

EVALUATION OF BACTEREMIA IN DOGS: 25 CASES

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Objective: To retrospectively evaluate dogs with bacteremia.

Procedure: Records of dogs with positive blood cultures between November 2002 and February 2005 were reviewed.

Results: Twenty-five dogs were identified, including 13 with gram negative infection (GrN) and 12 with gram positive infection (GrP). Clinical signs included fever 80%, lethargy 60%, tachypnea 44%, vomiting 36%, tachycardia 36%, and collapse 28%. Total white blood cell counts were elevated in 52% and decreased in 16%. Also identified were thrombocytopenia 64%, anemia 60%, presence of bands 28%, hypoalbuminemia 48%, hypoglycemia 28%, and elevations in alkaline phosphatase 84%, aspartate aminotransferase 52%, alanine transferase 48%, and total bilirubin 40%. Prior to diagnosis, 9/25 had received immunosuppressive drugs. Eight (32%) died or were euthanized. Although the number of patients with bands was similar between GrN infections and GrP infections, GrN patients had significantly higher numbers of bands than GrP patients (475 +/- 1201 vs. 104.5 +/- 226; $p < 0.01$). GrN patients had significantly lower numbers of lymphocytes than did GrP patients ($4.76 \times 10^3/\text{uL} \pm 1.201 \times 10^3/\text{uL}$ vs. $1.332 \times 10^3/\text{uL} \pm 1.618 \times 10^3/\text{uL}$; $p=0.02$). Of dogs with GrN infections, 62% were considered hospital acquired.

Conclusion: GrN and GrP bacteremia syndromes are clinically similar, although GrN bacteremia may produce a greater left shift, and a more profound lymphopenia. Hospital acquired bacteremia is more associated with GrN organisms.

PHARMACOKINETICS OF DALTEPARIN AND ENOXAPARIN IN HEALTHY CATS

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Objective: To determine dosage and dosing frequency required to maintain anti-Xa activity within the range of 0.5-1.0 IU/mL following administration of low molecular weight heparin (LMWH) to cats.

Procedure: Six purpose-bred healthy cats received either 150 IU/kg Fragmin (dalteparin) or 1.5 mg/kg Lovenox (enoxaparin) SQ q8h. Anti-Xa activity was measured to indicate drug concentration. A one-compartment model was used to predict pharmacokinetic parameters of the drugs and determine the experimental design of subsequent research. An additional 8 cats received either 180 IU/kg dalteparin or 1.25 mg/kg enoxaparin SQ q6h. Anti-Xa activity was measured prior to drug treatment, and at trough and 30, 60, 120, 180, 240, and 300 minutes after drug administration on treatment Day 3.

Results: The absorption time (T_a) and elimination time (T_e) constants, and predicted time to peak Xa-activity were determined. For dalteparin, T_a was 163 minutes and T_e was 80 minutes. For enoxaparin, T_a was 112 minutes and T_e was 128 minutes. The predicted time to peak Xa-activity was 95 minutes for dalteparin and 101 minutes for enoxaparin, when administered SQ q6h at 180 IU/kg or 1.25 mg/kg, respectively. The mean measured anti-Xa activity 2 hours after drug administration was 0.99 +/- 0.17 IU/ml for dalteparin and 0.95 +/- 0.13 IU/ml for enoxaparin. Target range was achieved 64% and 83% of the time for dalteparin and enoxaparin, respectively.

Conclusion: LMWH can be administered effectively to healthy cats, but requires frequent SQ administration to maintain anti-Xa activity within the range of 0.5-1.0 IU/mL.

COMMUNITY-ACQUIRED METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* IN SIX DOGS

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Objective: Methicillin-resistant *Staphylococcus aureus* (MRSA), a known hospital-acquired pathogen in people since the 1950s, is endemic in many human hospitals. Recently, community-acquired cases of MRSA have become more common. The objective of this report was to identify and describe canine cases of community-acquired MRSA.

Procedure: Culture and sensitivity profiles of cases with coagulase-positive *Staphylococcus* were identified; cases were included if organisms were resistant to oxacillin. Medical records were reviewed; signalment, disease process, predisposing condition, therapy and outcome were recorded.

Results: Six cases of canine MRSA were identified. All cases were confirmed as community-acquired infections. All cases were community-acquired. Median age was 7y 6mo (range: 5y 3mo – 11y 3mo). Culture sources included urine (2), synovial fluid (2), deep skin biopsy (2), endotracheal wash (1), surgical site (1). Two dogs had multiple positive cultures. Clinical diagnoses included: bronchopneumonia, necrotic panniculitis, generalized severe pemphigus vulgaris, localized discoid lupus, traumatic femur fracture with implant infection, severe fasciitis and amputation. Three cases were receiving immunosuppressive therapy prior to MRSA infection. Prior to the availability of C&S results, no patient was receiving adequate empiric antimicrobial therapy against MRSA. Dogs were treated with trimethoprim/sulfadiazine and/or clindamycin. Five dogs survived.

Conclusion: MRSA appears to be an emerging pathogen in dogs, with community acquired strains of MRSA in people serving as the likely source of canine infections. Early identification of patients with MRSA infection will allow for treatment with appropriate antimicrobial agents. Microbial C&S should be performed in order to identify those patients infected with MRSA.

CHARACTERIZATION OF FLUID RETENTION IN CRITICALLY ILL DOGS WITH PERIPHERAL EDEMA

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Objective: The objective of this study was to determine the plasma colloid osmotic pressure (COP), serum albumin (ALB) and the fractional urinary sodium excretion (FeNa) in critically ill edematous dogs compared with healthy dogs.

