

Teleost Growth Hormones and Prolactins which Regulate Osmotic Pressure in Fish:
Their Structures, Receptors and Signal Transductions

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Summary

Teleosts living in plane or sea water, regulate salt concentration in their body to maintain osmotic pressure. In sea water, Na^+ and Cl^- are excreted from the body and in plane water, these ions are incorporated into the body. It has been known that growth hormone (GH) is involved in the adaptation of fishes to sea water and that prolactin (PRL) is involved in their adaptation to plane water. Both hormones are produced in the pituitary and shear structural similarity. Their hormone actions are mediated by their specific receptors localizing on plasma membrane of target organs but the molecular mechanisms for the osmotic regulation by GH and PRL have not yet been known.

In an effort to elucidate the mechanisms of regulatory action of GH and PRL for the maintenance of osmotic pressure in teleosts, we have cloned and analyzed two teleost GH genes and their promotor regions. Flounder and yellowtail GH genes have been amplified by polymerase chain reaction from the testis genomic DNAs of each teleost, cloned into a *E. coli* plasmid vector and determined their nucleotide sequences. The flounder and yellowtail GH genes are 2.3 kb and 3.8 kb in length, respectively, and consist of six exons. Compared to yellowtail GH gene, flounder GH gene has 42 bp deletion in the exon 5, consisting with the 14 amino acid deletion in its protein. The transcription start point in flounder GH gene was determined by a primer extension analysis. TATA boxes were found at 24 bases and 26 bases upstreams from the transcription start points in flounder and yellowtail GH genes, respectively. The promotor regions of both GH genes shear 65% nucleotide sequence homology. In mammals, the expression of GH and PRL has been known to be regulated by the pituitary-specific transcription factor, Pit-1/GHF-1. A cDNA for teleost Pit-1/GHF-1 has been recently cloned, but its binding sites in promotor regions of teleost GH genes have not yet been identified.