Abstracts from the International Veterinary Emergency and Critical Care Symposium and the European Veterinary Emergency and Critical Care Society Annual Congress, 2013

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HYPERFIBRINOLYSIS IN CANINE SPONTANEOUS HEMOPERITONEUM

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Introduction: People with tissue injury and hypoperfusion are at risk for coagulopathy and hyperfibrinolysis, which increase mortality beyond that of trauma alone. We hypothesized that dogs with spontaneous hemoperitoneum (SHP) and shock would develop a similar syndrome of hyperfibrinolysis.

Methods: Dogs with SHP (n = 27) were recruited from 3 emergency services. Lactate and two channels of tissue factor activated thromboelastograms (TEGs) were run, one standard (s-TEG), and one with 50U/mL of tissue plasminogen activator (tPA) to enhance fibrinolysis (tPA-TEG). The tPA-TEG assay was used to improve the sensitivity of the standard TEG assay by accelerating and standardizing the in vitro generation of plasmin. Additional coagulation testing included platelet count, PT, aPTT, d-dimer, antithrombin, fibrinogen, and protein C. Age and breed-matched dogs were recruited as controls for comparison of TEGs, PT, aPTT and fibrinogen. Fibrinolytic potential was quantitated using the s-TEG and tPA-TEG LY30 parameters (percent decrease in clot area on the TEG tracing for 30 minutes after maximum clot strength).

Results: There were no differences in s-TEG LY30 between SHP dogs and controls. Mean tPA-TEG LY30 was higher in SHP dogs (48.1 ± 32.2%) than in controls (33.0 ± 21.5%, P = 0.04). On multiple linear regression analysis, among the coagulation parameters and lactate, only lactate predicted the LY30 in the tPA-TEG assays, with higher lactate associated with more fibrinolysis (P = 0.001).

Conclusion: Dogs with SHP demonstrated hyperfibrinolysis on tPA-TEG, and the degree of hyperfibrinolysis was associated with tissue hypoperfusion severity. These findings provide a rationale for using anti-fibrinolytic agents to reduce blood loss in SHP patients.
Listing of Small Animal IVECCS Abstracts (in alphabetical order of presenter)

QUANTITATIVE RESPONSE OF VOLUMETRIC VARIABLES MEASURED BY ULTRASOUND DILUTION CARDIAC OUTPUT MONITORING IN A CANINE MODEL OF HEMORRHAGIC SHOCK AND RESUSCITATION

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Introduction: Classical cardiac preload parameters, like central venous pressure (CVP) change with positive end-expiratory pressure ventilation (PEEP). The aim of this study was to investigate if volumetric variables of preload like TEDVI, SVI, and ACVI are influenced by changing PEEP in a canine hemorrhagic shock model.

Methods: Six anesthetized dogs were studied at baseline (NORMOVOLEMIA), after blood was withdrawn to obtain a MAP of 40 mm Hg (HYPOVOLEMIA), after blood was autotransfused (RESU), and after 20 ml/kg 6% Hetastarch was administered (HYPERVOLEMIA). During each volemic state, patients were ventilated with different forms of PEEP (0, 5, and 10 cm H2O). Heart rate, MAP, CVP, cardiac index, and systemic vascular resistance were recorded at each different time point and form of PEEP. TEDVI, SVI, and ACVI were measured by ultrasound dilution technology with the CoStatus device. Data were analyzed using Kruskal Wallis analysis and Dunn’s test.

Results: SVI, TEDVI, ACVI and CVP significantly changed during hypovolemic status. Mean% of baseline was 22%+/–0.05, 6%+/–0.35, 17%+/–0.5, and 48%+/–0.8, respectively. Resuscitated and hypervolemic states caused CVP to increase, whereas SVI, TEDVI and ACVI remained unchanged compared to baseline. CVP showed the most significant changes between different forms of PEEP. TEDVI and ACVI showed small significant changes between different forms of PEEP, whereas ACVI showed no significant changes between different levels of PEEP.

Conclusion: In this animal model, ACVI was superior to SVI, TEDVI and CVP in accurately reflecting hemorrhage under different form of PEEP and was also suitable to predict fluid responsiveness.

SURVIVAL AND PREDICTION INDICES IN PERSISTENTLY HYPOTENSIVE DOGS WITH OR WITHOUT HYPERLACTATEMIA

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Introduction: Blood lactate concentration is commonly measured in critically ill veterinary patients to detect and monitor perfusion status. Lactate levels have been studied as predictors of survival, disease severity, and organ failure. Patients with hypotension commonly have an elevated lactate concentration, although some hypotensive patients never develop hyperlactatemia despite severe circulatory stress. We hypothesized that hypotensive critically ill dogs with hyperlactatemia and systemic hypotension have a worse prognosis than those with normal lactate despite hypotension.

Methods: Forty-seven dogs admitted to the Intensive Care Unit with hypotension (non-invasive systolic blood pressure <90 mmHg, NIBP) and concurrent lactate were included. Exclusion criteria included diagnosis or history of neoplasia, renal failure, hepatic failure, thromboembolism, seizures, asthma, drugs associated with hyperlactatemia, or an incomplete medical record. SPI-2 scores were assigned retrospectively. Normal lactate was defined as <2.0 mmol/L.

Results: Median NIBP for all dogs was 75 mmHg (range: 40–90). Median SPI-2 score was 0.57 (range: 0.23–0.85, n = 36). Survival was closely associated with lactate levels but did not reach statistical significance (P = 0.051). Patients with normal lactate were 3.56 times more likely to survive than patients with hyperlactatemia (OR: 3.56, 95% CI: 1.152–14.92). There was a significant association between lactate and blood pressure (P = 0.025). There was no association between a diagnosis of sepsis and lactate (P = 0.126), SPI-2 and lactate (P = 0.071), or NIBP and survival (P = 0.0587).

Conclusion: Hypotensive critically ill dogs with normal lactate may have a better prognosis as compared to hypotensive dogs with hyperlactatemia and are more likely to survive. Lactate and blood pressure measurements are significantly correlated.

TRAMADOL IMMUNOMODULATION IN DOGS

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Introduction: Tramadol has sparing immunomodulatory effects in rodents and people. The objective of our study was to evaluate the influence of tramadol and its metabolite o-desmethyltramadol (M1) on the function of canine leukocytes, in vitro. We hypothesized that tramadol and M1 would not change phagocytosis, respiratory burst, or leukocyte cytokine production capacity.

Methods: Blood from 6 dogs was incubated with various concentrations of tramadol and M1. Phagocytosis and oxidative burst were assessed using flow cytometry, and lipopolysaccharide (LPS), lipoteichoic acid (LTA) and peptidoglycan (PG)-stimulated leukocyte production of TNF, IL-6, and IL-10 were measured using a canine specific multiplex assay. Data were compared using ANOVA and post-hoc Fisher LSD with significance set at P < 0.05.

Results: No significant differences were detected in phagocytosis or oxidative burst with any treatment. A statistically significant decrease in LPS stimulated IL-10 production was noted in low M1 concentrations (522 ± 357 pg/mL) compared to saline control (864 ± 504 pg/mL; P = 0.008), high M1 concentration, (805 ± 428 pg/mL; P = 0.033) and intermediate M1 concentration (764 ± 576 pg/mL; P = 0.046). Low concentrations of M1 also blunted LTA stimulated IL-10 production (827 ± 524 pg/mL) compared to saline control (1226 ± 788 pg/mL; P = 0.026). No other significant changes in stimulated leukocyte cytokine production capacity for TNF, IL-6, or IL-10 were noted.

Conclusion: Tramadol and its metabolite M1 are sparing to phagocytic function in dogs in vitro. Tramadol does not alter leukocyte cytokine response in vitro. However, M1 blunts IL-10 production suggesting that M1 might promote a proinflammatory shift. Further investigation into tramadol and M1’s effect on the canine immune system is warranted.
PROTEIN C ACTIVITY IN DOGS WITH ANTICOAGULANT RODENTICIDE INDUCED COAGULOPATHY

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Introduction: Anticoagulant rodenticide (ACR) induced coagulopathy is mediated by antagonism of vitamin K (VK) epoxide reductase and reduced production of procoagulant factors II, VII, IX, X. Since clotting factor activity cannot be measured in a point of care format, diagnosis is frequently made by documenting prolonged prothrombin time (PT). In addition, VK is needed for production of the anticoagulant protein C (PC), however, reduced activity of PC has not been previously documented in naturally occurring ACR-induced coagulopathy in dogs. The study goal was to evaluate PC activity in coagulopathic dogs after natural exposure to ACR, with the hypothesis that these dogs have low PC activity.

Methods: A citrated plasma sample was collected from healthy control dogs, and from dogs with known or suspected exposure to ACR, clinical signs of coagulopathy and a prolonged PT. Plasma was stored at −80 °C until batch analysis using the Elite Hematology analyzer. A Mann-Whitney U test was used to compare PC and PT between ACR exposed and control dogs. PT that exceeded 165 seconds (s) (the instrument detection limit) was recorded as 165s.

Results: Six ACR and 13 control dogs were enrolled. Coagulopathic dogs had a significantly (P < 0.001) higher median PT (165s; 61.7–165s) than control dogs (7.7s; range 6.7 – 8.7s), and a significantly lower median PC activity (4.5%; range 2.68–9.36%) than control dogs (121%; range 69.9–139.9%)(P < 0.001).

Conclusion: ACR induced coagulopathy is associated with a marked depression in PC activity. The role of analysis of PC activity in early detection of ACR induced coagulopathy remains to be determined.

OUTCOME OF DOGS AND CATS UNDERGOING MECHANICAL VENTILATION FOR MANAGEMENT OF CONGESTIVE HEART FAILURE (11 CASES)

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Introduction: Mechanical ventilation (MV) has infrequently been described in the veterinary literature as part of the treatment for congestive heart failure (CHF). This study aimed to evaluate the outcome of patients undergoing MV for CHF compared to patients undergoing MV for non-cardiogenic causes of hypoxemia.

Methods: The records of 125 patients receiving MV between 2007 and 2012 were evaluated. Patients undergoing MV for hypercapnia/hyponitilation were excluded. Patients ventilated for hypoxemia were divided into group 1: CHF (n = 11) comprised of dogs and cats, and group 2: non-cardiogenic hypoxemia (n = 34) comprised of dogs only. Outcome measures were defined as successful weaning or survival to discharge.

Results: In group 1, 45.4% (5/11) patients were successfully weaned from MV and 9.0% (1/11) survived to discharge. Of dogs alone, 57.1% (4/7) were successfully weaned and 0% (0/7) survived to discharge. In group 2, 32.3% (11/34) patients were successfully weaned and 17.6% (6/34) survived to discharge. Patients in group 2 had a significantly higher rate of survival to discharge than patients in group 1. Dogs surviving to discharge were significantly younger and had a significantly longer hospitalization stay than those that did not survive in both groups. Within the CHF group, cats had a significantly better outcome than dogs.

Conclusion: Patients receiving MV for CHF had a poorer outcome than patients ventilated for non-cardiogenic hypoxemia. A similar number of patients in both groups were successfully weaned from MV, however significantly fewer patients in the CHF group survived to discharge.