Procedure: Critically ill dogs which developed peripheral edema were recruited. Blood and urine samples were collected for determination of COP, ALB and FeNa. The severity of edema was graded on a scale of 0-3 with 3 being the most severe. Dogs with azotemia (Creatinine > 2.0 mg/dl) were excluded. Similar samples were collected from healthy dogs.

Results: Fifteen affected dogs and 8 control dogs were recruited. The median edema score of affected dogs was 2 with a range of 1-3. All control dogs had an edema score of 0. Albumin strongly correlated with the COP ($r=0.935$, $p<0.001$). The median albumin (1.7 gm/dl; 0.7-2.4 gm/dl) and COP (11.6 mmHg; 5.6-18.0 mmHg) were significantly lower than the control dogs (3.6 gm/dl; 3.1-3.8 gm/dl and 21.6 mmHg; 18.8-25.5 mmHg; ($p < 0.001$)). The median FeNa was higher in edematous dogs at 1.88% (range 0.28-6.4%) compared to 0.29% (range 0.06-0.55%) in the healthy dogs ($p < 0.001$).

Conclusion: The edema score positively correlated with the FeNa ($r = 0.603$, $p = 0.002$) and negatively correlated with ALB concentration ($r = 0.745$, $p < 0.001$) and with the COP ($r=0.739$, $p<0.001$). Edema formation in critically ill dogs is predominantly related to low COP and not to inappropriate sodium retention.

METHICILLIN RESISTANT *STAPHYLOCOCCUS AUREUS* IN A SMALL ANIMAL INTENSIVE CARE UNIT

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Objective: To retrospectively review the clinical data for small animal patients with methicillin resistant *Staphylococcus aureus* (MRSA) which had been hospitalised in a small animal intensive care unit (ICU).

Procedure: Medical records of the Queen Mother Hospital, Royal Veterinary College were searched from June 2003 to March 2005 for patients which had been diagnosed with MRSA infection and which had been hospitalised in the ICU. Records were retrospectively reviewed and the following information obtained; signalment, presenting complaint, site and date of positive MRSA culture, whether MRSA was cultured from any other sites and outcome.

Results: Seventeen patients met the inclusion criteria comprising 6 cats and 11 dogs. The site of MRSA infection was post-operative wound infections (6), acute traumatic skin wounds (3), urine (2), chronic skin wounds (1), aspiration pneumonia (1), upper respiratory tract (1), pyothorax (1), jugular catheter tip (1) and mitral valve and lung tissue post mortem (1). MRSA was cultured prior to or shortly after admission to the ICU in 6/17 patients, after several days of ICU hospitalisation in 7 patients and in 4 patients it was cultured on re-examination. In 6 patients the nasopharynx was cultured following diagnosis of the infection and all 6 had positive nasal cultures for MRSA. 11/17 patients (5 cats, 6 dogs) survived to hospital discharge.

Conclusion: MRSA may cause infection in small animal intensive care patients. It appears that patients with MRSA infection may undergo nasopharyngeal colonisation which has implications for treatment and control of this problem.

EVIDENCE OF HYPERCOAGULABILITY IN DOGS TREATED WITH ACETYLSALICYLIC ACID (ASA)

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Objective: To demonstrate changes in platelet aggregation, thromboelastography (TEG), and prostaglandin production in arthritic dogs treated with aspirin (ASA).

Procedure: Six dogs were administered ASA (5 mg/kg PO q 12h) for 10 days.

Blood was drawn on days 0 and 10. TEG was performed on citrated whole blood. Platelet function in platelet-rich plasma was measured using optical aggregometry with ADP, collagen, and thrombin as agonists for aggregation. Levels of *in vitro* PGE₂ production from LPS-stimulated macrophages, TXB₂ production from platelets, and plasma PGI₂ (measured as 6-keto-PGF-1 α) were measured via ELISA.

Results: TEG parameters α -angle, MA, and coagulation index were significantly increased above baseline at the end of the treatment period (medians of 10.8%, 3.6%, and 17.8% respectively, all $p < 0.05$). Clot formation progressed at a faster rate after treatment (indicated by a 17% decrease in the time value K, $p = 0.047$). Platelet aggregation induced by collagen was significantly decreased from baseline (29%, $p = 0.008$), and there was a trend towards decreased aggregation in response to ADP and thrombin as well (21% and 56%, respectively, $p = 0.151$ for both). While PGE₂ production did not diminish with treatment, TXB₂ was significantly decreased ($p = 0.007$), indicating inhibition of platelet COX-1.

Conclusion: Hypercoagulability in the presence of platelet dysfunction implicates a soluble factor influencing coagulation. Other studies suggest that accumulated salicylate from long-term ASA treatment may cause hypercoagulability. Lower doses of ASA (0.5 mg/kg PO q 12 h) have been used for thromboprophylaxis. Appropriate dose selection is important when prescribing ASA to patients at risk for thromboembolic disease.

RELATIVE ADRENAL INSUFFICIENCY IN DOGS WITH SEPTIC SYSTEMIC INFLAMMATORY RESPONSE SYNDROME (SIRS)

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Objective: To determine if relative adrenal insufficiency (AI) occurs in dogs with septic SIRS.

Procedure: Dogs were included in the study if they had a documented septic process and met SIRS criteria. Dogs were excluded if they had disease or medication history expected to affect the HPA axis. Serum cortisol concentration was measured before and 1 hour after IM administration of 250 µg of cosyntropin/dog. The change between baseline and post-ACTH cortisol concentration (delta cortisol) was determined in each dog. Dogs with delta cortisol ≥ 3 µg/dl and < 3 µg/dl were defined as responders and non-responders, respectively. Fifty percent of the lowest delta cortisol identified in healthy dogs was 3 µg/dl, the value arbitrarily used to separate responders and non-responders.

