

**Lab Locations**

Atlanta  
Georgia

Chicago  
Illinois

Dallas/  
Fort Worth  
Texas

Denver  
Colorado

Detroit  
Michigan

Honolulu  
Hawaii

Houston  
Texas

Los Angeles  
California

Memphis  
Tennessee

New York  
New York

Phoenix  
Arizona

Portland  
Oregon

San Francisco  
California

Seattle  
Washington

Tampa  
Florida

## LABORATORY DATA IN GERIATRIC DOGS & CATS

The following summarizes a study of geriatric dogs and cats performed at the VCA West Los Angeles Animal Hospital in 1998 and 1999.

### Background

As laboratory tests play an important role in the overall evaluation of animal patients, a clinical study of routine laboratory parameters was conducted in healthy senior dogs and cats. The study purpose was to evaluate laboratory findings from a large number of clinically normal older dogs and cats to evaluate the rationale for, and value of doing laboratory work routinely as part of a senior wellness program. Ninety dogs and 100 cats, all over seven years old, were enrolled in the study.

As an animal ages, there is a definite loss of functional reserve capacity of every organ system (Table). These changes of aging may affect laboratory

data without necessarily reflecting the presence of a disease process and must be considered when interpreting laboratory values in senior patients.

### Methods

Study animals were selected from the overall hospital database over a 5 month period. They were all over seven years of age, in apparent good health according to the owner, and had no underlying medical condition or treatment known to alter laboratory values (e.g., corticosteroids, phenobarbital). Once enrolled, the animal was presented for a thorough historical review, general physical examination and laboratory tests including a CBC, serum chemistry profile, T4, urine cortisol:creatinine ratio (dogs only), and complete urinalysis (cystocentesis samples). Only animals with a normal physical exam were selected.

## EFFECTS OF AGING

### METABOLIC EFFECTS

- Decreased metabolic rate and activity reduces caloric need by 30-40%.
- Decreased immune competence despite normal lymphocyte numbers.
- Decreased phagocytosis and chemotaxis with less resistance to infections.
- Autoantibodies and autoimmune disease develop more commonly.
- Increased function of most endocrine organs (thyroid, reproductive, pancreas) plus increased activation of hypothalamic-pituitary-adrenal axis.

### PHYSICAL EFFECTS

- Increased % of body weight represented by fat.
- Skin becomes hyperpigmented, loses elasticity.
- Footpads hyperkeratinize and claws become brittle.
- Loss of bone, muscle and cartilage mass with resultant development of osteoarthritis.
- Dental calculus results in gingival hyperplasia. Calculus with periodontitis leads to gingival atrophy, gum retraction, and tooth loss.
- Gastric mucosa becomes atrophic and fibrotic along with decreased production of pancreatic enzymes.
- Decreased hepatocyte numbers, with fibrous connective tissue replacement (hepatic fibrosis). Progressive disease may result in cirrhosis.
- Lungs lose elasticity and begin to fibrose, secretions become more viscous, vital capacity decreases as does cough reflex and expiratory ability.
- Decreased kidney weight, tubular atrophy, and increased glomerular filtration rate. Urinary incontinence may occur.
- Prostate and ovaries enlarge, testes atrophy, prepuce becomes pendulous, mammary glands become fibrocystic.
- Decreased cardiac output, valvular fibrosis and intramural coronary arteriosclerosis along with arrhythmias and increased peripheral resistance.
- Bone marrow becomes pale and fatty and anemia ensues.
- Decreased number of nervous system cells, with increasing amounts of beta amyloid.

# LAB DATA ON GERIATRIC DOGS & CATS (CONT'D.)

## Results

### CANINE POPULATION

Increased alkaline phosphatase (ALP) was seen in 15 (17%) dogs. Of these dogs, 4 had concurrent increases in their urine cortisol:creatinine ratios (UCCR), suggesting the possibility of hyperadrenocorticism. Three of four dogs were worked up further. Dexamethasone suppression tests were run on these patients and results indicated the presence of pituitary-dependent hyperadrenocorticism.

The UCCR was elevated in 14 dogs (16%). In 26 (29%) dogs, total T4 values were below normal. Eleven were reevaluated and nine dogs were diagnosed with hypothyroidism based on low free T4 (ED) values.

Eleven (11%) of the dogs had bacteriuria and pyuria. Four of them were also found to be azotemic, in the absence of clinical dehydration, consistent with possible pyelonephritis. Urine specific gravity of 2 of these dogs were 1.026 and 1.015, and both had positive urine cultures. This highlights the importance of performing a routine urinalysis, preferably on urine collected by cystocentesis, as part of the routine health assessment.