INCIDENCE OF ABDOMINAL EFFUSION ASSOCIATED WITH DECOMPRESSIVE CYSTOCENTESIS IN MALE CATS WITH URETHRAL OBSTRUCTION

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Introduction: Potential benefits of cystocentesis prior to catheterization include more rapid decompression and a decrease in urethral back-pressure. Concerns for potential damage/rupture of the bladder, especially in sicker patients, may limit application. Not previously reported, the objective of this study was to determine incidence of these complications secondary to cystocentesis.

Methods: Male cats admitted for urethral obstruction were enrolled. Cystocentesis was performed by standardized protocol prior to urethral catheterization; otherwise treatment was according to standard of care. Bedside ultrasound was performed (FAST technique) before cystocentesis (BC), 15 minutes after (AC), and the following day (ND). Subjective assessment of volume (scant, mild, moderate or marked) at each location was noted. If obtainable, fluid analysis was performed to characterize effusion (hemorrhage and/or urine). Associations between presenting blood work values (pH, BUN, creatinine, potassium) or volume removed by cystocentesis and presence of effusion were studied using two-sample t test or one-way ANOVA.

Results: A total of 45 cats were enrolled. Of these, 15 (33%) had fluid present BC (13 scant, 2 mild). An additional 7 patients (16%) had a scant amount of fluid present AC, total 22/45 (49%). By the ND assessment 4/45 (9%) still had a scant amount of effusion with no reported complications or changes to clinical course. No association between blood work changes or cystocentesis volume and presence of effusion was found.

Conclusion: Many male cats with urethral obstruction have a small amount of abdominal effusion at presentation. While an increased incidence of scant effusion occurred, clinically significant complications did not result from cystocentesis.

ASSESSMENT OF MICROCIRCULATORY CHANGES ASSOCIATED WITH TACHYCARDIA-INDUCED CARDIOMYOPATHY IN DOGS USING SIDESTREAM DARK FIELD IMAGING

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Introduction: Sidestream dark field imaging (SDF) allows direct assessment of microcirculatory blood flow. In human cardiac patients, microcirculatory assessment has been shown to have prognostic
value, as well as reflect response to therapy. The objective of this study was to assess whether SDF can be used to detect microcirculatory changes in dogs with tachycardia-induced cardiomyopathy.

**Methods:** A canine model of tachycardia-induced cardiomyopathy (TIC) was created by pacemaker implantation with continuous pacing at 160 beats per minute for one month (n = 5). A sham group (n = 5) was instrumented but not paced (SHAM). Standard echocardiographic measurements were obtained to assess cardiac function. SDF of buccal mucosa was performed (3 videos, 20 seconds in duration). Microvascular parameters (total vessel density (TVD), proportion of perfused vessels (PPV), perfused vessel density (PVD) and microvascular flow index (MFI)) were determined using vascular analysis software. Groups were compared using non-parametric Mann-Whitney test. Data reported as median [interquartile range], significance at P < 0.05.

**Results:** The TIC group had significantly higher heart rate (160[0] vs. 76[14.5]) and lower systolic blood pressure (111[22] vs. 134[6.5] mm Hg), ejection fraction (38.8[11.9] vs. 49.3[11.4]%), and fractional shortening (18.4[6.5] vs. 24.6[6.7]%) compared to SHAM. There was no difference in TVD, however PPV (81.2[8.9] vs. 92[2.5]%), PVD (21.6[4.5] vs. 23.3[5] mm/m²), and MFI (2.5[0.46] vs. 2.83[0.18]) were significantly decreased.

**Conclusion:** The TIC group had systolic dysfunction which was associated with a significant decrease in microcirculatory parameters; suggesting diminished tissue perfusion. This technology has potential application for assessment of patients with cardiac disease.

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**EARLY VS LATE INSULIN THERAPY AND TIME TO RESOLUTION OF DIABETIC KETOSIS/KETOACIDOSIS**

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**Introduction:** There are no evidence-based guidelines for insulin administration for diabetic ketosis/ketoacidosis (DK/DKA) in veterinary medicine. Insulin is commonly delayed by 6–8 hours after initiation of fluid therapy to reduce the risk of hypoglycemia and electrolyte disturbances. We hypothesized that earlier insulin administration would lead to more rapid resolution of DK/DKA, decreased length and cost of hospitalization, comparable time to long-acting insulin, and comparable complication incidences.

**Methods:** Medical records (2003–2012) from an electronic database at Cornell University were searched to identify animals with DK/DKA. Animals were divided into 2 groups based on time to administration of insulin after starting fluid therapy: early (≤6 hours) or late (>6 hours).

**Results:** There were 48 patients in the early group (median = 4 hours, range = 0–6 hours) and 20 in the late group (6.25–27.5 hours). Time until resolution of DK/DKA was shorter in the early group (37 hours, 2–108 hours) than in the late group (50 hours, 4–110 hours; Mann-Whitney U, P = 0.049). Length and cost of hospitalization, time to long-acting insulin administration, and incidence of complications did not differ.

**Conclusion:** Earlier insulin administration was associated with more rapid resolution of DK/DKA in this group of dogs and cats, but did not shorten time to transition to long-acting insulin, shorten or reduce cost of hospitalization, or improve outcome. However, there was no increased risk of complications with earlier administration. Early administration of insulin leads to more rapid resolution of ketosis without increased risk of complications, suggesting that delays in insulin administration may not be warranted.

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**RESOLUTION OF THE PROTHROMBOTIC STATE IN DOGS TREATED FOR IMMUNE MEDIATED HEMOLYTIC ANEMIA**

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**Introduction:** A prothrombotic state has been documented in dogs with immune-mediated hemolytic anemia (IMHA), but resolution has not been reported. We hypothesized that the prothrombotic state present during hospitalization for IMHA resolves with successful treatment.

**Methods:** Dogs diagnosed with IMHA were prospectively enrolled. Ten dogs had TEG and full hemostasis profiles performed at presentation, on day 3 of hospitalization, and 1 month after hospital discharge. All dogs were treated with a standardized protocol of immunosuppression (prednisone and azathioprine) and anti-thrombotic medications (heparin in the hospital; aspirin at discharge). A Friedman’s test was used to evaluate changes in hemostatic parameters over time and a Kruskal-Wallis test was used to compare TEG variables to those from 40 healthy dogs. P < 0.05 was considered significant.

**Results:** At presentation, MA, fibrinogen, and D-dimers were increased in all dogs. In addition, when comparing admission TEG variables to those from 40 healthy dogs, the R and K times were significantly shorter and the alpha and MA were significantly larger in dogs with IMHA. On day 30, alpha and MA were decreased from admission and from day 3 of hospitalization, while fibrinogen, D-dimers and FDPs were decreased compared to admission. At the 30-day recheck, MA and D-dimers, FDPs, and fibrinogen were within reference intervals for 9, 9, 6, and 5 dogs, respectively.

**Conclusion:** Dogs with IMHA appeared prothrombotic at presentation and during the first 3 days of hospitalization. By day 30 of treatment, the prothrombotic state had resolved in most dogs.
duration, underlying cardiac disease, arterial or venous blood gas values, pharmacologic therapy before, during and after PPV, drugs used to provide anesthesia, complications and outcome were recorded.

**Results:** Overall survival to discharge was 62.5% (10/16). Mean (± SD) duration of PPV was 30.8 ± 21.3 hours and average time from presentation to initiation of PPV was 5.9 ± 6.4 hours. Azotemia at initiation of ventilation and use of pentobarbital were negatively associated with survival to discharge (P = 0.011 and P = 0.036, respectively). The survival to discharge rate was 77% (10/13) for patients treated after 2005, none of which received pentobarbital. No significant association existed between signalment, nature of heart disease, furosemide dose, length of ventilation, first time CHF events, or lactate levels and survival to discharge.

**Conclusion:** Small animals requiring PPV for treatment of CHF had a good overall prognosis for hospital discharge and require relatively short duration of PPV. Azotemia and the use of pentobarbital were negatively associated with outcome.

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**EVALUATION OF IRON STORES IN DOGS ENROLLED IN A BLOOD DONOR PROGRAM**

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**Introduction:** Repeated blood donation in people is a significant cause of depletion of body iron stores. Progressive iron depletion may be noted in people after 3 to 4 donations within one year. Many canine blood donor programs permit the donation of 400–450 ml whole blood every 4–8 weeks. Red blood cell (RBC) and reticulocyte indices have been shown to be sensitive in the early detection of iron deficiency in both people and dogs. Specifically, decreased reticulocyte hemoglobin content (CHr) and decreased reticulocyte MCV (rMCV) appear to be more sensitive indicators of iron status in dogs than serum ferritin. The goal of this study was to evaluate canine blood donors for evidence of iron deficiency using red blood cell indices.

**Methods:** Dogs that had donated >5 times over the preceding 12 months through a canine blood donor program were enrolled. Blood was collected to measure serum iron, ferritin, and RBC and reticulocyte indices. Age- and weight-matched healthy dogs were enrolled as a control population.

**Results:** Dogs donating >5 times in the preceding 12 months (n = 13) had significantly lower hematocrit (P = 0.008), CHr (P = 0.009) and rMCV (P = 0.03) than the control population (n = 20). However, serum iron (P = 0.22) and ferritin (P = 0.37) levels were not different between groups.

**Conclusion:** Evaluation of reticulocyte indices suggests that dogs donating >5 times in a 12 month span show early evidence of iron deficiency. Re-evaluating the frequency of canine blood donation may be warranted.

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**A RETROSPECTIVE EVALUATION OF CONTRAST-INDUCED NEPHROPATHY IN DOGS**

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**Introduction:** Contrast-induced nephropathy (CIN) is a well recognized clinical syndrome in humans that impacts up to 10% of healthy individuals. CIN has not been well documented in veterinary medicine. This study aims to evaluate a population of dogs for evidence of CIN.

**Methods:** Medical records were evaluated (2006–2012) for dogs that received intravenous iodinated contrast agents. Patients that had BUN and creatinine measured within one week prior as well as within one week following administration of contrast were included. CIN was defined as an increase in >0.5mg/dL from baseline creatinine.

**Results:** Medical records of 1,217 dogs that received intravenous iodinated contrast agents were reviewed. Of these, 85 dogs with 93 contrast administrations fulfilled criteria for inclusion. 7.5% of contrast administrations (7/93) fulfilled the definition of CIN. The creatinine post-contrast administration as well as the change in creatinine was significantly higher in the CIN group than in the non-CIN group (median post 1.7 mg/dL vs. 0.8 mg/dL, median change 0.9 mg/dL vs. 0 mg/dL). Patient signalment, initial creatinine, number of total contrast administrations, dose of contrast received, duration of anesthesia, IV fluid administration, administration of nephrotoxic agents, and use of vasopressor therapy were not significantly different between groups.

**Conclusion:** The temporal association between contrast administration and renal injury in these cases highlights the potential for CIN in dogs. Due to the retrospective nature of this study, a causal association between contrast administration and renal injury cannot be determined. A prospective study is needed to further evaluate CIN in dogs.

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**INFLUENCE OF HANG TIME ON BACTERIAL COLONIZATION OF INTRAVENOUS BAGS IN A VETERINARY EMERGENCY AND CRITICAL CARE SETTING**

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**Introduction:** To assess the rate of bacterial colonization of fluid bags of Lactated Ringer Solution (LRS) in a veterinary emergency room (ER) and intensive care unit (ICU).