Results: Fourteen dogs were studied. Nine dogs (60%) were responders (median delta 8.4; range 3.8 – 27.6) and 5 dogs (40%) were non-responders (median delta 0.30; range –2.3 – 2.5). All responders survived. Two non-responders survived, 1 died, and 2 were euthanized due to intractable hypotension.

Conclusion: Relative AI occurs in some dogs with septic SIRS. This subpopulation may be more likely to die than dogs with septic SIRS that have normal HPA axes, though further investigation is required to determine if this relationship is valid. Further study is needed to determine whether non-responder dogs would benefit from physiologic steroid supplementation.

MINIMALLY INVASIVE LITHIUM DILUTION CARDIAC OUTPUT MONITORING AND OXYGEN DELIVERY IN CONSCIOUS, CRITICALLY ILL DOGS

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Objective: To determine whether cardiac index (CI) and oxygen delivery (DO₂) in conscious, critically ill dogs is significantly lower than published normal canine values.

Procedure: Seven client owned dogs meeting clinical criteria of the systemic inflammatory response syndrome (SIRS) and weighing > 10kg were evaluated. SIRS criteria included 2 or more of the following: respiratory rate >20 breaths/minute; heart rate > 120 beats/minute, rectal temperature < 100.4°F or > 104°F, and WBC < 5000 or > 18,000 cells/mm³. Lithium dilution cardiac output (CO) was measured using the LiDCO Plus cardiac output monitor at times 0, 4, 8, 16, and 24 hours after admission to the Critical Care Unit. CI (ml/kg/min) was calculated from CO to allow for variation in patient size. At each time period, arterial partial pressure of oxygen, arterial oxygen saturation, and hemoglobin concentration were measured to calculate oxygen content. DO₂ was calculated by multiplying CO and oxygen content. CI and DO₂ data were analyzed using a 2-sample comparison of unequal variances, a 2-tailed distribution and a p-value of <0.05.

Results: Complete data was collected from seven dogs at all five time periods. Mean CI in SIRS patients was 116.49 ± 36.8 ml/kg/min (n=34) and was significantly lower from previously reported normals of 136.37 ± 31.35 ml/kg/min (p<0.05). Mean oxygen delivery index 450.32 ± 161.97 ml/min/m² and was significantly lower from published normals of 730 ± 77 ml/min/m²/ (p<0.05).

Conclusions: CI and DO₂ in conscious dogs meeting criteria of SIRS are significantly lower than published canine normal values.

COMPARISON BETWEEN PERIPHERAL VENOUS PRESSURE AND CENTRAL VENOUS PRESSURE IN DOGS AND CATS

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Objective: To determine if peripheral venous pressures (PVP) correlate with central venous pressures (CVP), across different catheter sizes, catheterization sites, and patient positions, in critically ill dogs and cats.

Procedure: Forty-one client-owned dogs and cats admitted to a veterinary ICU with a functional centrally placed jugular catheter and peripheral venous catheter were enrolled in this prospective study. Peripheral venous catheters ranging in size from 18 to 24 g were placed in the cephalic, lateral saphenous, or medial saphenous veins. Central catheters ranging from 5.5 to 7 Fr were positioned in the left or right jugular veins. Catheters were connected to separate pressure transducers and to a monitor capable of displaying two simultaneous pressure tracings. For each patient, five paired measurements of PVP and CVP were obtained and the mean was calculated. Linear regression analysis was used to determine the relationship between PVP and CVP.

Results: On average, PVP was 6.2 ± 6.3 mmHg higher than CVP. However, a poor correlation between PVP and CVP ($r=0.20$) was observed. No apparent differences were discernable when the data was organized by species, catheter size, catheter location and patient position.

Conclusion: Peripheral venous pressure did not agree with central venous pressure across different catheter sizes, catheterization sites and patient positions. It cannot be recommended to estimate CVP in critically ill dogs and cats.

CRUSH INJURY ASSOCIATED WITH BITE WOUNDS IN CATS – A RETROSPECTIVE STUDY

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Objective: To report the incidence and characterize the clinical picture of crush injury associated with bite wound(s) in cats.

Procedure: Medical records of cats admitted to an urban emergency care center between January 1994 and July 2003 with a diagnosis of bite wound(s) were reviewed. Cases with recorded vital signs and an initial venous blood gas were included. Based on criteria derived from human medicine, crush was defined by: low pH (<7.25), high lactate (>2.0 mmol/L), high potassium (>4.2 mEq/L) and high glucose (>160 mg/dL). Vital signs, demographics, assaulting animal and case outcome were compared between cats with crush injury and cats without crush injury.

Results:

median; interquartile range OR mean SD OR percentile	Crush (n=9)	Non crush (n=89)	Significance
pH	7.18; (6.98, 7.22)	7.34; (7.31, 7.36)	P<0.001
lactate	10.3; (8.7, 17.4)	2.0; (1.4, 2.7)	P<0.001
potassium	4.88 ± 0.42	4.04 ± 0.45	P<0.001
glucose	233.11 ± 70.93	168.53 ± 53.93	P=0.001
Temperature (°F)	99.0°; (97.6, 100.2)	102.5°; (101.0, 104.0)	P=0.007
Heart rate	186 ± 52.97	183 ± 36.96	P=0.843
Respiratory rate	63; (44, 100)	40; (32, 60)	P=0.069
Dog bite	100%	46%	P=0.003
Survival to discharge	33%	92%	P<0.001

Conclusion: Crush injury from bite wounds is uncommon in cats. Those cats meeting criteria for crush injury are more likely to be bitten by a dog, be hypothermic and suffer high mortality.

