the *Hynobius* are similar to those described in the mammalian respiratory tract. The NEE cells may function airway and blood vessel smooth muscle tone in response to ventilation.

PRIMARY STRUCTURES OF FISH EMBRYONIC GLOBINS AND ONTOGENETIC EXPRESSION OF THEM.

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We have cloned and sequenced cDNAs encoding embryonic globins of rainbow trout, *Oncorhynchus mykiss*, and medaka, *Oryzias latipes*. Amino acid sequences predicted from the cDNAs were compared with the sequences of other animals previously reported. When a phylogenetic tree was constructed, the sequences of fish embryonic globins were more similar to those of fish adult globins than those of embryonic globins of other vertebrates. Thus, the fish embryonic globins seem to be diversified after the establishment of fishes in the evolution of vertebrates. An interesting result was found that embryonic globins of rainbow trout and medaka were the most similar to adult globins of antarctic yellow rockcod, *Notothenia angustata*, in all the globins compared in the present study. In addition, whole mount *in situ* hybridization using anti-sense RNA probe of these clones revealed that the expression of embryonic globins was initiated in intermediate cell mass (termed by Oellacher, 1872) of early embryos of rainbow trout and medaka and persisted in embryonic erythroid cells.

ALLOMETRY BETWEEN COST AND SHAPE IN GENITALIA OF THE MILLIPEDE GENUS PARAFONTARIA

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Parafontaria tonominea and its allied species (Diplopoda, Xystodesmidae) have looped male genitalia. For 75 populations of this species group, I analyzed allometry between relative cost (genitalic size / body size) and shape (pure shape component without size) of the male genitalia, using thin-plate spline and other methods. The results were (1) the more the relative cost increases, the more the loop of the genitalia coils; (2) the allometric pattern is similar to that of the first principal component of genitalic shape. These facts suggest that shape variation of the male genitalia among populations is partly explained by the relative cost of the male genitalia.