**Methods:** 1L LRS bags (n = 90) were hung in the ER and ICU for 10 days each. Bags were punctured 3 times daily with a sterile needle to simulate clinical use. Sampling for bacterial culture was performed on days 0, 2, 4, 7 and 10 to assess the fluid and swabs to assess the injection ports. All filtered samples were performed in duplicate. The study was designed to have 80% power to detect a 6% increase in the fluid colonization rate from baseline using an exact binomial test with a one-sided α = 0.025. Port colonization rate for ER versus ICU was testing using Fisher’s exact test.

**Results:** No bags were colonized at Day 0 and 2. The colonization rate was 1.1% on Day 4 and 4.4% on Day 7 and 10. All colonized bags were in ER (6.7%, 95% exact binomial confidence interval 1.9%–16.2%). No bags in ICU were colonized (0%, 95% exact binomial CI: 0%–11.6%). Port colonization was 4.4% on Day 0, 12.2% on Day 2, 17.8% on Day 4 and 31.1% on day 7 and 10. Colonization was higher in the ER versus the ICU (16.7% versus 40.0%, P = 0.032).

**Conclusion:** There is evidence for a light fluid colonization after day 3 in the ER. The bag’s injection port was more likely to be contaminated in the ER versus the ICU which may lead to fluid colonization.
PATIENT CHARACTERISTICS AND OUTCOME IN EXSANGUINATING DOGS: 49 CASES (2007–2012)

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Introduction: To describe patient population, treatment and outcome for dogs with exsanguination.

Methods: Retrospective study in 2 academic teaching hospitals. Electronic medical record systems were searched for dogs receiving blood products (BP). Exsanguination was defined by the need for rapid volume expansion using >25 mL/kg of BP to correct severe blood loss, classified as shock grade 3 or 4 using modified Advanced Trauma Life Support criteria. Massive transfusion (MT) was defined by classic (> one blood volume of BP over 24 hrs) and dynamic criteria (>½ blood volume of BP over 3 or 12 hours). Survivors and patients receiving MT were compared to non-survivors and non-MT. Fisher’s exact test, Mann-Whitney test or student’s test were used as appropriate.

Results: 49 dogs met inclusion criteria. Main causes for exsanguination was trauma (31%) and spontaneous hemoabdomen (22%). Mean (SD) hematocrit was 27% (11.8), lactate was 9.3 mmol/L (3.6) and systolic blood pressure was 64.4 mmHg (44.2). Average volume of BP administered was 42.9 (19.3) mL/kg. Survival, surgical bleeding control and MT rate were 39%, 49% and 49%, respectively. Non-survivors were more likely to have received more BP (47.8 vs. 35.0 mL/kg, P = 0.02), have higher systolic blood pressure (74.5 vs. 44.9 mmHg, P = 0.04) and a trend for receiving more resuscitation colloid (10.6 vs. 5.3 mL/kg, P = 0.057). Patients classified as MT were more likely to have received more BP (53.5 vs. 32.6 mL/kg, P < 0.0001) and quicker (5.4 vs. 12.2 hrs, P = 0.005).

Conclusion: Exsanguinating patients carries a guarded prognosis and are associated with significant resource utilization.

A MULTI-CENTER PROSPECTIVE COHORT STUDY OF FELINE PATIENTS SUSTAINING TRAUMA: INTERIM ANALYSIS

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Introduction: Trauma accounts for approximately 10–13% of admissions to veterinary teaching hospitals. Prognostic indicators have not been investigated prospectively in a population of cats sustaining trauma. The objective of this study is to prospectively characterize cats sustaining trauma with particular emphasis on scoring systems (Animal Trauma Triage (ATT) and modified Glasgow Coma Scale (mGCS)) and their association with outcome.

Methods: Using a web-based data capture system (REDCap–http://project-redcap.org), trained personnel prospectively recorded admission ATT and mGCS scores, clinical and laboratory data and outcome (survival to discharge, death or euthanasia) from cats presenting following trauma to five veterinary teaching hospitals. Data presented are interim analysis results on the first 70 prospectively enrolled cats.

Results: Male cats were injured most commonly (70%) and the majority were indoor/outdoor cats (55%). Unknown trauma occurred most commonly (24/70, 34%), followed by blunt trauma (12/70, 17%), multiple-bite wounds (10/70, 14.2%), crush (9/70, 12.9%), non-bite penetrating wound (7/70, 10%) and fall (6/70, 8.6%). 75.7% (53/70) of cats survived to discharge. ATT (median 3, range 0–18) and mGCS (median 18, range 4–18) scores at presentation were associated with outcome (P < 0.0001). Higher BCS (survivors median 6, range 3–9, non-survivors 5, range 2–7) was also associated with survival (P = 0.029).

Conclusion: In this interim analysis of a multi-center, prospective study of cats, non-survival following trauma was associated with increased ATT and decreased mGCS score.

INCIDENCE OF CONCURRENT ABDOMINAL INJURIES IN DOGS WITH PELVIC FRACTURES: 133 CASES

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Introduction: Pelvic fractures (PF) account for 20–25% of fractures in dogs, however the incidence of concurrent abdominal injury (AI) is not known. The goal of this study was to summarize the type of traumatic pelvic fractures and describe how they relate to occurrence of intra-abdominal injury, length of hospitalization and outcome.

Methods: Medical records (2008–2013) were evaluated for the presence of traumatic PF and included if they had complete medical records and pelvic radiographs available. Non-parametric statistical analysis was used with P < 0.05 considered significant.

Results: Of the 133 dogs included, 50 (37.6%) had AI defined as hemoabdomen (36), gross hematuria (22), septic peritonitis (3), uroabdomen (3), body wall hernia (3), pancreatitis (1), and mesenteric thrombus (1). Twelve had multiple AIs. Sacral fractures were 5 times more likely to have a concurrent hemoabdomen. Sacro-iliac luxations were more frequently associated with urinary tract injury. Number of PFs and percent pelvic canal narrowing did not correlate with AI. Dogs with arrhythmias were more likely to have an AI. Hematochezia was more often associated with septic peritonitis. Dogs were hospitalized longer if they had AI (median 4 days vs. 2). Overall survival to discharge was 88% which was significantly greater than dogs with septic peritonitis (33%).

Conclusion: Abdominal injury occurs commonly in dogs with PF. Dogs with sacral fractures, sacro-iliac luxations, or arrhythmias should be scrutinized for concurrent AI. It was previously reported that pubic fractures correlate with urinary tract trauma which was not supported in this study as most cases had pubic fractures (92.1%).

HYPOCALCEMIA IS ASSOCIATED WITH MORE SEVERE SHOCK AND DECREASED SURVIVAL TIME IN A CANINE MODEL OF SEPSIS

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Introduction: Hypocalcemia is a commonly recognized electrolyte disturbance in people and animals with sepsis and is associated with cardiovascular dysfunction and increased mortality. Dogs with induced endotoxemia develop ionized hypocalcemia in association with hypovitaminosis D. The objective of this study was to determine if markers of calcium homeostasis are associated with severity of illness and survival in a canine model of sepsis.

Methods: Twenty-five purpose-bred beagles were studied for up to 96 hours or until death after bronchial instillation of Staphylococcus aureus (1.25 × 10^8 CFU/kg) at time 0 (baseline). Blood samples were collected at 0, 10, and 24 hours to measure ionized calcium (iCa), parathyroid hormone (PTH), 25-hydroxyvitamin D (vitamin D), ionized magnesium (iMg), creatinine, lactate, and blood gases. Severity of illness was quantified by measuring mean arterial pressure and vasopressor dose to calculate the shock reversal score.

Results: Compared to baseline, iCa, vitamin D, and iMg were decreased at 10-24 hours (P < 0.05). iCa was negatively correlated with PTH (P < 0.001), lactate (P = 0.003), and vasopressor dose (P < 0.001) and positively correlated with pH (P = 0.004) and base excess (P = 0.008). Ionized hypocalcemia (iCa < 1.25 mmol/L) was a risk factor for increasing vasopressor dose (P = 0.009, OR = 1.299) and decreasing shock reversal score (P = 0.002, OR = 0.293). Ionized hypocalcemia at 10 hours (P = 0.019), elevated PTH at 10 (P = 0.039) or 24 (P = 0.005) hours, and hypovitaminosis D at 24 hours (P = 0.005) were all associated with decreased survival times.

Conclusion: Ionized hypocalcemia after induction of bacterial pneumonia is associated with worse septic shock and decreased survival time in dogs.

EFFECTS OF INTRAVENOUS ADMINISTRATION OF TRANEXAMIC ACID ON HEMATOLOGICAL, HEMOSTATIC AND THROMBOELASTOGRAPHIC ANALYSES IN HEALTHY DOGS

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Introduction: A large body of evidence in human medicine supports the clinical use of antifibrinolytic drugs for control of hemorrhage. To date, three anti-fibrinolytic drugs are used in humans for hemorrhage control including e-aminocaproic acid (EACA), tranexamic acid (TA) and aprotinin. The objective of this study was to assess the effects and adverse effects TA on hematological, hemostatic and thromboelastographic analyses in healthy dogs.

Methods: Eleven healthy dogs were administered TA as an IV bolus followed by a 3 hour constant rate infusion. Complete blood count, prothrombin time, activated partial thromboplastin times, D-dimer, antithrombin, fibrinogen and thromboelastography were measured prior to, and immediately after administration.

Results: Vomiting occurred in the first 2 dogs immediately after 20 and 15 mg/kg IV boluses but not during the constant rate infusion. In all other dogs, the IV bolus dose was reduced to 10 mg/kg and administered slower, and vomiting did not occur. All the measured hemostatic and hematological analyses remained within their reference intervals, however, following TA treatment, significant decreases were recorded in prothrombin time, thromboelastography R and A values, HCT, and hemoglobin concentration, while the thromboelastography LY30 significantly increased.

Conclusion: Administration of TA as a slow IV bolus at 10 mg/kg, followed by a 10 mg/kg/hr constant rate infusion for 3 hours is safe in dogs. TA promoted a pro-thrombotic state in healthy dogs as evidenced by a shorter prothrombin and R time; however its effect on thromboelastography A and LY30 values was inconsistent with its expected anti-fibrinolytic properties.

ASSSESSMENT OF HEMOSTATIC CHANGES IN A MODEL OF ACUTE HEMORRHAGE IN DOGS

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Introduction: Lung ultrasound has higher sensitivity and specificity than chest auscultation and radiography for many potentially life-threatening respiratory conditions in people. Diagnosis is primarily based on regionally surveying lung fields for the presence and absence of ultrasound lung rockets (ULRs). In their presence, ULRs represent interstitial edema. No information is known regarding the normal frequency of ULRs in dogs. Moreover, no regional lung ultrasound exam exists.

Methods: Fifty-four non-respiratory dogs with normal thoracic radiography were evaluated for the presence of ULRs using a regionally-based lung scan called Vet BLUE. ULRs found at each of the 4 bilaterally-applied regional sites were compared using McNemar’s chi-square tests. Age, body weight, and body condition score (BCS) were compared between dogs with and without ULRs using Mann-Whitney U tests and interpreted at the 5% level of significance.

Results: Overall frequency of ULRs with at least one positive site was 16.7% (9/54). Comparison of ULR-frequency between left and right at each regional location was as follows: caudodorsal (3.7%, 0%; P = 1.0), perihilar (0%, 0%; P = 1.0), middle (5.6%, 1.9%; P = 0.617), and cranial (3.7%, 1.9%; P = 1.0). Median (ranges) for age, weight and BCS (9-point scale) were compared between dogs with and without ULRs using Mann-Whitney U tests and interpreted at the 5% level of significance.