ECHOCARDIOGRAPHIC FINDINGS IN DOGS WITH HYPOVOLEMIA

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Objectives: To determine: 1) if Echocardiographic (Echo) findings are altered in dogs with clinical signs of hypovolemia; 2) whether Echo findings correlate with clinical parameters reflective of hypovolemia; and 3) if Echo findings of hypovolemia resolve following resuscitation.

Procedure: Client-owned dogs with signs of hypovolemia were prospectively studied. Dogs treated with > 30% of a shock dose of crystalloids or colloids before Echo were excluded. Data obtained included Echo, blood pressure (BP), PCV, total solids, fluid volume received, venous blood gas and lactate at entry and following resolution of clinical evidence of hypovolemia.

Results: Forty dogs with hypovolemia were enrolled in the study. Twenty-one of 26 weight-based Echo indices (Brown DJ, JVIM 2003) were abnormal at entry including indices reflective of left ventricular (LV) wall thickness, LV cavity size, and left atrial (LA) size. Echo indices reflective of increased LV wall thickness and decreased LV and LA size correlated with clinical markers of more severe hypovolemia (i.e., BP, PCV, total solids, and fluid volume administered within 4 and 12 hours). Twenty-one of the 40 dogs had a second Echo following resolution of clinical signs of hypovolemia. 20/21 dogs had normalization of lactate, however 8 of the 21 previously abnormal Echo indices remained abnormal including ejection fraction and those reflective of LV systolic cavity size ($p < 0.05$).

Conclusion: Echo abnormalities in dogs with hypovolemia include LV wall thickening, decreased LA size, and decreased LV cavity. Echo appears to be a useful tool for the evaluation of hypovolemia in dogs.

DISSEMINATED INTRAVASCULAR COAGULATION (DIC) IN CATS: 86 CASES (1990-2004)

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Objective: To describe cats at the University of Minnesota with DIC, underlying diseases and hemostatic abnormalities, and to identify risk factors for mortality and treatments that altered outcome.

Procedure: Medical records for cats with DIC were evaluated from 1990–2004. Inclusion criteria were intravascular fibrin deposition/thrombosis of >1 organ on necropsy or coagulation profiles meeting 3 of 5 criteria: elevated PT, aPTT, FDPs, or decreased platelet count (< 160,000/mcL) and fibrinogen. Signalment, historical data, clinical findings, clinicopathologic data, underlying disorders, management, and outcome were recorded.

Results: 86 cats fulfilled the criteria for DIC and had records available for review. Cats ranged in age from 7 weeks to 23 years (median = 9 years). Hemorrhage was noted in 14/86 (16%) cats. 15/86 (17%) cats survived. 71/86 (83%) cats died or were euthanized. Of cats with one underlying disorder, 34/49 were non-survivors (69% mortality). Of cats with >1 underlying disorder, 35/37 were non-survivors (95% mortality). There was a significant difference between cats with one underlying disorder and >1 underlying disorder in relation to outcome ($p < 0.005$). The median aPTT of non-survivors was more prolonged ($p=0.001$) than in survivors. There was no correlation between outcome and the following: signalment, specific underlying disease, hemorrhage, abnormalities in PT, fibrinogen, FDPs, platelet count, transfusions of blood products, and heparin therapy.

Conclusion: DIC is associated with a high mortality rate and the prognosis is worse for cats with > 1 underlying disorder. Plasma transfusions and heparin therapy did not affect outcome in this population of cats.

TRANSCRANIAL COLOR CODED DUPLEX SONOGRAPHY AS AN INDICATOR OF SEVERITY IN TRAUMATIC BRAIN INJURY – A PILOT STUDY

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Objective: To determine if Transcranial Color-Coded Duplex Sonography (TCCS), a non-invasive measure of blood flow velocity, used to estimate cerebrovascular resistive index (RI) correlates with severity of clinical signs in traumatic brain injury (TBI).

Procedure: Four patients with TBI who presented to the Emergency Service at the Veterinary Hospital of the University of Pennsylvania were studied. Modified Glasgow Coma Scale (MGCS) Scores were determined for each patient. TCCS scans of the basilar artery were done after initial stabilization, and RIs were calculated. The RI was compared to published ranges for normal dogs, and a linear regression analysis was done to determine the degree to which RI was associated with severity of injury as determined by the MGCS.

Results: One dog had severe head injury (MGCS=5), one had moderate injury (MGCS=13), and two had mild head injury (MGCS=16, 17). The severely head injured patient had an increased RI (1.1, ref=0.56-0.75), the moderately injured patient had an RI at the upper end of the normal range (0.73), and the mildly injured patients had normal RI (0.66, 0.69). There was a significant linear relationship between MGCS and RI among the patients ($r^2=0.97$, $p=0.01$).

Conclusion: RI as determined by TCCS shows promise as a non-invasive, objective measure of severity of head injury. However, the findings of this study must be further examined in a larger cohort of animals. Further studies are warranted to determine if RI has prognostic value and is a useful measure of response to treatment in traumatic brain injury.

CHANGES IN BLOOD CORTISOL AND ALDOSTERONE CONCENTRATIONS IN RESPONSE TO FLUID ADMINISTRATION IN NORMAL DOGS

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Objective: To compare the effect of colloid, isotonic saline and hypertonic saline fluids infusion on adrenal cortex response in normal dogs.

