



Canine Urology

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Introduction

- Prevalence of diseases
- Introduction to the kidney
- Chronic kidney disease
- Bladder Stones
- Urinary tract infections



Basset Hound Club of America Health Survey 2016

Overall prevalence rates among purebred owned Basset Hounds

- Prevalence rates of disease
 - Arthritis 10.5%
 - Chronic ear infections 12.1%
 - Skin yeast infections 12.2%
 - Hot Spots 13.7%
 - Sebaceous cysts 19.7%
- Prevalence rates of urinary disease
 - Bladder stones 2.8%
 - Chronic urinary tract infection 5.1%

Basset Hound Club of America Health Survey 2016

Table 1. Causes of death by organ system/category for Basset Hounds.

Cause of death		N	%	Most common specific causes in descending order
1	Cancer	44	31.0	Unspecified
2	Old age	19	13.4	Old age unspecified; old age euthanased
3	Gastrointestinal	16	11.3	Gastric dilatation/volvulus (GDV)
4	Cardiac	11	7.7	Heart failure; heart attack
5	Neurologic	8	5.6	Seizures; spinal or back or vertebral disease unspecified
6	Urologic	8	5.6	Chronic kidney failure
7	Cerebral vascular	7	4.9	Stroke or cerebral vascular accident
8	Combinations	5	3.5	
9	Other	5	3.5	Uncodeable
10	Trauma	5	3.5	Road traffic accident
11	Dermatologic	2	1.4	Skin disease unspecified
12	Hepatic	2	1.4	Liver failure chronic or unspecified
13	Musculoskeletal	2	1.4	Arthritis; hip dysplasia and spondylitis
14	Reproductive	2	1.4	Prostatomegaly; pyometra
15	Respiratory	2	1.4	Pneumonia; respiratory failure
16	Senility	2	1.4	
17	Ocular	1	0.7	Glaucoma
18	Perioperative	1	0.7	
Total		142	100.0	

Purebred Dog Health Survey for Basset Hounds

Report from Kennel Club/British Small Animal Veterinary Association Scientific Committee

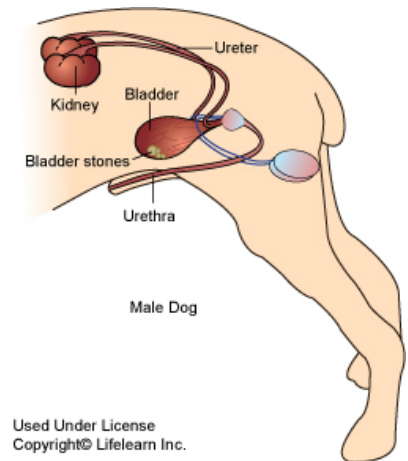
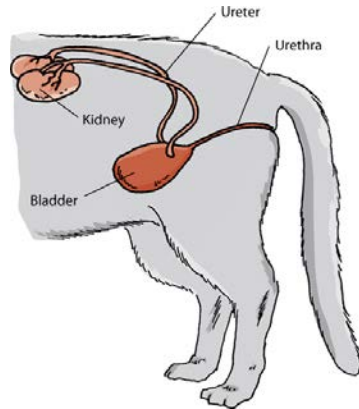
Table 3. Disease conditions by organ system/category for Basset Hounds.

Disease condition	All conditions		Most common specific conditions in descending order
	N	%	
1 Dermatologic	45	17.9	Dermatitis; fungal skin infection; sebaceous cyst; recurrent pyoderma
2 Reproductive	34	13.5	False pregnancy; pyometra; prostatomegaly; dystochia (physical blockage>uterine inertia)
3 Musculoskeletal	28	11.2	Arthritis; lameness (unspecified>forelimb); CLR; panosteitis; prognathism
4 Gastrointestinal	21	8.4	GDV; colitis; foreign body obstruction; IBD; pancreatitis; vomiting
5 Aural	18	7.2	Otitis externa; aural haematoma; excessive ear wax
6 Ocular	18	7.2	Cataracts; glaucoma; cherry eye; entropion; lens luxation
7 Immune mediated	16	6.4	Food allergy; gluten-sensitive enteropathy; atopy; dust mites; DLE; flea allergy
8 Cardiac	13	5.2	Heart murmur
9 Urologic	10	4.0	Cystitis; cystouroliths (mixed=unspecified=struvite); incontinence
10 Neurologic	8	3.2	Seizures or fits or idiopathic epilepsy
11 Unknown	7	2.8	Undiagnosed illness
12 Endocrine	6	2.4	Hypothyroidism; Addisons disease; diabetes insipidus; diabetes mellitus
13 Respiratory	6	2.4	Kennel cough; rhinitis; long soft palate; tracheal collapse
14 Benign neoplasia	5	2.0	Lipoma
15 Cancer	5	2.0	Type unspecified
16 Dental	4	1.6	Retained puppy teeth; dental disease
17 Behaviour	3	1.2	Aggression; unspecified
18 Trauma	2	0.8	Musculoskeletal; neurologic
19 Anal gland	1	0.4	Anal sacculitis
20 Hepatic	1	0.4	Hepatitis
Total	251	100.0	