Conclusion: Non-respiratory dogs infrequently have ULRs present; and ULRs presence is statistically independent of location, age, weight, and BCS establishing a basis for clinically-applied respiratory applications of the Vet BLUE lung scan.
Introduction: Hemostatic derangements associated with acute hemorrhage may occur in people and dogs. The aim of this study was to evaluate hemostatic changes in a canine model of acute hemorrhage by means of platelet count, PT, aPTT, thromboelastography and multiple-electrode impedance platelet aggregometry.

Methods: Blood was drawn for PCV, total solids, fibrinogen and the aforementioned coagulation tests from five dogs at time points corresponding to baseline, 20% blood-volume loss, 40% blood-volume loss, 60 minutes post-hemorrhage and after autologous blood transfusion. Blood was removed using proprietary blood collection sets.

Results: Over time platelet count was not significantly different (P = 0.879), however platelet function as assessed by aggregometry area under the curve significantly decreased overall when arachidonic acid (P = 0.004) and ADP (P = 0.008) were used as agonists. In addition overall significant changes were noted for PCV (p = 0.048), TS (p < 0.0001), PT (p < 0.0001), aPTT (P = 0.041), fibrinogen (P = 0.002) and the TEG variables R (P = 0.030), MA (P = 0.043) and G (P = 0.037).

Conclusion: Platelet dysfunction was documented in the face of unchanged platelet count. Whole blood multiple-electrode impedance platelet aggregometry has the potential to be a useful adjunctive tool in assessing platelet function in dogs with naturally occurring hemorrhage.

ASSESSMENT OF TRANSFUSION PRACTICES IN DOGS PRESENTING FOR EMERGENCY CARE FOLLOWING TRAUMA

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Introduction: Blood transfusions may be required for the stabilization of dogs following trauma. The aim of this study was to describe transfusion practices for a population of traumatized dogs presenting for emergency care at a university teaching hospital.

Methods: Medical records between 2005 and 2013 were retrospectively reviewed. Information included inclusion signalment, trauma type, patient characteristics at admission including animal trauma triage (ATT) score, if transfusions were administered and survival to discharge. If blood products were given the primary reason for transfusion administration was recorded.

Results: Blood transfusions were given to 36% (45/125) of dogs presenting for emergency care with 10 dogs fulfilling massive transfusion criteria. Pelvic fractures (10 dogs), long bone fractures (10 dogs) and penetrating wounds (10 dogs) were the most common injuries reported associated with transfusion. Seven of thirteen dogs with confirmed hemoperitoneum required blood transfusion however only two dogs needed surgical intervention. Blood products were most frequently administered perioperatively (18 dogs) or for treatment of hypoperfusion (14 dogs). Dogs that received blood transfusions had significantly higher heart rates (P < 0.0001), lower body temperature (P = 0.034), lower PCV (P < 0.0001), lower total solids (P < 0.0001), higher lactate (P = 0.007) and higher ATT scores (P < 0.0001) at the time of presentation. Dogs that received blood products were also significantly less likely to survive to discharge (P = 0.003).

Conclusion: Orthopedic injuries and penetrating wounds were common reasons for blood transfusions. Further studies are warranted to better characterize the associations between these injuries and the requirement for blood product administration, particularly in the peri-operative period.

EFFECT OF RED BLOOD CELL PRODUCT AGE ON INCIDENCE OF CANINE TRANSFUSION REACTIONS

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Introduction: The age of red blood cell (RBC) products has been correlated with an increased risk of transfusion reactions in humans; however, no similar data exists in the veterinary literature. The objective of this study was to determine if age of RBC product affects morbidity and mortality in dogs receiving transfusions. The hypothesis was that both would increase with age of product.

Methods: Medical records (2010–2012) were reviewed for dogs receiving RBC products. Patient signalment, reason for transfusion, source of product, dose, rate of administration, use of multiple transfusions, underlying disease, occurrence and type of reactions, various hematologic parameters, and survival were recorded. Data was analyzed for association between potential risk factors and occurrence of transfusion reactions as well as between transfusion reactions and survival.

Results: Of 333 transfusion events in 211 patients, 84 transfusion reactions occurred. Fever was most common (41/84), followed by hemolysis (21/84). The odds of hemolysis (but not fever) significantly increased with age of product (P < 0.0001). For every additional day of product age, odds of hemolysis increased by 1.11X. Occurrence of transfusion reactions was associated with higher dose of product, longer duration of administration, but not with source of product or reason for anemia. Administration rate (mL/kg/hr) was slower in patients that developed fever (P < 0.0001). Product age and occurrence of reactions were not associated with increased mortality.

Conclusion: Increasing age of stored RBC products is associated with increased risk of hemolytic transfusion reactions. Adjustment of recommended RBC product storage times may be warranted.

EMERGENCY TRACHEAL STENT PLACEMENT FOR THE RELIEF OF LIFE-THREATENING AIRWAY OBSTRUCTION IN DOGS WITH TRACHEAL COLLAPSE

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Introduction: Airway obstruction (AO) resulting from tracheal collapse (TC) is a common presenting complaint amongst veterinary emergency services. In some dogs, AO persists despite medical management necessitating intubation and procedures to relieve the AO. This study retrospectively evaluates the utility of tracheal stent (TS) placement as an emergency treatment for dogs with TC and life-threatening AO.

Methods: Procedural case logs (2006–2013) from the Interventional Radiology Service were reviewed to identify all dogs with TC that underwent TS placement. Dogs were included in the analysis if the TS was placed for relief of life-threatening AO as evidenced by intubation after attempts at medical stabilization or failure to successfully extubate after undergoing a procedure. Descriptive statistics were utilized to define the study population. A Kaplan-Meier survival analysis was performed to assess survival times.
Results: Fifty-three dogs underwent TS placement during the study period. 8/53 (15%) dogs met the study inclusion criteria. TS were placed in dogs that required intubation after attempts at medical stabilization (7/8 (88%)) or because of an inability to extubate (1/8 (12%)) following a procedure. TS were successfully placed to relieve AO in all (8/8) dogs and all were discharged alive. Resolution of clinical signs of AO was seen in all dogs. Median survival time based on Kaplan-Meier analysis was 3 years. The cause of death in all deceased dogs was unrelated to upper AO.

Conclusion: TS placement is a minimally invasive and highly successful method of relieving life-threatening airway obstruction in dogs with TC and AO refractory to medical management.

PENETRATING ABDOMINAL BITE WOUNDS IN 52 DOGS: 2000–2012

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Introduction: Bite wounds are common in dogs. Penetration of the abdomen resulting in intra-abdominal injury may increase the risk for the development of multi-organ failure and death. Therefore, the aim of the present study was to describe the surgical findings and outcome in dogs with confirmed penetrating abdominal bite wounds.

Methods: Medical records (2000–2012) were searched in a university hospital for cases of dogs with penetrating abdominal bite wounds with subsequent exploratory laparotomy.

Results: Fifty-one dogs with confirmed penetrating abdominal bite wounds were identified. Twenty (39%) were male and 31 (61%) were female. The median weight was 6.00kg and median age was 5.2 years. All patients had confirmed abdominal penetration due to puncture wounds. Patients had an average of 2.9 other intra-abdominal injuries (range 0–7). The most common injury found was a body wall hernia (n = 33). Intra-operative procedures performed other than puncture wound repair included herniorrhaphy (n = 33), resection and anastomosis (n = 7), partial or complete splenectomy (n = 3), partial pancreatotomy (n = 2), and nephropexy (n = 2). An average of 0.90 intra-operative procedures were performed (range 0–3). Seventeen dogs (33%) had only puncture wound repair with no other intra-operative procedures performed at the time of exploratory laparotomy.

Forty-four cases (86%) survived, 6 (12%) were euthanized, and 1 (2%) died. No statistical difference was identified among survivors and non-survivors between number of injuries or number of intra-operative procedures performed.

Conclusion: Penetrating abdominal bite wounds can result in severe injuries necessitating surgical intervention. Overall, the prognosis for penetrating abdominal bite wounds is good with 86% survival in this study population.

PARENTERAL FISH OIL EFFECTS ON PLASMA NON-ESTERIFIED FATTY ACIDS AND INFLAMMATORY MEDIATORS IN DOGS AFTER OVARIOHYSTERECTOMY

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Introduction: Parenteral administration of fish oil rich in omega-3 fatty acids abates inflammation in people. We hypothesized that administration of intravenous (IV) fish oil after canine ovariohysterectomy (OVH) would increase plasma omega-3 fatty acid concentration and decrease surrogate markers of systemic inflammation.

Methods: Thirty dogs received 2 ml/kg IV infusion of 0.9% saline (saline, n = 10), 10% fish oil emulsion (Omegevcan, n = 10; equivalent to 69 mg/kg IV administration of eicosapentaenoic acid (EPA) + docosahexaenoic acid (DHA)), or soybean oil (Intralipid, n = 10) for 3 hours after OVH. Blood samples were collected before, 5 and 24 hours after OVH for evaluation of non-esterified fatty acid concentrations and pathogen associated molecular pattern stimulated leukocyte tumor necrosis factor, interleukin(IL)-6 and IL-10 production capacity, and before and 24 hours after OVH for measurement of C-reactive protein (CRP).

Results: Plasma concentrations of non-esterified EPA, DHA, and total long-chain omega-3 fatty acids (LCw3FA) increased (P < 0.001) immediately after fish oil infusion. Plasma CRP concentrations increased (P < 0.001) after OVH, but with no significant group differences. A weak negative correlation occurred between post-OVH CRP and post-infusion LCw3FA concentrations (P = 0.014, r² = 0.21). Leukocyte LPS-stimulated IL-6 production capacity increased (P < 0.001) after OVH. Soybean oil infusion resulted in reduced leukocyte IL-6 production capacity (P < 0.05) compared to fish oil and saline infusions. No other treatment differences were observed.

Conclusion: Postoperative administration of fish oil emulsion increases plasma non-esterified omega-3 fatty acid concentrations, but does not attenuate post-OVH CRP production or leukocyte cytokine production capacity. Fish oil infusion at the dosage used does not decrease post-OVH inflammation indices.

SERUM D-LACTATE CONCENTRATIONS IN DOGS WITH PARVOVIRAL ENTERITIS

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Introduction: Dogs affected with canine parvovirus (CPV) are at risk for bacterial translocation and septicemia. D-lactate is a byproduct of bacterial metabolism and could serve as a surrogate marker for bacteremia in dogs with CPV. Serum concentrations of D-lactate may also correlate with other markers of clinical severity or acid-base derangements.

Methods: Thirty-three dogs with CPV were hospitalized and treated supportively for their disease. Serum was collected at admission, then daily for the first four days of hospitalization. D-lactate concentrations from CPV dogs were compared to several healthy controls using a commercially available colorimetric assay. In dogs with CPV, D-lactate concentrations were also compared to several markers of disease severity and acid-base status.

