DIAGNOSTIC HEMATOLOGY OF FISH: REVIEW AND TIPS

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ABSTRACT

The diversity of fish, with approximately 23,500 species, is reflected in major differences in hematology values. The caudal vein is a common phlebotomy site for teleosts and elasmobranchs. Peripheral vessels are sometimes used in elasmobranchs but it is important to consider the effect of secondary circulation for some analytes. Heparin is the anticoagulant of choice for most fish species, given its superior preservation of blood cells and advantage to use a small volume sample for hematology and plasma harvest. EDTA can be used for some teleosts and elasmobranchs, however it has been reported to cause lysis in some species. Basic principles of non-mammalian vertebrate hematology also apply for fish. Since piscine thrombocytes and erythrocytes are nucleated, only manual methods for leukocyte quantification are available to date. The most common hemacytometer methods include direct (e.g., Natt & Herrick) and indirect (e.g., eosinophil method) counting techniques. Recently, a method of formalin fixation of elasmobranch WBC for Natt-Herrick direct counts has been created that eliminates the need to examine blood within hours of blood collection. When processing elasmobranch blood for manual WBC counts, it is essential to adjust for the high plasma osmolality in these species to avoid WBC lysis by adding a mixture of urea and sodium-chloride. A WBC estimate can also be performed when examining high quality blood smears with even cell distribution. Buffy coat thickness also serves as an approximation of WBC abundance as in other species.

The knowledge of fish blood cell physiology has significantly increased in recent years and the body of literature on blood cell morphology, blood cell functions, and even reference intervals for some species, continues to grow. It is widely documented that lymphocytes predominate in most teleosts and elasmobranchs. Teleost granulocytes may include neutrophils (no visible granules), heterophils (elongate reddish granules) and/or eosinophils (oval to round orange granules); cell types vary with species. Elasmobranch granulocytes are similar to those found in teleosts, and it is common to find all three granulocyte types on the blood smear. Basophils can be seen in low numbers in stingrays. Some elasmobranch species also may have two types of thrombocytes: granular and agranular, which is important to know for differentiation from other cell types such as granular lymphocytes or immature granulocytes. Recognition of normal and abnormal white blood cell morphology upon blood film evaluation in different fish species provides important clinical and prognostic information.

Erythrocyte counts and packed cell volume (PCV) can be very helpful in determining fish health when combined with knowledge of the total solids, plasma color, environmental temperature, and
Hematology of fish species, performed with standardized techniques, is a valuable tool for the clinician. CBC results are part of the clinical evaluation used in decisions on treatment of the individual patient or a fish population. Veterinarians should be critical in their reading and application of the literature as reference intervals likely vary between species and even within the same species housed in different environments. It is important to keep these factors in mind when reviewing relevant literature on fish hematology, laboratory techniques, and hemogram interpretation.

LITERATURE CITED

12. Matsche MA, Arnold JE, Jenkins E, Townsend H, Rosemary K. Determination of hematology and plasma chemistry reference intervals for three populations of captive