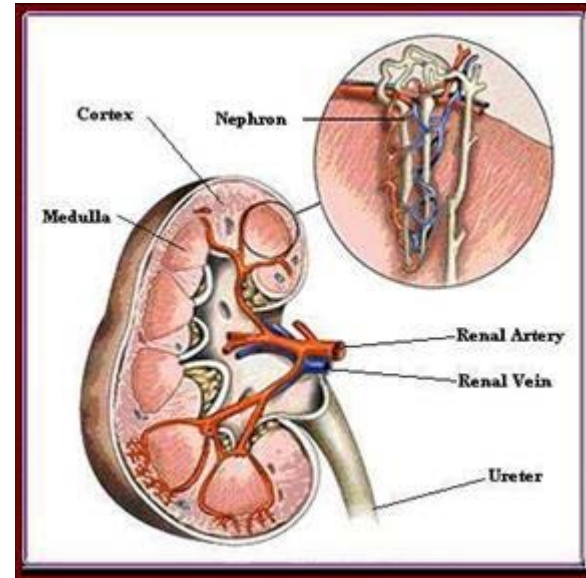
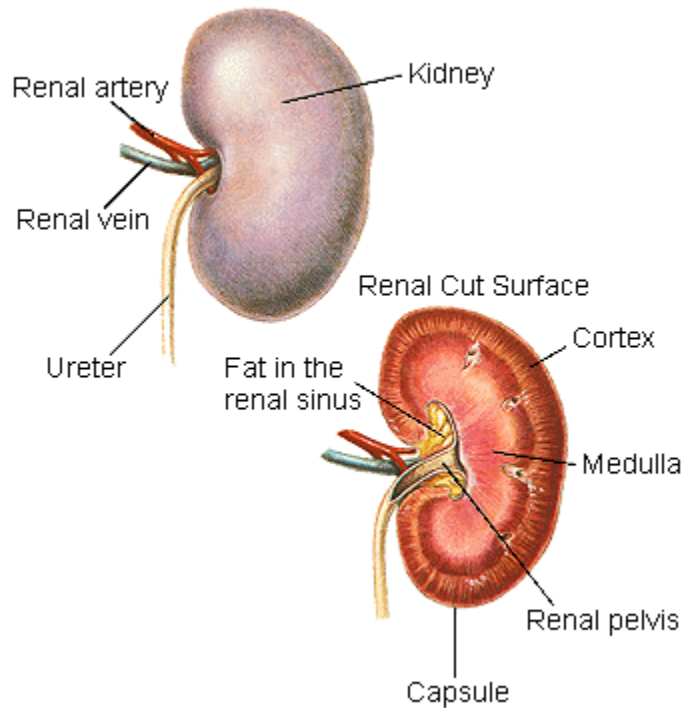
DLE=discoïd lupus erythematosus

Urology

- Branch of medicine and physiology concerned with the function and disorders of the urinary system
- Can also include reproductive system



Structure of the kidney



<http://www.vetmed.wsu.edu/outreach/Pet-Health-Topics/categories/cat-and-dog-anatomy/urogenital-system-of-the-dog>

<http://www.wheatenhealthinitiative.com/Pages/hereditpleIn.html>

Structure of the kidney

- Nephron - microscopic unit of the kidney
 - Each kidney has thousands of nephrons
- When 2/3rd of nephrons has been lost no longer able to conserve water and start urinating more
- When 75% of the nephrons have been lost routine blood work changes are noted
 - Elevated blood urea nitrogen
 - Elevated creatinine

Kidney disease

- Chronic kidney disease
 - Kidney disease that has been present for months to years
 - Different causes
 - Congenital e.g. renal dysplasia
 - Bacterial infection
 - Hypertension
 - Immune-mediated disease
 - Acute kidney disease resulting in chronic damage
 - Antifreeze poisoning

Chronic kidney disease

- Signs
 - Polydipsia/Polyuria
 - drinking and urinating too much
 - Incontinence
 - From high urine volume
 - Gastrointestinal signs
 - Reduced appetite, vomiting or diarrhea
 - Predisposed to development of ulcers
 - Related to build up of waste products
 - Lethargy, reduced energy
 - Related to build up of waste products
 - Anemia
 - Electrolyte abnormalities such as low potassium
- Physical exam
 - Dehydration
 - Weight loss
 - Poor haircoat
 - Weakness
 - Ulcers in the mouth
 - Pale gums

