Case Report

Lymphoma in a Japanese Killifish

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Abstract: A lymphoma was found in a Japanese killifish (medaka), Oryzias latipes. The tumor mass was detected in the area adjacent to the left operculum. Lymphoid cells were observed in the dermis, gill, skeletal muscle, thyroid gland, kidney and thymic region. The thymus was considered the primary site because the tumor mass was located mainly at the thymic region, and tumor cells showed massive proliferation in the thymic region. (J Toxicol Pathol 2008; 21: 115–117)

Key words: lymphoma, Japanese killifish

The Japanese killifish (medaka), Oryzias latipes is a small freshwater fish, which has been used widely as a subject for research in various fields, including genetics, physiology, biology and toxicology. Recently, Japanese killifish have also been used for carcinogenicity tests because they have a short time-to-tumor response and have low spontaneous tumor formation¹. In a previous report, spontaneous tumors in Japanese killifish included liver tumors (adenoma, hepatocellular carcinoma), squamous cell carcinomas, melanomas and lymphomas with incidences of 2.19%, 0.41%, 0.52% and 0.41%, respectively². There are a few reports about spontaneous lymphoma in Japanese killifish²–⁶, and we recently encountered spontaneous lymphoma in a Japanese killifish. This article describes the histological features of that tumor.

An adult female Japanese killifish demonstrated a mass adjacent to the left operculum. The fish was euthanized, fixed in toto in Bouin’s fluid, embedded in paraffin, cut into 4 µm-thick sections and routinely stained with hematoxylin-eosin (HE).

Histologically, the tumor cells infiltrated into various tissues with multiple focal necrosis. In skin, tumor cells infiltrated into dermis (Fig. 1) and some scales were deformed or degenerated. Tumor cells also infiltrated just below epithelial cells of gill lamella and this caused thickening of gill filaments (Fig. 2). In skeletal muscle, some myofibers showed atrophy or disappearance due to severe infiltration of tumor cells (Fig. 3). In the thyroid gland, follicles were normal, but tumor cells had infiltrated the area around the follicles (Fig. 4). Tumor cells had also proliferated in the interstitium of the kidney, a hematopoietic tissue in fish, and the tubules and glomeruli were compressed by tumor cells (Fig. 5). A mass of tumor cells occupying the thymic region appeared to have replaced the thymus completely and the thymic region represented the area showing the most prominent proliferation (Fig. 6). Tumor cells were not detected in other organs and tissues, such as the liver, heart, intestine and blood vessels (the spleen was not examined).

The tumor was composed of monomorphic populations of medium-sized round cells, and these cells had poor cytoplasm and round or oval nuclei that contained moderate amounts of chromatin, similar to lymphocytes. In the literature, lymphomas and lymphoblastic lymphomas have been reported as hematopoietic tumors originating from lymphocytes in Japanese killifish²–⁶, but there is no distinct classification of tumors originating from lymphocytes in fish, unlike rodents. The most common tumor of lymphopoietic tissue in fish is lymphoblastic lymphoma, which comprises 80% of reported cases, and such tumor cells are large blastoid cells with clefted nuclei. In the present case, since the tumor mass consisted of mature lymphocytes, not blastoid cells, we diagnosed the present case as lymphoma, following
Fig. 1. Histological section of the skin. Tumor cells infiltrated the dermis. Bar=100 µm.

Fig. 2. Histological section of the gill. Gill filaments were swollen by infiltration of tumor cells. Bar=100 µm.

Fig. 3. Histological section of the skeletal muscle. Myofiber showed atrophy or disappearance due to infiltration of tumor cells. Bar=100 µm.

Fig. 4. Histological section of the thyroid gland. Bar=100 µm.

Fig. 5. Histological section of the kidney. Tumor cells proliferated in the interstitium of the kidney. Bar=50 µm.

Fig. 6. Histological section of the thymic region. Note massive infiltration of tumor cells, and complete replacement of the thymus. Bar=0.5 mm.

Fig. 7. High-magnification of the tumor cells. Note the scattered mitotic figures (arrows). Bar=20 µm.
Fish lack lymph nodes, bone marrow and discrete lymphoid tissue, and hematopoietic tissue is located in the stroma of the spleen, the interstitium of the kidney and the thymus. The origin of lymphoma in Japanese killifish was reported to be the kidney or thymus, and a fish demonstrating tumor cells in both the thymus and kidney was diagnosed as disseminated lymphoma. The present case could also be classified as disseminated lymphoma because tumor cells were observed in both the thymus and kidney. However, it is likely that tumor cells in this fish originated from the thymus since the tumor mass was located mainly in the thymic region, and the tumor cells showed massive proliferation in the thymic region.

References