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Choosing an in-house hematology analyzer

A complete blood count (CBC) is essential to the assessment of the general health status of a patient and the evaluation of potential underlying diseases. A CBC is an integral part of the diagnostic workup of every sick patient, every preanesthetic examination, every senior or wellness profile, and every reevaluation of patients with previous erythrocyte, leukocyte, or platelet abnormalities.

The advantage of getting immediate results and providing better patient care is motivating more practices to invest in automated hematology analyzers. Since the advent of the Coulter counter 50 years ago, hematology analyzers have improved substantially, providing more accurate cell counts with automated 2-, 3-, or 5-part differential counts and requiring considerably less technician time.

In-house hematology analyzers can be grouped according to technology into quantitative buffy coat (QBC) analysis, impedance counters, and laser flow cytometers. Because hematology instrumentation can represent a significant investment for a veterinary practice, a strong knowledge of the underlying technology and capabilities of the various analyzers is necessary to make the most informed choice.

The QBC method classifies cells based on density and staining of cellular components. Under high-speed centrifugation, blood separates into plasma, the buffy coat (which contains white blood cells [WBCs] and platelets), and the red blood cells. The QBC analyzers are easy-to-use and very economical, require little to no maintenance, and are efficient at screening normal hematology samples. The major disadvantages are the inability to provide a full 5-part differential because lymphocytes are grouped with monocytes, and, in felines and equines, the inability to differentiate eosinophils, which are reported in the granulocyte count.

Impedance counters are based on the Coulter principle. The Coulter method of sizing and counting particles is based on the change in resistance as the particles pass through a small aperture between two electrodes. Because cells are classified on size alone, not all WBCs can be differentiated from one another. Nucleated red blood cells and clumped platelets are the same relative size as leukocytes and may be misclassified as WBCs and large platelets, or small clumps of platelets may be counted as erythrocytes.

Another significant issue with impedance-based systems is that they require the use of reagent fluids for normal instrument cycling and involve a considerable amount of maintenance and cleaning, which may increase the price per test. Impedance analyzers are moderately priced and provide fast results, but they cannot provide a true 5-part leukocyte differential or reticulocyte count.

Laser flow cytometry is the most recent and accurate automated cell analyzer technology and the method used in most reference laboratories to determine the leukocyte differential count. As cells pass through a laser beam, the pattern of light scattered by the individual cells records the cell size, nuclear characteristics, and cytoplasmic contents, providing a true optical 5-part leukocyte differential. Some analyzers provide an absolute reticulocyte count for the dog and cat, which is the gold standard in classifying anemias. This technology may be slightly more expensive than the other available methodologies and was previously limited only to reference laboratories.

The features of in-house hematology analyzers vary greatly. Practitioners should weigh the pros and cons of each instrument before deciding which one is most appropriate for the practice (*Table 1*). Regardless of instrumentation, veterinarians should interpret all analyzer results with a peripheral blood film evaluation, which provides invaluable information about the cellular morphologic changes that automated instruments cannot provide. Because hematologic samples are particularly vulnerable to changes over time, in-house analyzers offer the benefits of immediate and reliable information for screening, diagnosing, and monitoring your patients' health.

Table 1: Comparing three types of in-house hematology analyzers

	Quantitative Buffy Coat Profile	Impedance or Focused-Flow Impedance	Laser Flow Cytometer
WBC Differential	**2-part differential** Lymphocytes/Monocytes (combined) Granulocytes (3-part differential for canine and bovine samples with a significant number of eosinophils)	**3-part differential** Granulocytes Lymphocytes Monocytes (Some systems estimate eosinophils and basophils.)	**5-part differential** Neutrophils Lymphocytes Monocytes Eosinophils Basophils
Absolute Reticulocyte Count	No, but reticulocyte % is reported.	No	Yes
Sample Run Time	7 minutes	1 to 3 minutes	10 minutes
Nucleated RBC Interference with WBC Count	No	Yes	No
Large Platelet Interference with Cell Counts	No	Yes	No
Technician Time for System Run	Moderate	Minimal	Minimal
Required Maintenance	Run calibration rod daily.	Daily background counts Weekly and/or monthly cleanings (Some systems require 3-month, 6-month, and yearly maintenance.)	Clean air filter weekly.
Need for Peripheral Blood Film Evaluation	Yes (Review cell morphology, provide 5-part differential, validate data)	Yes (Review cell morphology, provide 5-part differential, validate data)	Yes (Review cell morphology, validate data)

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