Chronic kidney disease

Diagnosis

- Laboratory testing
 - Complete blood count
 - Anemia – low red blood cell count
 - Chemistry
 - Increased BUN and creatinine
 - Increased phosphorus
 - Urine
 - Reduced specific gravity (concentration)
 - Look for evidence of bacteria, protein
 - Urine culture



Chronic kidney disease

Diagnosis

- SDMA – Symmetric dimethyl arginine
 - Newer blood test by Idexx
 - Detect loss of kidney function earlier
 - 25-40% loss of nephrons
 - May identify CKD 9 months earlier in dogs
- Diagnosis made based on signs, exam findings, lab testing
- Other testing for evaluation of underlying cause/staging

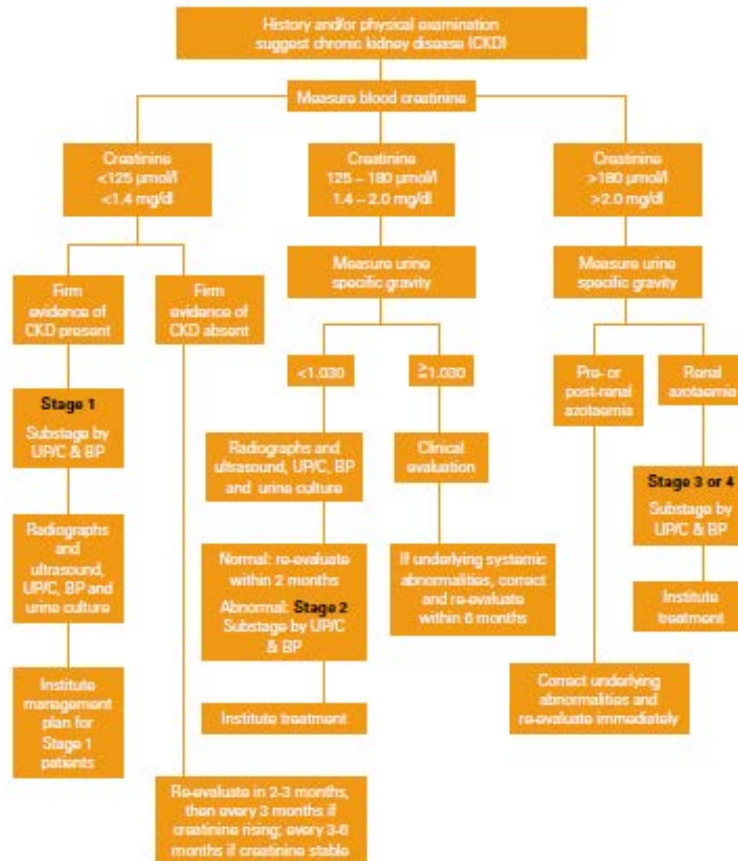
Chronic kidney disease

Staging

- IRIS kidney staging
 - Facilitate treatment and monitoring
 - Staging by fasted creatinine blood concentration
 - Sub-staged by blood pressure and urine protein content
 - Empirical recommendations made based on Stage of kidney disease



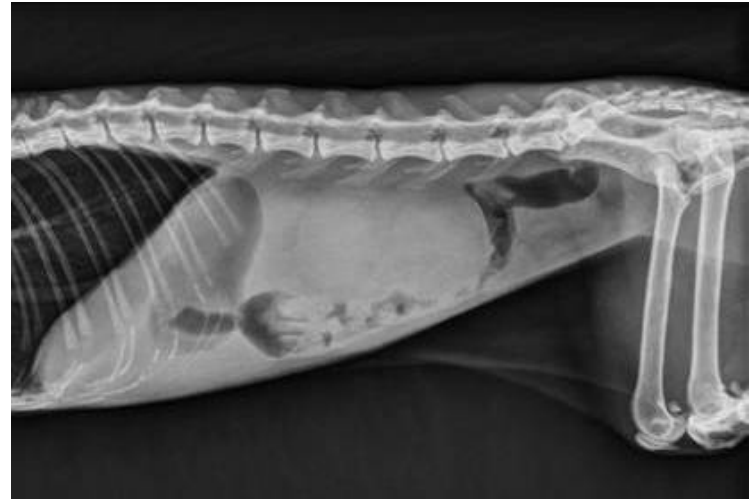
Algorithm for Staging of Chronic Kidney Disease in Dogs