Results: CPV dogs exhibited higher D-lactate concentrations than healthy controls (455 ± 170 µM vs. 325 ± 56 µM, P < 0.01). There were no significant changes in D-lactate concentration over time, and D-lactate concentration did not differ between CPV survivors and non-survivors (P = 0.57). D-lactate concentration appeared to correlate intermittently with other measured variables including base excess, pH, toxic neutrophils and L-lactate, but with no sustained significance over time.
**Conclusion:** Dogs with CPV have elevated D-lactate concentrations. A consistent correlation between D-lactate concentration and other markers of disease severity or acid-base status could not be identified. There was no difference in D-lactate concentration between CPV survivors and non-survivors. Future studies are warranted to determine the clinical significance of endogenous or exogenous sources of D-lactate in CPV, as well as trends in D-lactate concentration during continued recovery from CPV.

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**THE EFFECT OF PRE-PROCESSING STORAGE TIME ON FACTOR VIII CONTENT OF CANINE PLASMA**

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**Introduction:** European human blood banks allow production of plasma for transfusion after holding whole blood units at ambient temperature for up to 24 hours pre-processing. Factor VIII, a labile coagulation factor, is measured for quality control of plasma factor content. The aim of this study was to investigate the effect of storing canine whole blood units for 24 hours pre-processing on plasma factor VIII content and to compare the factor VIII content in plasma units from Greyhounds with other breeds.

**Methods:** A convenience sample of 114 units of whole blood was collected from canine blood donors (41 greyhounds, 73 other) in the United Kingdom. From each unit, one sample of plasma was prepared immediately (time 0). A second sample was prepared during processing up to 24 hours after unit collection (time 24). Factor VIII coagulant activity (FVIII:C) was measured in a one-stage activated partial thromboplastin time (APTT). FVIII:C were compared between time points and breed groups.

**Results:** At time 0 the median FVIII:C was 89 (range: 38–600) and at time 24 it was 117 (range:49–572). There were no significant differences in the median FVIII:C between time groups (P = 0.25) or between breed groups at either time point (P = 0.68, P = 0.71).

**Conclusion:** These results suggest that plasma prepared from whole blood units stored at ambient temperature for 24 hours pre-processing is an acceptable product for replacement of coagulation factors, and that the FVIII:C in Greyhound plasma units supplies sufficient factor VIII for replacement therapy of deficient dogs.

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**F(AB’)2 ANTIVENOM TREATMENT: A RETROSPECTIVE ANALYSIS OF 180 RATTLESNAKE ENVENOMATIONS IN DOGS**

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**Introduction:** Rattlesnake envenomation is a common veterinary emergency in Arizona. This study’s purpose was to evaluate clinical correlations within a large subset of dogs receiving Mexican F(ab’)2 antivenom.

**Methods:** Retrospective data were captured from 288 envenomated dogs requiring antivenin administration, between Oct. 2010 and Dec. 2012, from the Arizona Emergency Animal Clinic. Subset analysis was restricted to only dogs receiving Mexican F(ab’)2 antivenom and excluded dogs vaccinated with the Crotalus toxoid. Baseline morbidity scores were calculated based on bite wound and systemic observations. Data were tabulated in Excel and regression analysis used to identify correlations.

**Results:** 180 dogs received Mexican F(ab’)2 antivenom (average age and weight = 5.8 years old and 46 pounds, respectively) with a 96.1% survival rate. Significant correlations (P < 0.05) existed between baseline morbidity and age, baseline morbidity and number of vials administered (P < 0.05), and baseline morbidity and duration of hospitalization. A significant inverse correlation (P < 0.05) existed between weight and number of vials administered. No correlations were found between age and number of vials administered or duration of hospitalization, or baseline morbidity and weight.

**Conclusion:** Data support one vial of Mexican F(ab’)2 antivenom is sufficient for managing most dog rattlesnake envenomings in central Arizona, but smaller dogs may require higher doses; perhaps due to a higher ratio of venom concentration to body mass. The relationships between higher baseline morbidity and duration of hospitalization and required antivenom doses suggests clinical scoring may be a useful prognostic tool for dogs treated for rattlesnake envenomation. Further analysis of the entire dataset is warranted and ongoing.

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**EFFECTS OF PACKED RED BLOOD CELLS STORAGE TIME ON IRON METABOLISM IN HEALTHY TRANFUSED DOGS**

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**Introduction:** With increased storage time, storage lesions of red blood cells (RBCs) increase, leading to decreased post-transfusion recovery and accelerated extravascular clearance of these cells. Iron liberated by phagocytic digestion of RBCs enters the systemic circulation and can saturate the total iron binding capacity (TIBC) of the body. The aim of this study was to evaluate the concentrations of iron, ferritin and haptoglobin and the TIBC in dogs after transfusion of autologous 3 day old pRBCs in comparison with 35 day old pRBCs.

**Methods:** Ten healthy dogs were randomly assigned to either group F (Fresh; n = 5) or group S (Stored; n = 5) and received a transfusion of 1 unit of autologous pRBCs after 3 days of storage and 35 days of storage, respectively. Blood samples were taken before transfusion and at 5, 9, 24, 48 and 72 hours after transfusion. Concentrations of iron, ferritin, haptoglobin, and TIBC were measured.

**Results:** Dogs in group S had significantly higher concentrations of ferritin, haptoglobin and higher TIBC compared to dogs in group F. Iron concentration was overall not significantly different between both groups (P = 0.158), but significant changes were found within group S over time (P = 0.0001). The highest difference between both groups was found in iron concentration after 5 hours (P = 0.0001), in ferritin concentration and TIBC after 9 hours (P = 0.0001) and in haptoglobin concentration after 24 hours (P = 0.0001).

**Conclusion:** Transfusion of 35 days old pRBCs leads to higher concentrations of iron, ferritin, haptoglobin, and TIBC compared to 3 day old pRBCs.
CONCENTRATION OF LACTATE, POTASSIUM AND PH IN BAGS OF CANINE PACKED RED BLOOD CELLS DURING STORAGE

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Introduction: Storage of packed red blood cells can damage erythrocyte membrane reducing the quality of blood components transfused. This study evaluated if there were changes in biochemical and blood gas in bags of canine packed red blood cells (PRBC) collected with CPDA-1 according to the storage period.

Methods: We compared the values of hematocrit, pH, PO₂, PCO₂, lactate, potassium and percentage of hemolysis of 15 bags of canine PRBC on the collection day (T0), day 7 (T7), day 14 (T14), day 21 (T21) and day 28 (T28) of storage.

Results: The hematocrit increased from 70% to 78.33% between T0 and T28; lactate increased from 2.71 mmol/L to 19.9 mmol/L and potassium increased from 2.73 mmol/L to 7.73 mmol/L in T28. In addition the percentage of hemolysis increased from 1.32% to 3.88% between T0 and T28, despite the higher increase occurred between T14 (2.59) and T21 (3.61). There was a decrease in pH (6.98 to 6.32) and pO₂ suffered a significant decrease from the T21 (62.27 mm Hg) to T28 (53.8 mm Hg). The PCO₂ increased until day 21 (68.67mm Hg to 143 mm Hg) but decreased in T28 (98.2 mm Hg).

Conclusion: According to these results, changes in canine PRBC may indicate possible decrease in the quality of this hemocomponent, however clinical studies evaluating the response of the recipients should be performed.

THE EFFECTS OF PROTAMINE ON CLOT FORMATION IN THE CANINE EVALUATED BY THROMBOELASTOGRAPHY

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Introduction: Coagulopathies associated with canine cardiac bypass are complex and poorly understood. There is evidence that protamine contributes to these coagulopathies. The purpose of this study was to evaluate the effects of protamine on canine clot formation as assessed by thromboelastography (TEG.)

Methods: Whole blood was collected from the jugular vein of healthy, privately owned dogs into a syringe pre-loaded with 3.2% citrate with a final ratio of 9:1. Samples were divided into four aliquots and varying concentrations of protamine were added (0μg/mL, 22μg/mL, 44μg/mL, 66μg/mL). Samples were either activated with kaolin (n = 8) or not activated (n = 8), recalified with 0.2M CaCl₂ and TEG was performed. Precoagulation time (R), clot formation time (K), rate of clot formation (α), and maximum amplitude (MA) were measured.

Results: There was a significant prolongation (P < 0.01) of R and K and a decrease in α and MA were smaller between the 0 and 66μg/mL in both the activated and non-activated samples. When comparing 0 and 44μg/mL, the non-activated group had a decrease in MA and the activated samples showed prolongation of K and a decrease in α.

Conclusion: Protamine prolongs R and K and decreases α and MA in a dose dependent fashion. This study demonstrates that both activated and non-activated samples are appropriate for measuring protamine’s effect on coagulation. Future in vivo studies will demonstrate the clinical significance of these effects, but caution should be taken when administering protamine to cardiac bypass patients.

STABILITY OF DEA¹⁺ ANTIGEN EXPRESSION AND PRODUCTION OF ALLO-ANTIBODIES AFTER TRANSFUSION IN DOGS. A PRELIMINARY STUDY

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Introduction: The antigen expression level on red blood cell (RBC) surface corresponds to the mean fluorescence intensity (MFI) in flow cytometry (FC). We aimed to investigate the stability of DEA¹⁺ antigen expression after blood transfusion (BT) and to show that transfusion between dogs expressing different levels of DEA¹⁺ antigen does not induce the formation of allo-antibodies.

Methods: A quick test typing (Alvedia strip), and a FC analysis were performed in recipients and donors. Recipients were evaluated 24–48h and 1–2 months after BT. Two months after BT, a cross match test was performed between the recipient serum and the RBC of DEA¹⁺ and DEA¹⁻ control dogs. DEA¹⁺ antigen expression was described as very weak (MFI < 50), weak (50 < MFI < 100), normal (100 < MFI < 350) and strong (MFI>350).

Results: Dogs 1 and 2 (DEA¹⁻) received respectively DEA¹⁺ and strong⁺ RBC. Dogs 3, 4 (weak⁺) and dog 5 (normal⁺) received strong⁺ RBC. Dogs 6, 7 and 8 (strong⁺) received respectively DEA¹⁻, weak⁺ and normal⁺ RBC. 24–48h after BT, all FC showed two populations of RBC except for dog 1. Two months after BT, the DEA¹⁺ antigen expression was similar to the initial one and only one RBC population was present in all dogs. DEA¹⁺ allo-antibodies were found only in dog 2.

Conclusion: The level of antigen expression remains the same after a BT. The recipient recovers its DEA¹⁺ expression after disappearance of transfused RBC. DEA¹⁺ dogs, whatever the level of antigen expression, are DEA¹⁺. Transfusion between dogs expressing different levels of DEA¹⁺ antigen does not induce the formation of allo-antibodies.

PHARMACODYNAMIC EVALUATION OF SINGLE ORAL DOSE RIVAROXABAN IN HEALTHY ADULT CATS

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**Introduction:** Rivaroxaban is an oral direct factor Xa (FXa) inhibitory drug. Based on favorable safety and efficacy in people, we evaluated its use as an anticoagulant for cats.

**Methods:** The anticoagulant effects of rivaroxaban, administered at fixed oral doses of 2.5 mg (n = 6 cats; G2.5), and 5 mg (n = 3 cats; G5) were evaluated by measuring anti-factor Xa activity (aXa), dilute prothrombin time (DPT), and activated partial thromboplastin time (aPTT) before and 3, 8, and 24 hours following administration.

