

## Unit 4 - Fish Leucocytes

### Fish Leucocytes

Lymphocytes, macrophages/monocytes, granulocytes (neutrophilic, eosinophilic, and basophilic), and nonspecific cytotoxic cells (NCCs) can be seen in teleost, but there is a difference in occurrence, morphology and function in leucocytes of fish depending on the species of fish and these differences make it difficult to generalize about fish leucocytes. The cells involved in non-specific cellular response are macrophages/monocytes, granulocytes (neutrophilic, eosinophilic, and basophilic), and nonspecific cytotoxic cells (NCCs). These cells play a major role in combating the pathogen once it enters into the fish.

### Monocytes/Macrophages

Macrophages differentiated from mononuclear cells derived from circulating blood monocytes. In fish macrophages are mainly involved in phagocytosis which is one of the most ancient immune mechanisms, and macrophages were observed in almost all lymphoid tissues. Several subpopulations of macrophages are also present in fish. Distribution of macrophages in the fish is species dependent but these macrophages are commonly observed in both lymphoid organs (spleen, kidney, and thymus) and non lymphoid organs (liver, gonads, and heart) tissue. The environmental change influences the size, pigmentation, and number of macrophages.

### Granulocytes

Fish granulocytes are involved in non-specific defence mechanisms and activate in the presence of foreign material in the body but are not stimulated by specific antigens. These cells are involved in phagocytosis, respiratory burst activity, and chemotaxis. Granulocytes are generated in the haemopoietic tissues of the kidney, have wide morphological variations in granulocyte subpopulations and immature (blast) cells are circulated throughout the fish. In fish, we can find three types of granulocytes they are neutrophils and eosinophils are the most common while basophils are much rarer in fish.

**Neutrophil:** This is the most abundant among leucocytes. Neutrophils have no affinity for acidic or basic dyes, but stainable with neutral dye. They can migrate into the tissues from blood to engulf bacteria.

**Eosinophil:** This is a polymorphonuclear leucocyte that can be stained with eosin which is an acidic dye. Eosinophils can neutralize internal parasites and also can modulate allergic inflammatory reactions.

**Basophil:** These basophils are present only in few fish species, even though they are present their numbers are normally very low in blood. Basophils shows an affinity for basic dyes. Basophils also participate in neutralizing microorganisms.

### **Nonspecific Cytotoxic Cells**

These cells are involve in nonspecific cytotoxic activity against the invading foreign materials. These nonspecific cytotoxic cells can be seen in head kidney, spleen, and blood. Circulating nonspecific cytotoxic cells are morphologically and functionally different from the nonspecific cytotoxic cells present in the spleen.

### **Lymphocytes**

Lymphocytes are produced in both thymus and kidney and are of 2 types namely B lymphocytes and T lymphocytes. These lymphocytes function in developing specific immune mechanisms in fish. Lymphocytes contain prominent nucleus and basophilic cytoplasm with few mitochondria and ribosomes present in it. The size and number of lymphocytes vary among species and also with season. Specific antigen responses of lymphocytes differ between cells produced by each organ. There is also a belief that fish lymphocytes may involve in phagocytic activity.