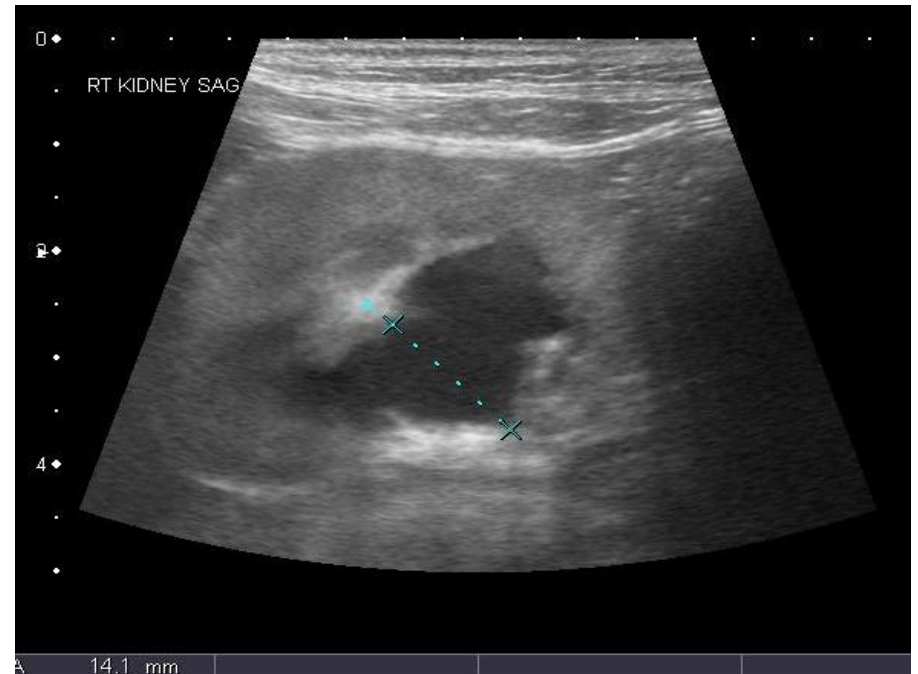
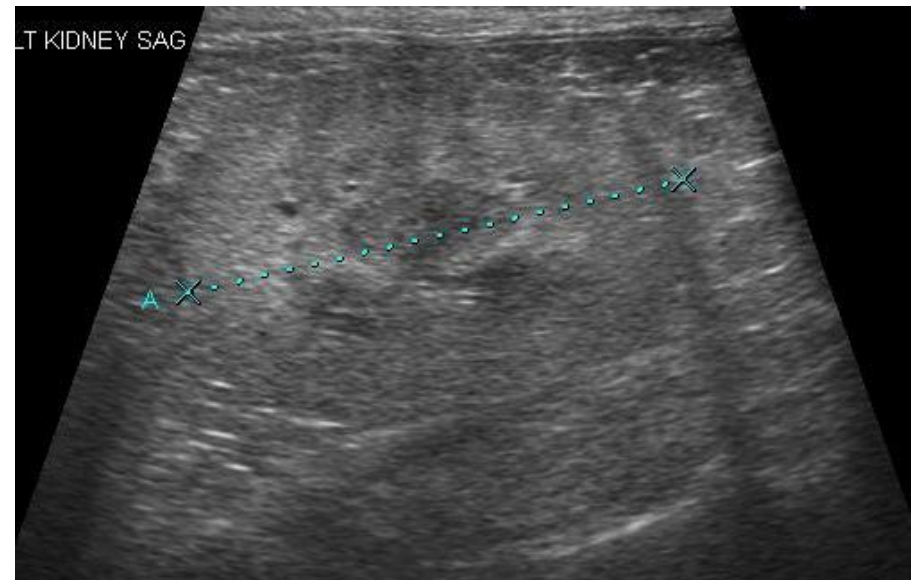
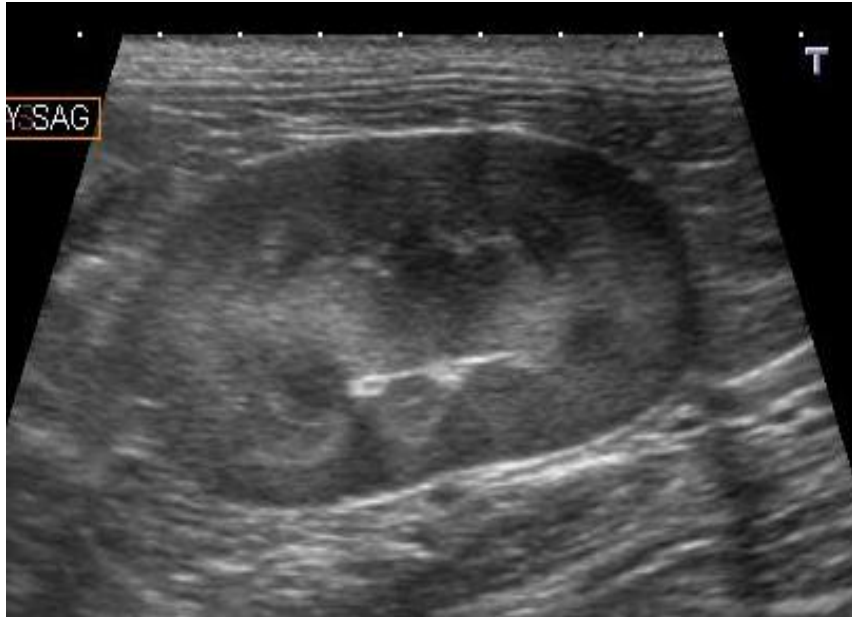
Chronic kidney disease

