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Clinical Approach to Advanced Renal Function Testing in Dogs and Cats  1193
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Serum creatinine concentration is insensitive for detecting kidney injury and does not assist in differentiation between glomerular versus tubular damage. Advanced renal function tests, including glomerular filtration rate testing, determining fractional excretion of electrolytes, and assay of urine biomarkers, may allow earlier detection of reduced renal function mass, differentiation of renal from non-renal causes of azotemia, and assist with localization of damage. This article reviews the principles, indications, and limitations of these tests and describes their use in sample clinical scenarios.

A Laboratory Diagnostic Approach to Hepatobiliary Disease in Small Animals  1209
Seth E. Chapman and Roger A. Hostutler

Routine biochemical tests generally include serum enzymes, proteins, and other markers useful for identifying hepatobiliary disease in dogs and cats. Obtaining results outside the reference intervals can occur with direct hepatocellular injury, enzyme induction by hepatocytes or biliary epithelium, or decreased hepatic function. However, detection of biochemical abnormalities does not necessarily indicate clinically significant disease. For a comprehensive approach to detection and treatment of hepatobiliary disease, the laboratory results must be correlated with the history and physical examination findings, diagnostic imaging results, and other assays.

Diagnosis of Small Intestinal Disorders in Dogs and Cats  1227
Karin Allenspach

Laboratory tests are an important part of the workup of small intestinal diseases in dogs and cats. Especially in chronic cases, when extragastrintestinal causes need to be ruled out, it is important to adhere to a systematic workup. This article details the newest available data on tests to aid this diagnostic process. Once the diagnosis of a chronic enteropathy is made, there are many laboratory tests that can help in monitoring the disease and providing prognostic information. Several new tests being evaluated for clinical usefulness are discussed.

Practical Interpretation and Application of Exocrine Pancreatic Testing in Small Animals  1241
Caroline Mansfield

The pancreas remains a difficult organ to evaluate using laboratory methods alone. No single laboratory test is diagnostic of pancreatitis (chronic or...
acute) without other diagnostic modalities concurring with the diagnosis or ruling out other diseases. The diagnosis of pancreatitis is particularly difficult in cats, and pancreatitis often occurs with other diseases. The use of pancreatic cytology may be useful in diagnosing both inflammation and neoplasia. Exocrine pancreatic insufficiency (EPI) can be relatively easily diagnosed when clinically manifested by the measurement of trypsinlike immunoreactivity. Diagnosis is more difficult when EPI is subclinical.

**Using Cardiac Biomarkers in Veterinary Practice** 1261
Mark A. Oyama

Blood-based assays for various cardiac biomarkers can assist in the diagnosis of heart disease in dogs and cats. The two most common markers are cardiac troponin-I and N-terminal pro-B–type natriuretic peptide. Biomarker assays can assist in differentiating cardiac from noncardiac causes of respiratory signs and detection of preclinical cardiomyopathy. Increasingly, studies indicate that cardiac biomarker testing can help assess the risk of morbidity and mortality in animals with heart disease. Usage of cardiac biomarker testing in clinical practice relies on proper patient selection, correct interpretation of test results, and incorporation of biomarker testing into existing diagnostic methods.

**Practical Acid-Base in Veterinary Patients** 1273
Andrea A. Monnig

Acid-base abnormalities are common in critically ill veterinary patients. Rapid recognition of disturbances can be helpful in identifying the underlying cause of the patient’s clinical signs, directing diagnostics, and monitoring response to therapy. If acid-base disturbances are left unidentified and untreated, severe physiologic consequences can result, including cardiovascular and neurologic dysfunction, protein and enzyme dysfunction, and electrolyte derangements. Treatment of acid-base disorders is aimed at correcting the underlying disease process.

**Use of Lactate in Small Animal Clinical Practice** 1287
Leslie C. Sharkey and Maxey L. Wellman

Lactate is a product of anaerobic metabolism. Lactate concentration in blood is used clinically as an indicator of tissue hypoperfusion and hypoxia to determine disease severity, assess response to therapy, and predict outcome. This article reviews lactate physiology, sample collection and processing, and interpretation of lactate concentration in clinical practice.

**Hypocalcemia of Critical Illness in Dogs and Cats** 1299
Marie K. Holowaychuk

Hypocalcemia occurs in critically ill dogs and cats and is associated with medications, treatments, and underlying diseases such as acute kidney disease, pancreatitis, parathyroid disease, sepsis, and trauma. Possible underlying mechanisms include hypovitaminosis D, acquired or relative hypoparathyroidism, hypomagnesemia, and alterations in the ionized fraction of calcium caused by changes in chelated or protein-bound calcium. If severe or acute, hypocalcemia can cause obvious clinical signs related to muscle or neurologic hyperexcitability or more subtle signs of
cardiovascular dysfunction. Emergency treatment with calcium gluconate administration is recommended when clinical signs are present or if there is moderate to severe ionized hypocalcemia.

**Diagnosis of Disorders of Iron Metabolism in Dogs and Cats**
Andrea A. Bohn

Iron is an essential element and is used by every cell in the body. This article summarizes iron metabolism and disorders associated with iron metabolism in dogs and cats. The diagnostic tests currently in use for assessing iron status are discussed.

**Making Sense of Lymphoma Diagnostics in Small Animal Patients**
Mary Jo Burkhard and Dorothee Bienzle

This article summarizes and compares the various assays available to aid in the diagnosis and characterization of lymphoma in small animal patients. These techniques include cytology, histopathology, immunocytochemistry and immunohistochemistry, immunophenotyping by flow cytometry, and polymerase chain reaction for clonal antigen receptor gene rearrangement.

**Current Diagnostic Trends in Coagulation Disorders Among Dogs and Cats**
Marjory B. Brooks and James L. Catalfamo

The diagnostic workup to differentiate hemorrhage caused by vascular injury from a systemic hemostatic imbalance typically involves a combination of broad screening tests and specific assays. The characterization of 3 overlapping phases of primary hemostasis, secondary hemostasis, and fibrinolysis provides a simple diagnostic framework for evaluating patients with clinical signs of hemorrhage. New techniques such as flow cytometry, thrombin-generation assays, thrombelastography, and anticoagulant drug monitoring are under investigation for veterinary patients; however, their ability to improve diagnosis or treatment requires further study in clinical trials.

**Molecular Diagnostics for Infectious Disease in Small Animal Medicine: An Overview from the Laboratory**
Joshua B. Daniels

Molecular diagnostic tests have augmented the way in which veterinary practitioners approach the diagnosis of infectious disease. The technical bases of these tests are explained in addition to the general clinical applications for which they are most aptly suited, as individual assays are best discussed in the context of their respective diseases. In this article, an emphasis is placed on validation of molecular tests so that practitioners can be educated consumers of molecular diagnostics. The relationships between disease prevalence and positive and negative predictive values are discussed. Finally, examples of the pitfalls of multiplex polymerase chain reaction testing are illustrated.

**Using Cytology to Increase Small Animal Practice Revenue**
Joanne Hodges

Diagnostic cytology is a useful, noninvasive test with practical foundations in high-quality medicine and applications to practice building. Cytology will
generate practice revenue whether assessed in-house or sent to a clinical pathologist. Thorough in-house evaluation is adequate in some cases, but expert opinion is important in many cases. Specimen slides should at least be reviewed in-house for assessment of cellularity and potential artifacts before submission to a reference laboratory. Reference laboratories also provide special stains and advanced molecular diagnostics to help further characterize many neoplastic processes, search for organisms, identify pigments, and address other important aspects of the lesion.