Procedure: Six male healthy Beagles were enrolled. All dogs received over 10 minutes each of the following fluid infusions with three weeks separating each treatment: infusion of (1) 30 ml of NaCl 0.9%, (2) 5 ml/kg of hydroxy ethyl starch, (3) 5 ml/kg of NaCl 10%. For every infusion, plasma cortisol and aldosterone were measured at T0, T+5, T+15, T+30, T+60, T+120, T+180 and T+240 minutes. Simultaneously, PCV, total solids, osmolality were evaluated. Same time schedule of sampling was used during a control session without fluid infusion. An analysis of variance for repeated measures with a Fisher's PLSD was used for statistical analysis.

Results: Hypertonic saline induced a highly significant rise in cortisol values ($p < 0.001$) as compared to other fluids and control. All fluids induced a highly significant drop in aldosterone values ($p < 0.001$) as compared to control. Osmolality was highly significantly increased with hypertonic saline ($p < 0.001$) as compared to control and other fluids. Each fluid infusion lowered PCV and total solids showing blood volume expansion.

Conclusion: Adrenal cortex steroids are differently influenced by fluid administration. The decreased aldosterone secretion observed with any kind of fluids may have been due to the volume expansion and/or the elevation of osmotic pressure. The raise in cortisol secretion reveals that hypertonic saline infusion induces an activation of the hypothalamic-pituitary-adrenal axis which could provide a potential benefit in critical care resuscitation.

FELINE PANCREATITIS AND NASOGASTRIC TUBE FEEDING

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Objective: To determine if early nasogastric tube feeding is of benefit or detriment in treating feline pancreatitis.

Procedure: Records of 25 cats admitted to the Animal Emergency Center between 1/1/2001 and 12/31/2004, diagnosed with pancreatitis based on history, physical exam and ultrasound, treated with nasogastric tube (NGT) feeding were reviewed.

Results: All cats received IV fluids, and 18/25 received partial parenteral nutrition (FreAmine® or ProcalAmine®). Motility modifiers were used in 24/25 (cisapride: 18, metoclopramide: 10, both: 4). At a mean of 18.0 hours from admission, an electrolyte solution was fed via NGT in all cases. CliniCare® feeding was initiated at a mean of 34.4 hours from admission; 20/25 were trickle fed and 5/25 were bolus fed. Maintenance feeding (52.8 kcal/kg/day) was achieved at 31.4 hours from initiation of CliniCare® feeding. 8/25 patients developed diarrhea. 22/25 cats were vomiting prior to presentation, and vomiting in hospital occurred in 3/5 bolus fed cases and 10/20 trickle fed cases. Vomiting resolved prior to discharge in 12/13 cases by decreasing the volume of feeding and/or adding a promotility agent. One patient was euthanized due to persistent vomiting and financial constraints. Patients were hospitalized for a mean of 76.2 hours (bolus fed patients: 53.3 hours, trickle fed patients: 79.1 hours). Regain of appetite, reported in 18/25 cases, returned at a mean of 119.4 hours from presentation.

Conclusion: Early NGT feeding of an electrolyte solution and CliniCare® by either bolus or trickle feeding was well-tolerated and can provide a means of nutritional management for feline pancreatitis.

ENDOTRACHEAL STENTS FOR RELIEF OF SEVERE DYSPNEA IN 11 DOGS WITH AIRWAY OBSTRUCTION

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Objectives: (1) Determine effectiveness of stents for dogs with severe airway obstruction, (2) establish procedure to determine stent size, and (3) follow a group of dogs long-term.

Procedure: Eleven client-owned dogs were treated. Ten were presented for tracheal collapse; one for tracheal stenosis. Location and extent of the collapse were determined by radiography and endoscopy. Stent length was measured under tracheoscopy and diameter by positive pressure distention of the trachea. Self-deploying, knitted, nitinol stents were placed under intravenous anesthesia. Seven dogs had one stent while four had two stents. Dogs were observed in intensive care for one night post-stenting; corticosteroids and antibiotics were administered for two weeks. Long-term care included cough suppressants, bronchodilators, and environmental humidification.

Results: All had immediate relief of dyspnea and were discharged the day following stent placement. All were evaluated by radiographs and/or tracheoscopy for a period of 7-38 months. One stent was removed because of improper size. Three stents in the cervical region broke; one of those was re-stented. Two dogs died of additional tracheal collapse. One dog developed excessive granulation tissue over the end of the stent.

Conclusion: Endotracheal stents provide immediate relief of dyspnea for patients with airway obstruction. The long term outcome on patients is good with mild clinical signs. Major complications include additional collapse, stent fracture and formation of granulation tissue. Stents should be considered in patients who have severe tracheal collapse or stenosis.

EVALUATION OF NONINVASIVE DOPPLER BLOOD PRESSURE MEASUREMENTS IN NORMAL PSITTACINE BIRDS

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Objective: To evaluate instrument placement and normal indirect Doppler blood pressure measurements in awake and anesthetized psittacine birds. Previous studies done by the author in ducks showed an excellent correlation between direct and indirect Doppler blood pressure measurements.

Procedure: Eighty healthy psittacine birds owned by Kaytee Products, Inc. were used in the study (eight psittacine species with 10 birds in each group). A sphygmomanometer cuff was placed on the awake bird around the humerus and a Doppler flow probe was positioned on the wing detecting ulnar arterial blood flow. Systolic Doppler blood pressure measurements were recorded for each bird awake and then under isoflurane anesthesia. The mean, median, and range of Doppler blood pressures for all birds while awake and under isoflurane were calculated.

Results: Overall mean systolic Doppler blood pressure while awake: 139.4, median: 130, and range: 83- \geq 300 mmHg. Overall mean with isoflurane: 107.04, median: 91.5, and range: 30-260.