- Other diagnostics
 - Abdominal radiographs
 - Size of kidneys
 - Chronic kidney disease – small kidneys
 - Evidence of stones
 - Abdominal ultrasound evaluation
 - Shape/Size of kidney
 - Evidence of stones
 - Evidence of infection
 - Tumors
 - Rest of urinary tract and other organs
 - Kidney biopsy
 - Congenital disease
 - Immune-mediated disease
 - Cancer

Radiographs



Ultrasound



Chronic kidney disease

Treatment - Management

- Goals
 - Prevent or treat complications of kidney disease
 - Manage conditions secondary to kidney disease
 - Slow down loss of kidney function



Treatment – Management

- Nutrition

- Prescription kidney diet

- Low protein, reduced phosphorus, lower sodium
 - Higher Vitamin B, soluble fiber
 - Higher caloric density
 - Higher omega 3 fatty acids and antioxidants

- Probiotics

- Limited effect but may help with reducing the amount of nitrogen in GI tract

- Homecooked diet

- Consult with nutritionist

Treatment – Management

- Ulcer prevention
 - Famotidine – Pepcid
 - Ranitidine – Zantac
 - Omeprazole – Prilosec
- Ulcer treatment
 - Carafate
 - Binds to exposed collagen in acidic environment – coats ulcers
 - May also be used to bind phosphorus

Treatment – Management

- Nausea
 - Metoclopramide
 - Ondansetron
 - Maropitant citrate- Cerenia
- Appetite stimulant
 - Mirtazapine
- Phosphorus binding agents
 - Aluminum hydroxide
 - Can cause reduced appetite, constipation
 - Newer
 - Sevelamer hydrochloride (Renagel)
 - Lanthanum carbonate (Fosrenal)

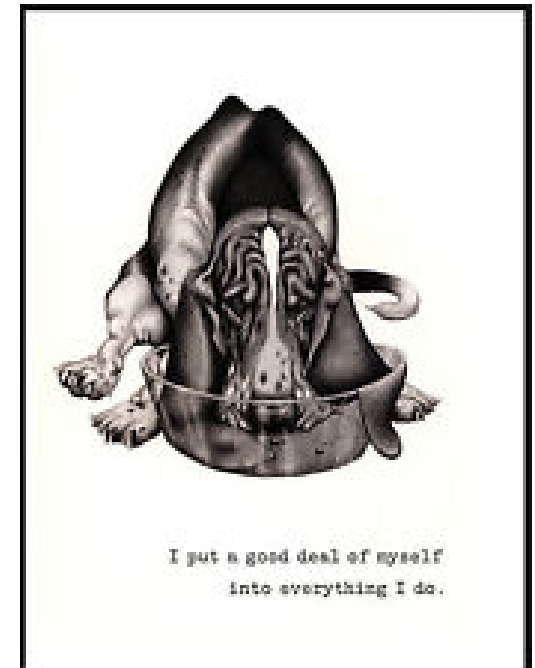


Treatment – Management

- Hydration
 - Polydypsia helps adjust for polyuria
 - Worsening dehydration
 - Lack of access to water
 - Concurrent disease reducing water consumption
 - Progression of kidney disease
 - Signs of dehydration
 - Sunken eyes, weakness/lethargy, constipation, loss of appetite
 - Worsening kidney values

Treatment – Management

- Treatment of dehydration
 - Canned foods – adding additional water
 - Subcutaneous fluids
 - Lactated ringers most common
 - Administered every 1-3 days
 - May need hospitalization



Treatment – Management

- Proteinuria
 - Omega 3 fatty acids
 - Benazepril – reduce blood pressure at level of kidney slightly
 - May cause worsening kidney values
 - Other medications may be indicated
 - Losartan, Telmisartan
 - Immuno-suppressive medications