**Results:** Treated cats demonstrated no apparent side effects or signs of hemorrhage. Average dosage (mg/kg ± SD) was 0.73 ± 0.2 for G2.5 and 1.3 ± 0.4 for G5. Peak anticoagulant effects were seen at the 3-hour timepoint for all assays. Maximum mean (± SD) aXa values were 3 ± 1.6 U/mL in G2.5 and 3.5 ± 0.6 U/mL in G5. Both treatment groups demonstrated significant prolongations of DPT and aPTT, with peak prolongation to 1.3 X baseline DPT and 1.5 X baseline aPTT for G2.5. Mean aXa values and APTT for G5. All clotting times returned to baseline by 24 hours; however, residual aXa activity persisted (0.3 ± 0.2 U/mL and 0.5 ± 0.2 U/mL, for G2.5 and G5 respectively).

**Conclusion:** Oral rivaroxaban demonstrated dose-dependent anti-FXa activity in cats. Factor Xa inhibition persisted at 24 hours after a single 2.5 mg dose, providing a basis for designing clinical trials to determine drug safety and efficacy in cats with thrombotic syndromes.

**INCIDENCE OF URINARY TRACT INFECTION AT PRESENTATION AND AFTER URINARY CATHETERIZATION IN FELINE URETHRAL OBSTRUCTION**

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**Introduction:** Many male cats with urethral obstruction are placed on antibiotics for the concern of urinary tract infection (UTI) at presentation, or acquired secondary catheterization. Evidence is limited as to whether antibiotics are truly warranted. This study sought to determine the incidence of UTI in these patients as well as bacterial identification and sensitivity profiles.

**Methods:** Male cats admitted for treatment of urethral obstruction were eligible. Exclusion criteria were urethral catheterization within one month or the presence of cystic or urethral calculi. Presenting urine sample was obtained by cystocentesis (pre-catheterization). After catheterization a urine sample was obtained every 24, as well as just prior to removal. Urine samples were immediately processed or refrigerated for no more than 12 hours. Samples positive for growth had bacterial identification and sensitivity performed.

**Results:** Thirty-six cats were enrolled. Of these, 5 (14%) were withdrawn after the initial culture (1 death, 2 euthanasia, 2 with calculi). The remaining 31 (86%) had median catheterization time of 42 hours (range 20–110 hours). No urine cultures were positive at presentation (0/36). A total of 4/31 patients (13%) developed positive cultures, all by 24 hours with same organism at 48 hours. Bacteria identified included Streptococcus sp (3) and Pasteurella (1).

**Conclusion:** Male cats with urethral obstruction are very unlikely to have a UTI at the time of presentation. The overall incidence of acquired UTI (13%) is also very low. Empirical administration of antibiotics may not be warranted in many cases. Culture and sensitivity testing after at least 24 hours of catheterization is recommended.

**EFFECTS OF SALINE DILUTION ON CONDUCTIVITY VERSUS MANUAL HEMATOCRIT IN DOGS**

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**Introduction:** Protein concentration changes affect conductivity-based hematocrit measurements in humans. The study objective was to assess the magnitude of hematocrit incongruence between spun and conductivity methodologies following saline dilution of canine whole blood (WB).

**Methods:** University of Calgary Animal Care Committee approval was obtained (AC13–0053). Blood (35mL) was collected by saphenous venipuncture from a healthy 100lb intact male Leonberger. Sterile water was added to 0.9% saline to obtain a sodium concentration equal to the sodium concentration of the WB (142 mmol/L). Saline to WB dilutions at 0.5:1.5, 0.75:1.25, and 1:1 (S0.5, S0.75, and S1) were prepared in 2mL aliquots. Albumin concentration was measured on WB and at each dilution. Eight replicates per dilution were performed by centrifugation and iSTAT (hematocrit and sodium). Methodologies were compared using paired t-test and Bland-Altman analysis. Sodium was analyzed with one-way ANOVA with Bonferroni’s correction. P values < 0.05 were considered significant. Results are mean difference (bias) ±SD of the difference (precision).

**Results:** Conductivity underestimated hematocrit at all dilutions (P < 0.0001). Bias increased with increasing dilutions; 1.5 +/− 0.5, (albumin 39 mmol/L), 5.4 +/− 0.5 (albumin 26 mmol/L), 5.8 +/− 0.5 (albumin 20 mmol/L), and 6.6 +/− 0.5 (albumin 16 mmol/L) for WB, S0.5, S0.75, and S1 respectively. There were no differences in sodium levels between groups.

**Conclusion:** Saline dilution of canine WB, likely due to effects on albumin, affects conductivity-derived hematocrit when compared to centrifugation. This is similar to what is reported in people. The degree of incongruence may have clinical significance by effecting decision-making, particularly for hypoproteinemic dogs.

**MOLECULAR CHARACTERISTICS OF ESCHERICHIA COLI ISOLATED FROM DISEASED CHICKENS**

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**Introduction:** The emergence of antibiotic resistance among Escherichia coli (E. coli) has become a serious problem. We aimed to detect serotyping, antibiotic profile, phylogenetic group, and the frequency of antimicrobial resistance in E. coli and to evaluate the ability of resistance transfer by conjugative plasmids.

**Methods:** We assessed phenotypic and genotypic characteristics of 197 E. coli isolated from chickens. Isolates were subjected to bacteriological identification, serotyping, antibiotic profiling using disc diffusion and minimum inhibitory concentration (MIC) methods, phylogenetic grouping according to their virulence factors, and plasmid profiling. Virulence assessment was done using Congo red binding activity, enterohaemolysin production, and production and detection of cytotoxins in Vero cells. Transformation of antibiotics resistance determinants were examined by conjugation.
**VENTRICULAR PREMATURE COMPLEXES (VPC) OCCURRENCE DURING SWAN-GANZ CATHETER PLACEMENT IN DOGS**

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**Introduction:** Swan-Ganz catheter placement requires an experienced professional, because of its close contact with the myocardium and cardiac valves. The objective was to evaluate the occurrence of ventricular premature complexes (VPC) during this procedure in dogs.

**Methods:** Three healthy Beagle dogs were used in the study, weighing 12.7 ± 1.19 kg. Animals were fasted for 12 hours and water was withheld for 2 hours. Anesthesia was induced with 5% isoflurane via face mask and endotracheal intubation was performed. Anesthesia was maintained with 2 ± 0.4% isoflurane in 100% oxygen at 2 L.min⁻¹. A percutaneous introducer kit was positioned in order to guide Swan-Ganz catheter placement through the left jugular vein. During Swan-Ganz introduction, atrial, ventricular and arterial wave forms, as well as electrocardiography, were observed in order to divide different locations where ventricular premature complexes would be recorded. Four locations were studied: cranial vena cava (CVC), right atrium (RA), right ventricle (RV) and pulmonary artery (PA). Chi-square test was performed in order to evaluate if VPC occurrence was dependent of any location.

**Results:** A total of 22 VPCs, respectively 45.4% in RA and 54.5% in RV, were observed. Chi-square’s P value was 0.0205, showing that VPCs depend on the location of the catheter.

**Conclusion:** We have concluded that the contact between the Swan-Ganz catheter and the myocardium, rather than the endothelium, causes the muscle to generate VPCs in isoflurane-anesthetized dogs.

**N-TERMINAL PRO-C-NATRIURETIC PEPTIDE AND CYTOKINE KINETICS IN DOGS WITH SYSTEMIC INFLAMMATION**

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**Introduction:** Rapid identification of infection in patients with sepsis enables prompt administration of antibiotics that are essential to improve survival. Serum N-terminal pro-C-natriuretic peptide (NT-proCNP) concentration can differentiate naturally occurring sepsis from non-septic inflammation, however, little is known about serum NT-proCNP concentrations in dogs during the course of sepsis. The purpose of this study was to determine serum NT-proCNP and cytokine kinetics in dogs with induced endotoxemia, an established model of canine sepsis.

**Methods:** Eight healthy adult Beagles were randomized to receive *Escherichia coli* O127:B8 lipopolysaccharide (LPS, 5 ug/kg, IV) or placebo (0.9% NaCl, equal volume, IV) in a randomized crossover study. Serum collected at 0, 1, 2, 4 and 24 hours was stored at -80°C for batch analysis. NT-proCNP was measured by ELISA and 13 cytokines and chemokines by multiplex magnetic bead-based (Luminex) assay.

**Results:** Serum NT-proCNP concentrations did not differ significantly between LPS- and placebo-treated dogs at any time. When comparing serum cytokine concentrations in LPS- to placebo-treated dogs, IL-6, IL-10, TNF-α and KC-like were elevated at 1, 2, and 4 hours; IL-8 was elevated at 2 and 4 hours; CCL2 was elevated at 4 and 24 hours; and CXCL10 was elevated at 4 hours (P < 0.05) in dogs treated with LPS. There were no differences in serum GM-CSF, IFN-γ, IL-2, IL-7, IL-15 or IL-18 between groups of dogs.

**Conclusion:** In dogs, serum NT-proCNP concentration does not distinguish LPS-induced inflammation from health. Serum cytokines and chemokines significantly increased within 1–4 hours of LPS administration in dogs and this warrants further investigation.

**COYOTE ATTACKS IN DOGS AND CATS**

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**Introduction:** To identify and characterize the bite wounds inflicted on dogs and cats attacked by the common coyote, *Canis latrans*

**Methods:** Retrospective case series with 71 cats and 154 dogs from 1997 through 2012.

**Results:** All cats were <10 kg and the overall mortality rate was 23.95%. Cats with wounds to the thorax and abdomen had a higher mortality rate, 47.3% and 33.3%, respectively. Overall mortality rate in dogs was 15.58%. Twenty-one of the 24 deaths (87.5%) inflicted by coyote were in dogs less than 10 kg. Dogs with wounds to the thorax had 21.25% mortality and those with wounds to the abdomen had 20% mortality.

**Table 1: Classification of bite wound injury**

| Representative Injury | Number of Cats Affected | Number of Dogs Affected |
|-----------------------|-------------------------|-------------------------|
| Mandibular fracture   | 7 (9.85%)               | 2 (1.2%)                |
| Scapular fracture     | 3 (4.2%)                | 1 (0.64%)               |
| Rib fracture(s)       | 2 (1.2%)                | 31 (20.12%)             |
| Pulmonary contusions  | 6 (8.45%)               | 22 (14.28%)             |
| Pneumothorax          | 6 (8.45%)               | 17 (11%)                |
| Tracheal tear         | 1 (1.4%)                | 9 (5.8%)                |

**Table 2: Prevalence of coyote attacks**

| Years       | 1997–2000 | 2001–2004 | 2005–2008 | 2009–2012 |
|-------------|-----------|-----------|-----------|-----------|
| Animals affected | 42        | 74        | 90        | 121       |

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Conclusion: A high overall mortality rate was associated with coyote attacks on cats and dogs weighing <10 kg, especially if the injury occurred to the thorax or abdomen. Higher mortality associated with thoracic and abdominal wounds are likely due to direct damage of vital organs and ensuing organ dysfunction along with the systemic effects associated with hemorrhage, shock and sepsis. Coyote attacks are an increasing problem due to urbanization and are associated with substantial morbidity and mortality.

CT ANGIOGRAPHY FOR DETECTION OF PULMONARY THROMBOEMBOLISM AND PORTAL VEIN THROMBOSIS IN DOGS WITH IMMUNE-MEDIATED HEMOLYTIC ANEMIA (IMHA)

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Introduction: The objective of this study was to prospectively evaluate the use of CT angiography to diagnose thromboembolic disease (TE) in dogs with IMHA.

