

Luke Rump, DVM, Veterinary Referral Center of Colorado, Englewood, Colorado

i-STAT Handheld Clinical Analyzer

Veterinarians in all types of clinical practice see emergency patients. After initial airway, breathing, and circulation problems are addressed, more information is needed to help treat and diagnose the patient.

A more detailed secondary examination and diagnostics such as blood analysis, urinalysis, and imaging studies should be performed after initial stabilization. A starting point for blood analysis includes blood glucose, packed cell volume, blood urea nitrogen, electrolytes, and blood gases. In addition, urine specific gravity and a blood smear will help determine an initial plan of treatment. Needless to say, in emergency situations the veterinarian and patient both benefit from quickly obtained blood analyses.

The use of an i-STAT (Heska, www.heska.com) handheld clinical analyzer allows the clinician to quickly and easily assess initial emergency blood analyses. This battery-operated analyzer uses self-contained disposable cartridges and requires only 0.05 ml of whole blood. Results are available in 2 minutes. Since the machine contains no electrodes, no maintenance is required and calibration is performed automatically at regular intervals.

Heska offers 11 separate cartridges for the analyzer—they vary from a single test (ie, glucose,

creatinine, activated clotting time, cardiac troponin) to cartridges that yield 13 results (see **Table**). The results are both measured directly and calculated from measured results.

Indications

The i-STAT cartridges can be used 3 ways: for diagnosis/treatment, to determine prognosis, and for ongoing monitoring.

Diagnosis & Treatment

Results obtained provide information that permits the clinician to set up a treatment plan and give direction to owners about next steps. The cartridges that test glucose, electrolytes, blood urea nitrogen, creatinine, and acid–base status are most helpful. In addition, testing for activated clotting time will assist with the diagnosis of anticoagulant rodenticide poisoning.

The choice of which crystalloid fluids to administer is based on electrolyte and acid–base status. Blood gas analysis from an arterial sample will provide information about lung function and overall acid–base balance. Venous blood samples can indicate the acid–base status of the



Images courtesy of Heska

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animal but will not provide much information about oxygenation.

Prognosis

The cartridges that test lactate, pH, and cardiac troponin I are the most valuable for determining prognosis.^{1,2} Lactate levels can provide information about oxygen delivery, oxygen demand of the tissues, and inadequate oxygen utilization within the tissues. Cardiac troponin I shows promise as a prognostic indicator for heart disease, but guidelines are not set.

These measures can be used to guide discussions with owners, but clinicians should be careful to avoid relying on single blood values to determine the whole picture. Trends of change are as important as an individual result. Frequent checking to see if the values are going in the right direction will provide more information about prognosis than a single individual test. Similarly, any blood result needs to be evaluated as part of the big picture clinically: if the results do not align with the clinical picture, repeat the test or reconsider the underlying assumptions about the disease and its treatment.

Monitoring

Frequent, ongoing monitoring is indicated in most hospitalized patients and patients that are not behaving as would be expected after starting treatment. Patients that benefit from frequent monitoring and adjustment of treatment based on results include those with metabolic disorders (diabetes, diabetic ketoacidosis, acute vomiting or diarrhea, Addison's disease, eclampsia, hyponatremia), those receiving anesthesia (and are hypopneic or hyperkalemic), and critical care patients. Using the same machine to monitor changes is important for consistency and better care of your patient.

Advantages

The i-STAT has many advantages that can make practice easier. It is especially useful when results are needed rapidly and/or the ability to have blood analyzed by a standard laboratory is

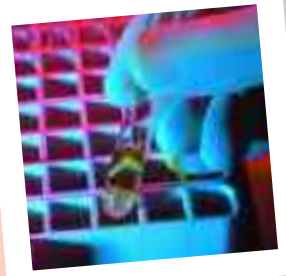
i-STAT Analyzer Cartridges

	Cartridges											
	CG4+	CG8+	G	Crea	E3+	6+	ACT Celite	EC8+	Glu* 8+*	CHEM 8+*	cTnl*	
Hematology												
Hematocrit		✓			✓	✓		✓			✓	
Hemoglobin		✓			✓	✓		✓			✓	
Chemistry												
Blood urea nitrogen						✓		✓			✓	
Creatinine				✓							✓	
Ionized calcium		✓									✓	
Glucose		✓	✓			✓		✓	✓	✓	✓	
Electrolytes												
Chloride**					✓	✓		✓			✓	
Sodium		✓			✓	✓		✓			✓	
Potassium		✓			✓	✓		✓			✓	
Acid Base												
pH	✓	✓						✓				
PCO ₂	✓	✓						✓				
HCO ₂	✓	✓						✓				
TCO ₂	✓	✓						✓			✓	
Anion gap								✓			✓	
Base excess	✓	✓						✓				
Blood Gas												
PO ₂	✓	✓										
sO ₂	✓	✓										
Specialty												
Lactate	✓											
ACT (celite)							✓					
Cardiac troponin I												✓