Treatment – Management

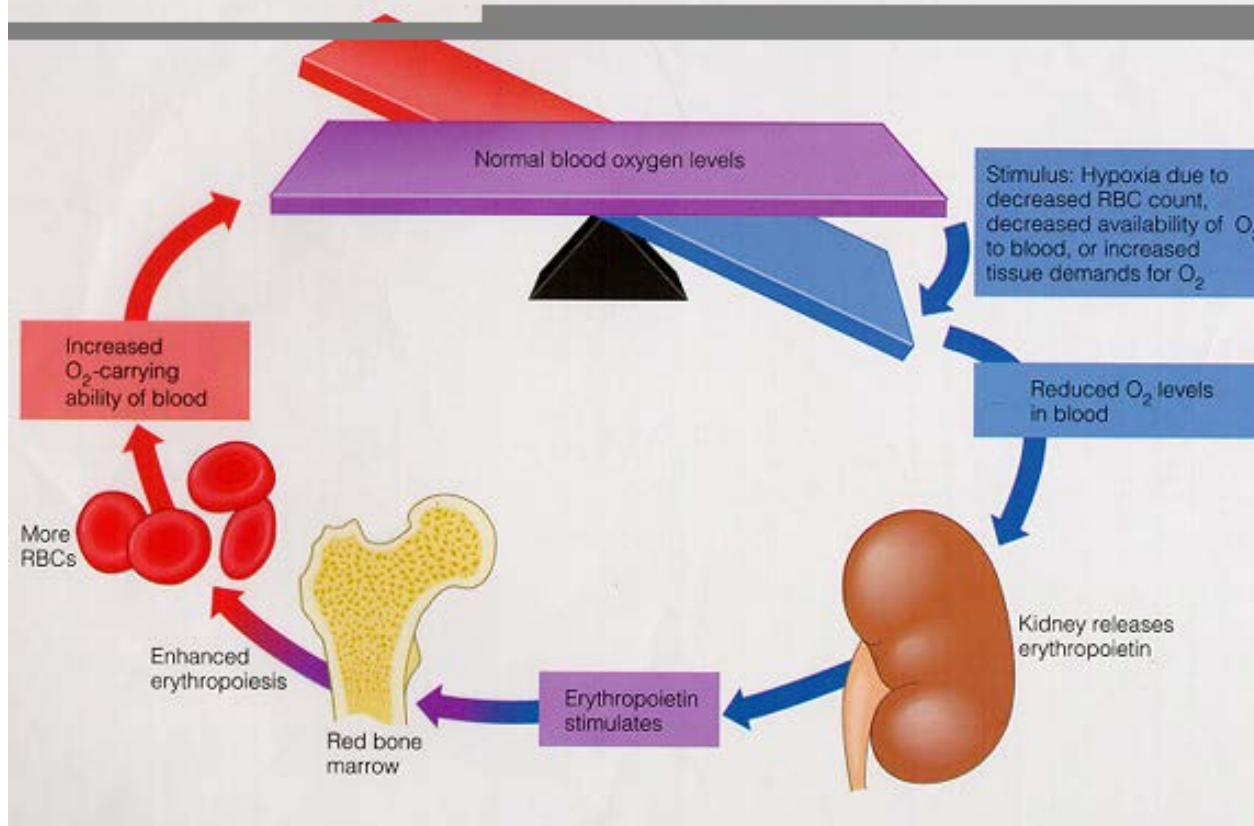
- Hypertension – High blood pressure >160-180 mmHg
 - Concern for end-organ injury
 - Eyes, Kidneys, Nervous System, Cardiovascular system
 - Blindness, seizures, heart changes
 - Multiple measurements, separate days
 - Benazepril
 - Mild reduction – only 10 mmHg
 - Amlodipine/Norvasc
 - Can be combined

Treatment – Management

- Anemia – low red blood cells
 - Bleeding from GI ulcer
 - Reduced production of erythropoietin by kidney
 - Increased red blood cell fragility
 - Iron deficiency
- Treatment
 - Iron supplementation
 - Iron injection – iron dextran
 - Oral supplementation – Pet Tinic

Anemia

Erythropoietin mechanism for regulating the rate of erythropoiesis (Figure 18.6)



Treatment – Management

- Treatment of Anemia
 - Hormone supplementation
 - Erythropoeitin – Procrit, Epogen
 - Darbepoietin – Aranesp
 - Longer acting but more expensive
 - Possibly associated with less antibody production

Prognosis

- Variable
- Monitor for progression
 - Exam, CBC/Chemistry/Urinalysis, Blood pressure, Urine culture once to twice yearly
- Early stages – every 4-6 months, later stages every 3-4 months
- When adjustments are made to treatment protocol monitor more often

Bladder stones



Bladder stones

- Uroliths – stones in any section of the urinary tract- most common in the bladder
- Cause of uroliths
 - Genetics
 - Appropriate environment conditions
 - Occur when urine too concentrated
 - Urine pH
 - Bacterial infection
 - Minerals precipitating out as crystals – form together to create sand and further precipitation of sand forms stones
- Three main types
 - Calcium oxalate, struvite, urate
 - Cystine stones are rare but can be seen in basset hounds
-