Conclusion: Doppler blood pressure is a simple method for measuring systolic blood pressures in psittacine birds. Although there was a large range of blood pressure measurements in this study, this may be a good monitoring tool for detecting trends of change in systolic blood pressure in avian medicine. Further studies need to be done measuring Doppler blood pressure in awake and anesthetized companion psittacine birds.

ON-SITE MEDICAL CARE OF SEARCH DOGS RESPONDING TO 9/11 ATTACKS

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Objective: To examine on-site treatment records of search dogs responding to the 9/11/2001 attacks in New York City to characterize morbidity experienced, generate an estimate of the number and types of teams, and examine veterinarians' role during disaster response.

Procedure: Three types of visit records were examined, as well as complete blood counts and chemistry profiles. All legible information was recorded.

Results: 1026 visits for 219 disaster response-related dogs were chronicled. Visit dates ranged from 9/13/01 to 10/3/01. Dogs with a listed breed (n=152) were mostly German Shepherd Dogs (47%) or Labrador Retrievers (27%). The majority with an organization affiliation (n=215) were police dogs (43%) or Federal Emergency Management Agency certified (29%). Median age (n=124) was five years (1-10.5). Gender (n=97) was more often male (65%) than female (35%). Mean temperature (n=179) was 101.7±0.8°F. Six dogs had temperatures > 103.0°F, four of which received cooling baths. Recorded heart and respiratory rates were within normal limits. Supplemental hydration was given at 21.8% of visits; subcutaneously (90%), intravenously (3%), and orally (7%). Lacerations and abrasions presented at 18.9% of visits. Four wounds (2%) required sutures. Drugs administered could be classified as treating gastrointestinal signs, pain, or prophylactic antibiotics. Nothing remarkable was found on the complete blood counts (n=62) or chemistry profiles (n=63).

Conclusion: Fewer disaster response canines were present than previously estimated. Although veterinarians' care is essential for these working dogs, their primary role is preventive health care rather than critical care.

INCIDENCE AND CHARACTERIZATION OF ANEMIA IN CRITICALLY ILL DOGS

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Objective: Prospectively determine (1) the incidence of anemia in critically ill dogs, (2) association of anemia with morbidity/mortality in veterinary patients and (3) to evaluate the current transfusion protocols used in anemic animals.

Procedure: Over a one month period, all critically ill dogs (n=60) admitted to the intensive care unit were evaluated for anemia. Upon admission a packed cell volume (PCV) and complete blood count were obtained. Anemia was defined as a PCV of <37%. Factors affecting care and outcome were recorded.

Results: The incidence of anemia was 32% (19 of 60 animals). Causes of anemia included blood loss (n=8), hemolysis (n=2), and decreased production (n=6). In three cases the cause of anemia was not determined. Eight animals received blood transfusions. No complications were noted with their administration, however animals that received red blood cell transfusions were more likely to die (p=0.016). Forty one animals survived to discharge. Nineteen died. Of the anemic animals, mortality rate was 47%, compared to 25% for non-anemic animals. This result was not statistically significant (p=0.189).

Conclusions: Anemia is a common finding in critically ill dogs. Anemic dogs in this study had a high mortality rate compared to non-anemic dogs. Transfusions were associated with increased mortality; however, this was not associated with acute transfusion reactions. Instead, this may reflect other contributing factors such as underlying disease or long term effects of transfusion.

CLINICAL CHARACTERIZATION OF PNEUMONIA IN PUPPIES: 1993-2003

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Objective: Characterize community-acquired pneumonia in puppies and identify those with pneumonia due to *Bordetella bronchiseptica*.

Procedure: Retrospective study with four inclusion criteria: (1) dogs < 12 months old, (2) primary respiratory abnormality, (3) radiographic alveolar disease, (4) positive tracheal wash bacterial culture. Dogs were excluded if the medical record was incomplete or if they had other cardiorespiratory disease. Records were evaluated for history, physical examination, laboratory evaluation, treatment and outcome. Results are presented as median [range], or as mean \pm SD.

Results: 65 dogs representing 36 breeds were included. 32/65 (49%) puppies were positive for *Bordetella*; 33/65 had other bacteria, predominantly gram negative enterics. Puppies with *Bordetella* pneumonia were younger (14[7-35] vs 21[4-49] weeks, $p=0.0038$); were more likely to originate from a pet store (19/31 vs 7/32, $p=0.01$); were owned for a shorter time prior to illness (18[3-120] vs 90[2-330] days, $p=0.0006$); had higher PvCO₂ values at presentation (48.7[32.8-65.8] vs 41.3[24.7-70.2] mmHg, $p=0.0149$); were more likely to need oxygen (25/32 vs 16/33, $p=0.013$); needed longer oxygen supplementation (4.8 \pm 2.7 vs 3.9 \pm 2.4 days); and had a longer hospitalization (7.2 \pm 3.7 vs 4.9 \pm 2.7 days, $p=0.0137$). 30/32 (94%) of the *Bordetella* puppies survived to discharge, compared to 27/33 (82%) in the non-*Bordetella* group.

Conclusion: In puppies, the incidence of pneumonia due to *Bordetella bronchiseptica* is higher than previously reported in adult canine populations. Puppies with *Bordetella* pneumonia tended to have more severe disease than those with non-*Bordetella* pneumonia, and were more likely to originate from a pet store. The outcome was good with intensive treatment.

LEFT ATRIAL RUPTURE IN DOGS: 14 CASES (1990 – 2005)

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Objective: To describe the clinical presentation, treatment, and outcome of dogs with left atrial rupture secondary to chronic mitral valve insufficiency.