### FELINE POPULATION

Elevations in the total T4 were noted in 6 (16%) of 100 cats. However, thyroid nodules were palpable on physical examination in only 1 of them.

Nine cats were found to be azotemic based on elevations in BUN and creatinine in the absence of clinical dehydration. Five of them had urine specific gravity below 1.035.

One of the 100 cats was diagnosed with diabetes mellitus based on persistent hyperglycemia and glucosuria.

## Discussion

### CANINE POPULATION

Elevations in serum ALP can be due to a variety of factors, including bone disease, cholestasis, drug induction, neoplasia, hepatic nodular hyperplasia, hepatitis, reactive hepatopathy, and endocrine disease. The absence of medications known to alter ALP makes exogenous induction unlikely to be the cause of high ALP in these dogs. In this study, three dogs were diagnosed with hyperadrenocorticism and the disease was suspected in one other due to an increase in ALP and elevated UCCR. The only clinical sign noted by the owner of one dog diagnosed with hyperadrenocorticism was recent weight gain.

Of the 90 dogs studied, 14 (16%) had elevated UCCR. There was no evidence in these dogs of non-adrenal illness based on other laboratory tests or clinical examination findings. Previous studies have demonstrated a relationship between dogs that develop geriatric-onset behavioral changes and elevations in UCCR values. This is thought to be due to dysregulation of the hypothalamic-pituitary-adrenal axis seen in geriatric dogs which develop Alzheimer-like behavioral changes in the absence of an underlying medical condition.

Hypothyroidism is one of the most common endocrinopathies diagnosed in the dog. Typically, hypothyroidism affects dogs between the ages of 4 and 10 years with spayed females and castrated males being at an increased risk. Of the 90 older dogs studied, 26 (20%) had decreased total T4 concentrations. However, this parameter can be affected by

other nonthyroidal illnesses making it unreliable by itself in diagnosing hypothyroidism. Eleven of these dogs were reevaluated by measuring free T4 (ED) concentrations; five of them were decreased, thus confirming hypothyroidism. None of these dogs was displaying classic symptoms of hypothyroidism.

### FELINE POPULATION

Hyperthyroidism was diagnosed in 6 of the 100 cats based on elevated total T4 concentrations. While this condition is still the most common endocrine disorder diagnosed in the cat, increased awareness of the problem has resulted in earlier detection and intervention before the onset of severe signs. Only one of the cats diagnosed with hyperthyroidism in this study was symptomatic based on the owner's observations. Feline hyperthyroidism is typically caused by thyroid adenomas with the age of onset ranging from 4 to 22 years. About 6% of hyperthyroid cats are less than 10 years of age at the time of diagnosis, although 3 of the 6 hyperthyroid cats studied here were under 10 years of age.

Nine of the 100 cats had azotemia and 5 of these 9 cats had renal failure based on a urine specific gravity < 1.035.

## Conclusions

As pets age, the importance of routine veterinary visits and diagnostic laboratory screening becomes even greater. The overall prevalence of disease found in these apparently healthy dogs and cats was one of the most valuable findings in the study. Despite the fact that these animals were not being treated for any underlying medical problems, clinically significant disease was found in more than 20% of the canine population and more than 17% of the feline population.

Subclinical disease is thus relatively common in the senior dog and cat. Veterinarians should therefore consider spending more time taking a thorough history, and performing physical examinations and laboratory tests with geriatric animals. As many owners may dismiss early clinical signs of illness as "simple aging" and not mention them to the veterinarians, we should rely less on the owner to provide information about changes in their pet's physical and behavioral health since the last office visit. Scheduling frequent follow-up visits can also help detect early signs of an emerging health problem.

## LAB TIP

### UTI in Endocrine Disorders

In a recent study of 101 dogs with hyperadrenocorticism, diabetes mellitus, or both disorders, 42% had urinary tract infections (UTI) diagnosed by urine culture. UTI was present in 46% of dogs with hyperadrenocorticism, 37% of dogs with diabetes mellitus, and 50% of dogs with both disorders. *E. coli* was the most common bacterium isolated, present in 69% of dogs. Clinical signs of dysuria or pollakiuria were present in < 5% of the dogs with UTI, and 19% of dogs with positive cultures had neither pyuria or bacteriuria on urinalysis.

**Conclusion:** A urine culture should be included routinely as part of the initial evaluation of dogs with these endocrine disorders regardless of clinical signs or urinalysis findings.

**Reference:** Forrester, et al. J Vet Int Med 13: 557-560, 1999.