Bladder stones – Clinical signs and Diagnosis

- Signs
 - Blood in urine
 - Urinating frequently
 - Strain to urinate
 - May not show signs
- Diagnosis
 - Radiographs
 - Radiopaque stones – calcium oxalate, not as obvious are struvites and cystine
 - Radiolucent – urate
 - Ultrasound

Bladder stones – Treatment

- Increasing water consumption
- Dilute urine so less concentrated so not allowing precipitation of precursors
- Tools
 - Canned food 75% water compared to dry 12% water
 - Multiple bowls of fresh water
 - Water pump/fountain
 - Adding ice or meat flavoring
- Monitor urine specific gravity

Bladder Stones – Treatment

- Dissolution
 - Possible with struvite, urate, cysteine
 - Caution as get smaller of urinary obstruction
 - Can take 1-3 months
- Surgery
- Urohydropropulsion
- Monitor for recurrence every 3-6 months

Antegrade urohydropropulsion

NATOMEXPLORER
BY CALLIMEDIA
CAT & DOG

ROYAL CANIN



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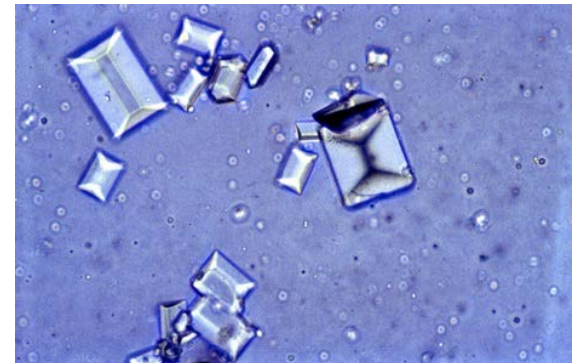
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Bladder stones – Struvite

- Composed of magnesium, ammonium, phosphates
- Alkaline pH
- Miniature Schnauzer, Shih Tzu, Bichon Frise, Miniature Poodle, Cocker Spaniel, and Lhasa Apso
- Commonly occur concurrently with urinary tract infections (UTI)
- More common in female – more likely to have UTI

Bladder Stones – Struvite

- Stones may be dissolved
 - Treat underlying infection
 - Lower urine pH
 - Diets have addition of methionine to help acidify urine
 - Lower protein diet recommend so that have lower ammonium and phosphate in urine
 - May not work if combination stone
 - Hills S/D diet

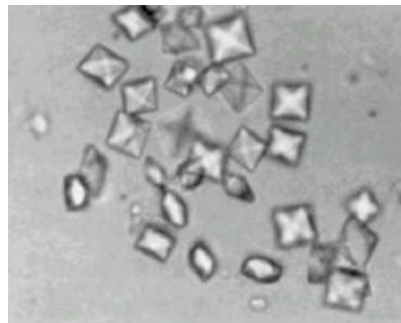


Bladder stones – Calcium oxalate

- Comprised of calcium and oxalate
- Miniature Schnauzer, Lhasa Apso, Yorkie, Bichon Frise, Pomeranian, Shih Tzu, Cairn Terrier, Maltese, Mini Poodle, Chihuahua
- Acidic urine pH
- Reduce calcium intake – not too much! – can cause more oxalate to be absorbed
 - Normally calcium binds oxalate so that not absorbed from GI tract
- Reduce oxalate intake – come from natural processing of other nutrients in diet
 - Limit vegetables and fruits

Bladder stones – Calcium oxalate

- Evaluate for causes of high calcium excretion into urine
 - high calcium on blood work
- Hyperadrenocorticism is associated with calcium oxalate stone formation
 - Exogenous steroids



Calcium oxalate stones management

- Diet
- Drugs
 - Potassium citrate
 - Increases urine pH ideally to neutral
 - Citrate complexes with calcium
 - Thiazide diuretics – hydrochlorothiazide
 - Reduce urinary calcium excretion
 - May not work as well with higher sodium diets and increased water intake

Dietary management of Struvite and Oxalate

- Royal Canin SO – multiple different versions
- Royal Canin Multifunction urinary and hydrolyzed dry, Multifunction urinary and satiety dry
- Royal Canin Mature Consult Dry
- Royal Canin Diets with S/O index
 - reduce relative supersaturation for struvite and oxalate
- Purina UR
- Hills C/D multicare dry/canned/stew
- Treats
 - RC urinary canine treats (canine/feline), kibbles from dry diet, high moisture fruits/vegetables

