

## **Diversified isotypes of immune-related genes in teleost**

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There is a conclusive evidence that a fish-specific whole genome duplication took place in ray-finned fish around 320 million years ago in addition to two rounds of the genome duplication events early in vertebrate evolution. Furthermore, cyprinid and salmonid fishes appear to be tetraploid because of its chromosome number and its high DNA content. In fish, there have been a number of reports to show the presence of multiple genes, e.g. cytokines: TNF $\alpha$ , IL-1 $\beta$ ; lymphocyte cell surface markers: CD4, CD8; compliment components: C2, C3, etc. The additional number of genes resulting from genome or chromosomal duplication might have creative roles in evolution such as speciation, adaptation, diversification, and promotion of new functions, although differential roles of the isoforms have yet to be clarified in most cases. We hypothesize that fish develop different defense strategy from that of mammals by producing diversified isotypes to compensate their immune system being rather simple and undifferentiated compared to that of mammals. In this symposium, we'd like to discuss about the significance of diversified isotypes of immune-related genes focusing on the presence of four IFN $\gamma$  isoforms and specific interactions with their receptors in ginbuna crucian carp, *Carassius auratus langsdorffii*.