* Available only on the new i-STAT 1 analyzer
 ** Chloride on the E3+ cartridge is available on the original i-STAT analyzer only
 ACT = activated clotting time

not readily available. For an initial diagnostic panel, the cost is reasonable, and the device can help the clinician direct treatment. The device also helps make ongoing monitoring of patients easier and more affordable.

The variety of cartridges allows clinicians to pick the tests they need. The small sample of blood required makes the device a good choice for puppies and kittens. In addition, blood gas



New Resource

analysis can be done immediately after the blood draw, without the need for icing the sample.

The i-STAT handheld analyzer has been tested against standard laboratory machines in both veterinary and human medicine studies and has correlated favorably.^{3,4}

Disadvantages

It can take some time for the staff to learn how to use the machine and cartridges. If the clinician is unsure of how the cartridges will be used, the cost of the cartridges can seem high. No cartridges are available for evaluating hepatic function, phosphorus, or proteins.

Depending on the i-STAT results, a complete blood panel may be needed, an additional step that increases the cost of blood analysis and means that the veterinarian will still need a laboratory that can do full blood panels, either in-house or off-site. In addition, knowledge of the value of lactate and cardiac troponin I levels is still evolving—what do these measures really tell us, and how should they be used to help patients and their owners?

Economic Impact

The handheld analyzer costs \$3500 to \$5000. Cartridges cost from \$5.50 to \$20 each, and come in boxes of 5, 10, or 25 (depending on the type of cartridge). Newer cartridges are not compatible with older versions of the machine. Technician time to operate the machine is minimal once the proper technique is mastered. Cartridge errors increase cost because the cartridges cannot be reused. The cost to the client can be mitigated by improved patient care and quicker recovery time. ■

See **Aids & Resources**, back page, for references, contacts, and appendices. Article archived on www.cliniciansbrief.com

Dental Health Month Kit

As part of the 14th annual National Pet Dental Health Month in February, Hill's Pet Nutrition has made kits available to veterinary hospitals. The kits include a program guide with suggested activities to educate clients, dental care brochures, window clings, and information on Hill's brand pet food. Kits can be requested by visiting www.PetDental.com or by calling 877-552-1550.—*Press Release 11/30/07*

Salmon Poisoning in Dogs

Alert

An occurrence of salmon poisoning disease (SPD) was recently reported in Orange County, California. SPD is an acute infectious disease that occurs within 5 to 7 days in dogs, wolves, ferrets, and foxes that ingest uncooked salmon, trout, steelhead, and similar freshwater fish. Treatment generally involves antibiotics and dewormer, as well as intravenous fluids. Pet owners need to be aware of the possibility of dogs contracting this disease by eating raw fish.—*Press release 11/17/07*

Medication Exchange Program Launched

New Program

Wedgewood Pharmacy has introduced the Refresh exchange program, which lets veterinarians return expired custom-compounded medications for exchange, at no cost. The program, a compounding-pharmacy profession first, will exchange unopened, expired compounded veterinary medications within its regular formulary of more than 6,000 medications, including those prepared by other compounding pharmacies. Controlled substances and oncology-related medications are the key exceptions. For more information and to enroll, go to www.wedgewoodpharmacy.com/refresh—*PRNewswire 12/3/07*

Cyberspace Hangout for Pet Lovers

New Web Site

NBC Universal and Procter & Gamble have kicked off a new Web portal that looks something like a Yahoo or AOL for pet owners, with a bit of Facebook and MySpace thrown in. Petside.com offers all things dog and cat—from serious (recognizing signs that a pet may be sick) to silly (funny animal videos) with links to shopping sites and articles on topics such as handling pet allergies. Visitors can network to meet other pet owners.—*Press release 11/19/07*

IVF Success for Cheetahs

Research Milestone

Cheetah embryos were recently produced for the first time by in vitro fertilization (IVF) at the Cheetah Conservation Fund International Research and Education Centre in Namibia. Scientists are working to develop a better understanding of cheetah reproductive longevity so they can be bred in captivity to bolster their numbers and improve their gene pool. Cheetah embryos have precise requirements for temperature, carbon dioxide levels, and laboratory growth mediums.—*Press release 11/14/07*