Procedure: The medical records of dogs with an echocardiographic or necropsy-based diagnosis of left atrial rupture secondary to chronic mitral valve insufficiency were reviewed.

Results: Fourteen dogs (10 male and 4 female) were included. Mixed breed dogs (n=6) and Shetland sheepdogs (n=3) were most commonly affected. The median age was 12 years (range 5.8 - 18 years). The median weight was 11 kg (range 4 kg - 30 kg). The most common presenting complaints included collapse (10), dyspnea (7), and coughing (7). Four dogs presented in either respiratory or cardiac arrest. Thirteen dogs had pericardial effusion. The median LA:AO ratio was 2.66 (range 1.66:1 to 5.52:1).

Pericardiocentesis was performed in three dogs. Five dogs were discharged, three of which were euthanatized within 35 days of initial diagnosis for recurrence of clinical signs (n=2) and for hematochezia and lethargy (n=1). Five dogs were euthanatized while in the hospital for a variety of reasons including DIC, worsening azotemia, collapse and recurrence of pericardial effusion, or possible seizure episode.

Conclusions: Though rare, left atrial rupture secondary to mitral valve insufficiency resulting in pericardial effusion should be considered in older small breed dogs presenting with collapse and dyspnea. The overall prognosis appears poor.

RELATIVE ADRENAL INSUFFICIENCY IN CRITICALLY ILL DOGS

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Objective: Relative adrenal insufficiency (AI) is recognized as a contributor to morbidity and mortality in critically ill people. The objectives of this study were to retrospectively identify and characterize a population of critically ill dogs with AI.

Procedure: Medical records of all dogs in the ICU that had an ACTH stimulation test performed between January 1st 2004 and January 31st 2005 were reviewed. Dogs with a primary diagnosis of hyper or hypoadrenocorticism were excluded. Adrenal insufficiency was defined by a baseline cortisol of less than 10 nmol/L and a difference of less than 9 nmol/L between the two samples. The remaining dogs were considered to have adequate adrenal function and served as a cohort for comparison.

Results: A total of 42 dogs meeting the entry criteria were identified. Four of the 42 met the definition of AI. The four dogs with AI all had underlying infectious disease including severe bronchopneumonia, bacterial endocarditis, abdominal sepsis, and sepsis secondary to bite wounds. Ten of 38 (24%) control dogs died and 4/4 (100%) dogs with AI died ($p=0.01$).

	Group	Mean	SD	Significance
Baseline Cortisol	Cohort AI	7.6 nmol/L 2.8 nmol/L	± 7.1 ± 1.6	$p = .12$
Post Stimulation Cortisol	Cohort AI	21.3 nmol/L 6.1 nmol/L	± 7.1 ± 1.6	$p = .09$
Change in Cortisol	Cohort AI	14.4 nmol/L 3.3 nmol/L	± 7.9 ± 2.0	$p < 0.01$

Conclusion: This study documented the presence of AI in four critically ill dogs. Baseline cortisol alone may not be useful for the diagnosis of AI in dogs.

ASSOCIATION OF FECAL CARRIAGE OF *ENTEROCOCCUS* spp. ISOLATES WITH CLINICAL INFECTION ISOLATES USING PULSED FIELD GEL ELECTROPHORESIS

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Objective: To identify gastrointestinal tract enterococci as a potential source of enterococcal infections in dogs.

Procedure: Between March 2001 and August 2002, rectal swabs were obtained from all dogs entering an Intensive Care Unit (ICU) on admission (D0) and on days 3, 6, 9 and 12 (D3-12). In dogs with indwelling urinary catheters, urine was obtained for culture and antimicrobial susceptibility testing on D0, 3, 6, 9 and 12. Enterococci isolated from these infections were examined by pulsed field gel electrophoresis (PFGE) to identify relatedness between rectal and infection isolates from the same patient.

Results: 182 indwelling urinary catheters were placed during the study. Enterococcal urinary tract infections (UTIs) were identified in 6/182 (3.3%) D0 catheters, 5/72 (6.9%) D3 catheters, 4/17 (23.5%) D6 catheters, 0/3 D9 and, 0/2 D12 catheters. Lack of complete data sets (urine + rectal swab growth) resulted in exclusion of some patients from the study. *Enterococcus* spp. isolates from four UTIs, three of which were acquired between D3-D6, were compared with the patient's rectal swabs. Rectal and urine isolates were indistinguishable by PFGE in two dogs. The third sample set did not match. The dog with a D0 UTI had an indistinguishable rectal isolate.

Conclusion: In 3 of 4 data sets, enterococcal UTI isolates were indistinguishable to rectal isolates indicating that the patient's own fecal enterococci represent the major infection source. In 3 of 4 UTIs, the UTI developed during the patient's stay in the ICU, indicating they are nosocomial in origin.

INCIDENCE AND SIGNIFICANCE OF HYPERGLYCEMIA IN CRITICALLY ILL DOGS

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OBJECTIVE: The objective of this study was to report the incidence and significance of hyperglycemia in dogs hospitalized in the ICU.

PROCEDURE: Prospective study conducted over a two month period. Dogs in the ICU had their highest daily blood glucose concentration recorded. Hyperglycemia was defined as a glucose concentration > 120 mg/dl. Hyperglycemic dogs were monitored for the persistence and resolution of hyperglycemia. Other variables recorded included duration and degree of hyperglycemia, whether hyperglycemia was preexisting or if it developed during hospitalization, presence of complications, length of hospitalization (LOH), and outcome.