Methods: Dogs with IMHA and suspicion of pulmonary thromboembolism (PTE) or portal vein thrombosis (PVT) were eligible for inclusion. Suspicions of PTE were based upon the presence of severe hypoxemia, non-specific radiographic findings, and evidence of a prothrombotic state. Suspicion of PVT was based upon ascites, ultrasonographic findings, and a prothrombotic state. Dogs diagnosed with other conditions associated with hypoxemia or ascites were excluded. For eligible dogs, dual phase angiography of thorax and abdomen was performed.

Results: Eight dogs met the inclusion criteria based upon the presence of severe hypoxemia. Five of these additionally had ascites. Angiography identified pulmonary emboli in 3 dogs. In dogs without thrombi, pulmonary pathology included ARDS (1), diffuse interstitial lung disease (1), focal pneumonia or atelectasis (1), chronic bronchitis/bronchiectasis (1), and undetermined (1). Significant non-thoracic findings included gastric pneumatoceles (1) and contrast enhancing splenic or liver nodules (1 each). Four dogs died or were euthanized during their hospital stay. One of these had PTE on CT and multiple fibrin thrombi confirmed at necropsy. 2 of 3 dogs without CT evidence of TE were necropsied and both had thrombi in lung or hepatic vessels. Of 4 survivors, 3 died or were euthanized within 2 months of discharge.

Conclusion: CT angiography may be useful for diagnosing PTE in dogs with IMHA. However, a variety of other conditions may also contribute to hypoxemia and ascites in these patients.

EFFECTS OF AGGRESSIVE DIURETICS THERAPY DURING CONGESTIVE HEART FAILURE ON HOSPITALIZATION AND SURVIVAL: 35 CASES (2011–2012)

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Introduction: Diuretic therapy is the mainstay of treatment for congestive heart failure (CHF). Volume depletion due to aggressive diuresis has been implicated as a cause of worsening renal function. When the decrease in the intravascular volume exceeds the replacement from the extravascular compartment, the concentration of hemoglobin and plasma proteins increase. We hypothesize that hemococoncentration secondary to diuretic therapy in CHF is associated with development of azotemia and worse survival outcomes in dogs.

Methods: A medical records database search was performed at the Veterinary Hospital at the University of Pennsylvania for all dogs hospitalized with a diagnosis of congestive heart failure between 2011–2012. All patients were treated with diuretic therapy. Collected data included hematocrit, total protein, creatinine, blood urea nitrogen (BUN), and body weight measurement.

Results: There was no correlation between admission-to-24-hour change in total protein concentration (P = 0.09), or hematocrit (P = 0.08) with days in oxygenation or hospitalization. Decreased hematocrit was correlated with a decrease in days of hospitalization (P = 0.0089). Increased BUN was correlated with longer hospitalization (P = 0.05), however did not decrease the duration of oxygen supplementation (P = 0.12). A previous history of CHF did not have a significantly longer duration of hospitalization (P = 0.25), or duration of oxygen therapy (P = 0.49), but did have a significantly worse outcome during hospitalization (P = 0.04).

Conclusion: Despite the relationship of hemococoncentration and aggressive fluid removal, a decreased hematocrit concentration is associated with decreased length of hospitalization. These
observations raise the question of whether aggressive deconges-
tion can positively affect survival.

THE IN VIVO EFFECTS OF OPIOIDS ON INNERE IMMUNE SYSTEM FUNCTION IN HEALTHY ADULT DOGS

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Introduction: Opioids have immunomodulatory properties in many species. Our objective was to compare the effects of opioids on innate immune function in healthy dogs.

Methods: Six healthy adult dogs received treatments in a randomized cross-over design: morphine (0.5 mg/kg IV, then 0.1 mg/kg/hour), buprenorphine (0.015 mg/kg IV, then 1.7 mcg/kg/hour), and saline (control; 1 ml/kg/hour) for 24 hours with at least a 10 day washout period between treatments. Blood was collected at baseline and 24 hours. Leukocyte apoptosis, phagocy-
tosis, and oxidative burst were evaluated using flow cytometry. Lipopolysaccharide (LPS), lipoteichoic acid, and peptidogly-
can (PG)-stimulated leukocyte production of tumor necrosis factor (TNF)-α, interleukin (IL)-6, and IL-10 were determined using ca-
nine specific multiplex assays. Data were compared using ANOVA and post-hoc Fisher LSD with significance set at P < 0.05.

Results: Saline infusion did not significantly change cytokine pro-
duction in response to any stimulant. Buprenorphine infusion in-
creased IL-10 and TNF production in response to LPS and PG. Morphine evoked an increase in IL-10 production after LPS stimu-
ation of whole blood. No significant differences from baseline were detected for leukocyte apoptosis, phagocyte function or oxidative burst for any treatment.

Conclusion: Buprenorphine promoted pro- and anti-inflammatory cytokine production, whereas morphine was associated with an anti-inflammatory shift. Our findings suggest an immunomodula-
tory effect of opioids in dogs. Based on these data, strategic selection of opioids in canine patients at risk for inflammatory conditions may be beneficial and warrants further investigation.

FLUID OVERLOAD IN 17 CATS WITH URETHRAL OBSTRUCTION: 2002–2012

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Introduction: Feline urethral obstruction is a common reason for emergency hospitalizations and treatment with IV fluid diuresis. Fluid overload resulting in pulmonary edema and/or pleural effusion is a possible complication of aggressive IV fluid administration. The purpose of this study is to describe the development of fluid overload in a cohort of cats with urethral obstruction.

Methods: Medical records of cats (January 2002- December 2012) with urethral obstruction were reviewed for evidence of fluid overload. Fluid overload was defined as the development of pleural effusion and/or pulmonary edema while receiving IV fluids. Data recorded included: signalment, body weight (kg), body condition score, initial electrolytes, BUN and creatinine, initial hypotension, total IV fluid volume input and urine output, presence and de-
velopment of a murmur or arrhythmia, underlying heart disease, treatment of fluid overload, and outcome. Fluid overload scores were calculated: (Total Fluids In – Total Fluids Out)/Admission Body Weight.

Results: 17 cats were included in the study. Median body weight was 6.7kg (range: 5.6-8.8), with a median BCS of 6.9 (range: 5-8). On presentation, 4/13 (31%) were hypotensive; 12/16 (75%) were azotemic, and 10/17 (59%) were hyperkalemic. Heart murmurs were heard in 2/17 cats, 7/15 (47%) and 14/17 (74%) developed a murmur or arrhythmia during hospitalization respectively. Posi-
tive fluid overload scores were noted in 8/11 (73%) (range 4-12.6) cats. Underlying heart disease was diagnosed in 7/9 (78%). Sixteen cats survived to discharge; one cat was euthanized after urethral obstruction recurrence.

Conclusion: Fluid overload is a possible complication of treatment of feline urethral obstruction.

A PILOT STUDY EVALUATING THE SAFETY AND EFFICACY OF AMINOCAPROIC ACID FOR THROMBOCYTOPENIC BLEEDING IN DOGS

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Introduction: Aminocaproic acid (ACA) has been successfully used for thrombocytopenic bleeding in people. The ability of ACA to decrease transfusions was assessed in dogs with primary immuno-
mediated thrombocytopenia (IMT). Secondly, the role of fibrinoly-
isis in IMT was assessed.

Methods: Non-coagulopathic IMT dogs that were anemic and bleeding underwent randomization to receive ACA or placebo. ACA (30 mg/kg/hr for 2 hours, 10 mg/kg/hr thereafter), or identi-
tical volume saline for placebo, were administered until platelet concentrations were ≥30,000 platelets/μL. All were treated with 2 mg/kg/day of prednisone or equivalent, 0.5 mg/m² vincristine, fluids to maintain euvolemia, and 10 ml/kg packed red blood cell transfusions (pRBC) to maintain PCV > 18%. Blood was collected by direct venipuncture with a syringe containing 3.2% citrate at enrollment and 48 hours. Thromboelastography (TEG) was per-
formed after a 30-minute rest with kaolin-activation in heparinase cuvettes, with and without plasminogen activator (170 IU/mL tPA).

Results: Ten dogs were enrolled (5 in each group), with similar baseline characteristics. Three patients in each group failed to sur-
vive. No differences were noted in median pRBC transfusion (8.7 mL/kg for ACA vs. 24 mL/kg for placebo, p = 0.4) or treatment times (40 hours for ACA vs. 99 hours for placebo, p = 0.056). En-
hanced fibrinolysis was not detected via TEG. The alpha was lower in the placebo group vs. ACA (p = 0.036), with no other differences detected. The in vitro fibrinolytic effect of tPA appeared negated in ACA-treated patients.

Conclusion: This dose of ACA was well tolerated and inhibited the induced-fibrinolysis. Larger studies are needed to determine efficacy.

COLLOID OSMOTIC PRESSURE DURING AND AFTER SURGICAL INTERVENTIONS IN ADULT AND SENILE DOGS

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THE EFFECTS OF SPINAL ANESTHESIA, PERIPHERAL NERVE BLOCKS OR FENTANYL ADMINISTRATION ON THE STRESS RESPONSE IN DOGS UNDERGOING STIFLE SURGERY

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Introduction: The present study evaluates the stress response in dogs undergoing stifle surgery receiving different analgesic protocols.

Methods: After committee approval, forty-five client-owned healthy dogs were divided into three groups which were randomly assigned to receive fentanyl VRI, spinal anesthesia, or femoral and sciatic nerve block as part of a standard anesthetic protocol during stifle surgery. Fifteen healthy dogs undergoing non invasive orthopedic diagnostic procedures under anesthesia were included as control group. Blood samples were collected on arrival at the hospital (T0), induction of anesthesia (T1), extubation (T2), and one hour after extubation (T3). Serum cortisol was analyzed in all samples. Dysphoria and pain scores were evaluated postoperatively by a blind researcher.

Results: In control group cortisol was 2.9 ± 1.6, 3.6 ± 2.0, 2.4 ± 1.2, 1.8 ± 1.0 μg/dL at T0, T1, T2 and T3 respectively. In spinal anesthesia and peripheral nerve block cortisol was 4.0 ± 1.7, 4.1 ± 2.1, 5.1 ± 2.4, 3.3 ± 2.0 and 3.7 ± 2.0, 4.3 ± 2.2, 3.2 ± 2.1, 3.1 ± 2.1 μg/dL at T0, T1, T2 and T3 respectively. In fentanyl group cortisol was significantly higher at T2 and T3 compared to the other groups (3.6 ± 0.7, 5.3 ± 1.7, 9.2 ± 1.6, 10.8 ± 1.5 μg/dL at T0, T1, T2 and T3 respectively). Dysphoria and pain scores were higher in fentanyl group compared to the other groups.

Conclusion: Spinal anesthesia and peripheral nerve blocks reduce the stress response in dogs improving postoperative outcome.

PROGNOSTIC VALUE OF PREOPERATIVE SERUM ALBUMIN LEVEL IN CANINE AND FELINE GASTRO-INTESTINAL SURGERY: 150 CASES (2009–2012)

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Introduction: We hypothesized that preoperative serum albumin level would be a relevant prognosis indicator of postoperative morbidity-mortality in dogs and cats undergoing gastro-intestinal surgery.

Methods: Retrospective study of client-owned domestic carnivores presented for gastro-intestinal surgery with a preoperative serum albumin level available.