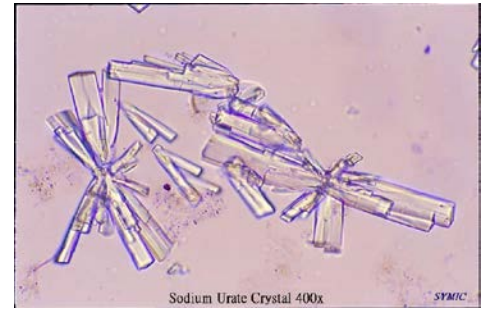
Bladder Stones – Urate



- Comprised of ammonia and uric acid
- Form in acidic urine
- Liver disease – most common a liver shunt
 - Liver not breaking down ammonia (to urea) and uric acid (to allantoin) so more filtered into urine
- Genetic defect in how handle uric acid which comes from purines
 - Dalmatian, English bulldogs, Black Russian Terriers
- Miniature Schnauzers, Shih Tzu, and Yorkie
- Purines come from DNA – large amounts found in protein- highest in organ meats, lowest in vegetable or dairy proteins
 - Cottage cheese or egg-based diets commonly used

Management of Urate stones

- Diagnose underlying liver disease
- Diet
 - Royal Canin Urinary UC Low Purine dry
 - Purina HA dry – ok for growth
 - Royal Canin Vegetarian dry/canned
 - Royal canin Hepatic dry only
 - Hills L/d dry/canned – ok for growth
 - Hills U/d dry/canned – short term ONLY
- Increase urine pH
 - Consider potassium citrate



Bladder stones – Cystine



- Comprised of cystine molecules
- Genetic defect in carrier protein that reabsorbs cystine in the kidney so does not end up in urine
- Cystine solubility in urine low so likely to form stones
- Mastiffs, Australian Cattle dogs, English Bulldogs, Chihuahua, Newfoundland, Rottweiler, Pitbulls, Staffordshire Bull terrier, Basset Hounds

Management of cystine stones

- High protein diets – especially those high in methionine should be avoided
- Ideally use plant protein diets
- Also having a neutral to slightly alkaline urine helps increase solubility of cystine
 - Potassium citrate
- 2-MPG or tiopronin
 - Thiol in drugs results in reaction that makes cystine soluble in urine
 - Can result in dissolution but lots of side effects (Behavioral, muscle and skin changes, blood abnormalities)

Urinary tract infections



Urinary tract infection

- Infection of any or all parts of the urinary tract
 - Most commonly urinary bladder
 - Most commonly bacteria
- To get a urinary tract infection
 - Break in animal's defenses
 - Bacteria migrate into urinary tract, catch hold and multiply
- May affect 14% of all dogs during their lifetime

Urinary tract infections

- Natural defense mechanisms
 - Normal urination – continence, frequency of urination, complete voiding, adequate volume
 - Mucosal defense barriers
 - E.g. antibody production, exfoliation of cells, surface glycosaminoglycans
 - Urine flow from kidney to bladder
 - Antimicrobial properties of urine
 - E.g. high concentration of urea, organic acids, host defense peptides (defensins)
 - Systemic immunocompetence
 - In male dogs length of urethra is a benefit; in female dogs this is a risk factor

Urinary tract infections

- Predisposing factors
 - Systemic illness
 - Chronic kidney diseases
 - Diabetes mellitus
 - Cushing's disease or exogenous steroid administration
 - Hyperthyroidism
 - Weight
 - Skin disease
 - Lower urinary tract disease
 - Hooded or recessed vulva
 - Ectopic ureters
 - Urethral sphincter incompetence- incontinence
 - Stones
 - Neoplasia
 - Nidus of infection – at prostate, kidney

Urinary tract infection

- Signs
 - Blood in urine
 - Straining to urinate
 - Foul odor of urine
 - Urination in inappropriate places
 - Inability to hold urine – urinary accidents
 - Urinating small volumes frequently
 - May not see signs
 - May see more severe signs if involving kidneys
 - Fever, abdominal pain, inappetence, lethargy, vomiting

Diagnosis

- Sterile urine sample
 - Most common via cystocentesis
 - Safe and painless
 - Urinalysis evaluating for white blood cells, blood and bacteria
 - If urine dilute may not see white blood cells, blood or bacteria
 - If immunocompromised may not see white blood cells
 - Urine culture may ultimately be needed for diagnosis
 - 1 day for bacteria to grow, 1-2 days to test antibiotic susceptibility

Treatment of urinary tract infections

- Simple
 - Primarily in female dogs
 - 10-14 days of antibiotic treatment
- Complicated – when there are complicating diseases
 - Chronic kidney disease, diabetes mellitus, hyperadrenocorticism
 - Treat for 3-6 weeks
 - Evaluate culture partway through treatment and again once finished



Questions?