RESULTS: During the study period, 245 dogs were evaluated, of which 38 (16%) were hyperglycemic. Twenty-six percent (10/38) developed hyperglycemia during hospitalization, while 74% (28/38) were hyperglycemic at presentation. LOH was shorter in dogs that presented with hyperglycemia compared to those that developed hyperglycemia while hospitalized ($p=0.001$). Seventy-one percent (27/38) of dogs were discharged from the hospital, while the remaining 29% (11/38) died or were euthanized. Non-survivors had a significantly higher median glucose concentration [median = 176 mg/dl (range 122 – 310 mg/dl)] than survivors [median = 139 mg/dl (range 121 – 191 mg/dl); $p=0.021$]

CONCLUSION: The incidence of hyperglycemia in this population of dogs hospitalized in ICU was 16%. Dogs that developed hyperglycemia had longer LOH and non-survivors had more pronounced hyperglycemia than survivors.

RETROSPECTIVE EVALUATION OF UROKINASE USE IN CATS WITH ARTERIAL THROMBOEMBOLISM

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Objective: To describe indications and outcome following therapy with urokinase in cats with arterial thromboembolism (ATE).

Procedure: Medical records of cats receiving urokinase for ATE between 2003-2005 were retrospectively evaluated.

Results: Twelve cases were identified. Based on echocardiography, 7/12 had a diagnosis of hypertrophic cardiomyopathy, one had restrictive cardiomyopathy, and unclassified heart disease was identified in three others. Location of ATE included: bifurcation of the abdominal aorta (10); left pelvic limb (1), and right thoracic limb and left pelvic limb (1). On admission, 8/12 were hypothermic, and 3/12 had documented congestive heart failure (CHF). Nine cats had no voluntary motor to the affected limb(s) prior to urokinase; five of these regained function. One cat with weak voluntary motor improved to normal function. No palpable pulse in the affected limb(s) was detected in 11 cats, and of these three regained pulse(s). One other cat with weak pulses had substantially improved pulses. Three cats developed hyperkalemia post-urokinase infusion, and these same cats had no evidence of voluntary motor or pulses pre-and post-urokinase. No clinical bleeding was noted although transient gross pigmenturia was recorded in 5/12. Five cats improved and were discharged, including 1/3 with CHF and 3/8 with hypothermia; 7 were euthanized.

Conclusion: Urokinase may be a useful treatment for ATE in cats. Urokinase infusion was not associated with serious clinical bleeding.

RETROSPECTIVE EVALUATION OF UROKINASE USE IN DOGS WITH THROMBOEMBOLISM (4 CASES: 2003-2004)

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Objective: To describe indications and outcome following therapy with urokinase in dogs with thromboembolic disease.

Procedure: Medical records of dogs receiving urokinase as treatment for thromboembolism were retrospectively evaluated using a standard data collection sheet.

Results: Four cases were included. Three dogs had arterial thromboembolism (ATE) at the bifurcation of the abdominal aorta and one dog had pulmonary embolism (PE). Diagnosis of ATE was confirmed with abdominal ultrasonography; and diagnosis of PE was established with echocardiography (Echo). All dogs with ATE had pulses and voluntary motor in the affected limbs prior to and following urokinase. None of the dogs with ATE showed any clinical improvement, and persistence of the lesion was confirmed with ultrasonography. The dog with PE presented for acute dyspnea. This dog improved clinically. Echo proved partial resolution of the lesion. Only one dog (ATE) developed hyperkalemia and metabolic acidosis. No bleeding was observed in any of the dogs during or following urokinase. Of the dogs with ATE, two were euthanized, and the remaining dog died during hospitalization. The dog with PE survived and was discharged.

Conclusion: Administration of urokinase at a standard dosage as treatment for thromboembolism in dogs was not associated with serious complications. Functional improvement was not observed in dogs with ATE. Urokinase may be a viable treatment for PE in dogs.

AORTIC THROMBOEMBOLISM IN DOGS: 21 CASES (1999-2004)

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Objective: To describe clinical signs, underlying disease, and outcome following treatment of aortic thromboembolism (ATE) in dogs.

Procedure: Medical records of dogs with ATE based on abdominal ultrasonography were retrospectively evaluated.

Results: Twenty-one cases were identified. Presenting complaints included vomiting, anorexia, lameness, rear limb weakness, and pain. Median duration of signs of ATE prior to hospital admission was 14 days (range 0.5-180 days). Concurrent diseases included: protein-losing nephropathy (6/21), cardiac disease (4/21), neoplasia (2/21), liver disease (2/21), diabetes mellitus (1/21), chronic urinary tract infections (1/21), hyperadrenocorticism (1/21), and unidentified (4/21). Owners of two dogs declined treatment. Dogs received treatment regimens including: anticoagulants (8/21); systemic thrombolytics (4/21); thrombolectomy via balloon catheterization (5/21); local thrombolytic infusion (tPA) via aortic catheterization (1/21), and limb amputation without adjunctive therapy (1/21). Ten dogs were euthanized, 4/21 died in the hospital, and 7/21 were discharged. Of the five dogs which had balloon catheterization for thrombolectomy, 3/5 died post-operatively, 1/5 was euthanized, and 1/5 was discharged but euthanized two months later. The dog with local thrombolytic infusion was euthanized. Of the four dogs receiving anticoagulants and systemic thrombolytics, three were euthanized and one died in the hospital. Of the two cases where treatment was declined, one was discharged and one was euthanized. Of the remaining dogs that were discharged, two died at home. Only 3/21 were reportedly doing well.

Conclusion: Dogs with ATE had long-standing prior medical histories, and duration of signs was variable. Despite a variety of therapy plans, treatment was largely ineffective. Survival was poor.