Results: 102 dogs and 48 cats were enrolled in the study. 50.1% of dogs and 27.1% of cats were hypoalbuminemic (albuminemia < 28g/L).

Overall mortality rate was 16.1%. Kaplan-Meyer survival curves analysis showed that hypoalbuminemia was significantly associated with mortality (plogrank = 0.008). In an adjusted multivariate analysis, a hypoalbuminemic patient had a 3.6 times higher relative risk of death following GI surgery. Length-of-stay in Hospital was significantly higher (5.4 ± 0.3 days) in hypoalbuminemic animals than in animals with a normal albumin level (3.6 ± 0.1 days) (P = 0.002).

Overall postoperative complications rate was 46.7% and included GI complications (suture dehiscence, peritonitis, vomiting, diarrhea), laparotomy complications (site infection and suture dehiscence) and systemic complications (septic shock, hypovolemic shock and DIC). Kaplan-Meyer survival curves analysis showed that hypoalbuminemia was significantly associated with postoperative complications (plogrank = 0.001). In an adjusted multivariate analysis, a hypoalbuminemic patient had a 6.4 times higher relative risk of complications following GI surgery. There was a 2.6 times relative risk to present a GI complication and 28.6 times to present a systemic complication, but no increased risk was found to present laparotomy complications.

Conclusion: Patients with a low preoperative serum albumin level undergoing GI surgery were at higher risk of death as well as digestive and systemic postoperative complications and stayed longer in hospital.

DIAGNOSTIC ACCURACY OF THE MULTISTIX 8SG REAGENT STRIP TO DIAGNOSE BACTERIAL PERITONITIS IN DOGS WITH ASCITES

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Introduction: A fast, reliable bedside test to rule out the presence of septic peritonitis in dogs is lacking. Leukocyte esterase tests for detecting septic peritonitis have a very high specificity in human patients with ascites.
Abdominal fluid samples were collected from 41 dogs with ascites presenting to the Purdue University Small Animal Veterinary Teaching Hospital. Abdominocentesis was performed; fluid was placed on the leukocyte esterase test pad reagent strip [Bayer Multistix 8 SG Reagent Strips, Bayer Diagnostics] and concurrently submitted for cytology and aerobic/anaerobic culture. Reagent strips were classified as positive for septic peritonitis if the leukocyte esterase test results were greater than “trace” or “negative.” Samples were classified as disease positive if intracellular bacteria were noted within neutrophils during cytologic examination or if positive growth was found on culture. The sensitivity and specificity for detection of peritonitis were calculated for the leukocyte esterase reagent strip.

Results: Using cytology or culture as the referent, the leukocyte esterase test pad had a specificity of 100% (95% CI: 86–100%) with a sensitivity of 69% (95% CI: 41–89%). Using cytology only as the referent for diagnosis of septic peritonitis, the leukocyte esterase test pad had a specificity of 93% (95% CI: 78–99%) and a sensitivity of 48% (95% CI: 48–98%). Of the 14 dogs with positive cultures, six cultures had multiple organisms and eight were single organisms. Twelve of the 18 organisms cultured were aerobic and six were anaerobic.

Conclusion: The leukocyte esterase test has a high specificity to detect septic peritonitis in dogs with ascites.

THE PREVALENCE OF ACUTE LUNG INJURY IN DOGS RECEIVING TRANSFUSIONS

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Introduction: Transfusion-related acute lung injury (TRALI) is the most common complication of transfusions in humans. Veterinary acute lung injury (VetALI) has been documented in dogs; it is suspected that dogs can have TRALI.

Methods: Dogs receiving a transfusion (blood, plasma products) received an arterial blood gas analysis 0–12 hours before and 24–48 hours after the completion of the transfusion and thoracic radiographs 0–24 hours before and 24–48 hours after the transfusion. The arterial partial pressure of oxygen (PaO2) values were used to determine the PaO2/FiO2 (inspired oxygen fraction) ratio for each patient and dogs were observed for respiratory-related clinical signs. Radiographs were reviewed by a board certified veterinary radiologist. Patients with post-transfusion radiographic pulmonary infiltrates, a post-transfusion PaO2/FiO2 ratio less than 300 or evidence of respiratory-related clinical signs were suspected of having VetALI and underwent an echocardiogram to exclude left sided heart failure. The prevalence of VetALI was calculated and Chi-squared tests were used to compare the prevalence in the test population to the prevalence of VetALI in ill dogs and the prevalence of transfusion-related ALI in humans.

Results: The reported prevalence of VetALI (3/54; 5.5%) in the test population was significantly (P = 0.001) less than the prevalence of TRALI reported in humans receiving transfusions and not statistically (P = 0.28) increased over the prevalence of VetALI reported in ill dogs.

Conclusion: VetALI occurred in the test population at a frequency predicted by the previous literature. Transfusion did not increase the prevalence of VetALI in the test population.

DIAGNOSTIC AND PROGNOSTIC IMPLICATIONS OF SERUM IRON IN DOGS WITH SIRS

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Introduction: To measure serum iron concentrations and other inflammation markers (albumin, CRP, and fibrinogen) initially and over the ICU stay of dogs suffering SIRS, and to investigate its prognostic value.

Methods: Prospective study based on SIRS dogs admitted to an ICU. Blood samples for determination of the studied parameters were taken on admission and then every other until discharge or death. Two other groups of dogs were used in this study: 1) dogs with evidence of local inflammation (INFLAM) and 2) healthy dogs as control group. All studied variables were compared among groups using Wilcoxon-Mann-Whitney’s test. Values were also compared between outcome groups for animals in the SIRS group. Data are presented as means ± standard error.

Results: As expected, animals on INFLAM (n = 42) and SIRS (n = 54) groups had significantly lower iron and albumin and higher CRP and fibrinogen levels than control animals (n = 20) on admission. Dogs with SIRS had significantly lower serum iron (65 ± 5.8 vs. 90 ± 6.7 μg/mL, P = 0.001) and albumin (19.1 ± 0.064 vs. 2.52 ± 0.062 g/dL, P < 0.001) and higher CRP (165 ± 11.1 vs. 108 ± 10.8 μg/mL, P < 0.001) concentrations than INFLAM dogs. Fibrinogen concentrations were not significantly different between dogs with local or systemic inflammation. Survivor SIRS dogs showed a normalization of the serum iron and CRP levels (89 ± 9.1 and 91 ± 14.7) before discharge but non-survivors did not show any normalization (66 ± 8.8 and 169 ± 16.9) resulting in a difference between both groups (P = 0.057 and P = 0.001).

Conclusion: Serum iron could be a reliable indicator of systemic SIRS in critically ill dogs and further studies are warranted to confirm the prognostic value of this inflammatory marker.

EFFECT OF ANTI-INFLAMMATORY MEDICATION ON THE OUTCOME OF CANINE PULMONARY BLASTOMYCOSIS

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Introduction: Blastomycosis is a systemic fungal disease endemic to the central and southeastern United States. Acute respiratory distress syndrome (ARDS) has been reported due to pulmonary blastomycosis and secondary to antifungal treatment in ~10% of human patients. Cases of ARDS are associated with increased mortality rates, and human literature has advocated the use of corticosteroids in patients with ARDS secondary to pulmonary blastomycosis. The purpose of this study was to elucidate if the treatment of canine pulmonary blastomycosis with anti-inflammatory medication improved 30-day survival.

Methods: The medical records of dogs with pulmonary blastomycosis from May 2002-October 2012 were identified. Cases were classified based on anti-inflammatory therapy received: non-steroidal anti-inflammatory (NSAID), steroid, both or none. Additional therapy and outcome (survival to 30-days vs. euthanized or died) were also recorded.
**Results:** Of 139 dogs with confirmed pulmonary blastomycosis, 87/139 (62%) survived to 30-days, 34/139 (25%) were euthanized due to progressive clinical disease and 18/139 (13%) died secondary to respiratory or cardiac arrest. In a multiple regression model controlling for effects of itraconazole dose, sex, age and pretreatment with anti-inflammatory medication, the odds for survival to 30-days was not statistically different when compared to no anti-inflammatory medication (none) for the NSAID (OR 1.12, \( p = 0.86 \)), steroid (OR 1.41, \( p = 0.65 \)) or both (OR 4.90, \( p = 0.27 \)) groups.

**Conclusion:** Use of anti-inflammatory medication did not improve 30-day survival in this retrospectively evaluated population of dogs with pulmonary blastomycosis.

**MODULATION OF COAGULATION AND FIBRINOLYSIS BY CARBON MONOXIDE AND NITRIC OXIDE IN DOGS: A THROMBOELASTOGRAPHIC ANALYSIS**

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**Introduction:** Inflammatory conditions such as sepsis, neoplasia, pancreatitis, and immune-mediated diseases cause hemostatic abnormalities via a number of mechanisms, including the production of carbon monoxide (CO) and nitric oxide (NO). CO and NO have been shown to modulate coagulation and fibrinolysis in vitro by redox modulation of hemoglobin molecules associated with fibrinogen, plasmin, and α2-antiplasmin.

**Methods:** Using a plasma-based clot lifespan thromboelastographic method, we established the effects of CO and NO on tissue factor activated citrated plasma with tissue plasminogen activator (tPA) (to assess fibrinolysis) or without tPA (to assess coagulation) in 10 healthy dogs.

**Results:** With a carboxyheme state induced by CO, both clot strength (maximum amplitude, MA) and velocity of clot growth (maximum rate of thrombus generation, MRTG) were significantly increased. With a metheme state induced by NO, both clot strength (MA) and velocity of clot growth (MRTG) were significantly decreased. With the addition of tPA, a carboxyheme state significantly increased clot strength (MA) and decreased rate of fibrinolysis (maximum rate of lysis, MRL). A metheme state did not significantly change clot strength (MA) or fibrinolysis (MRL).

**Conclusion:** The data suggests that coagulation is modulated by a balance between CO and NO. In contrast, fibrinolysis is primarily modulated by NO since the lack of change with addition of NO suggests a pre-existing metheme dominated state in vivo. This assay will be useful to dissect the mechanisms of inflammation mediated effects on coagulation and fibrinolysis in such diseases as immune-mediated hemolytic anemia (where CO is increased and NO is decreased), neoplasia, and sepsis.
Gastric ulcers could be triggered by the chronic, un-
738 horses having peritoneal fluid
A retrospective case-control study was designed; med-
Data were analyzed using a repeated measures ANOVA
Resveratrol (RES, trans-3,5,4’-trihydroxystilbene) is a
At this time we cannot conclude that RES at the rou-
One hundred forty eight horses were identified as “cases”.
Enterolithiasis is a recognized cause of acute ab-
Measurement of peritoneal fluid lactate, either alone
Methods:
Dressel
YEAR PERIOD: 2001–2011
MODULATE THE INNATE IMMUNE RESPONSE IN
DOES ORALLY ADMINISTERED RESVERATROL
Brockway L,Johnson P, Amorim J, DeClue A
University of Missouri, Columbia, MO, USA
Introduction: Resveratrol (RES, trans-3,5,4’-tri-
and placebo treated horses. Phagocytosis and respiratory burst ca-
pacity were evaluated via flow cytometry. Tumor necrosis factor
and interleukin-1beta were measured using cytotoxicity and ELISA
assays, respectively.
Results: Data were analyzed using a repeated measures ANOVA
with P < 0.05 considered significant. There was no significant differ-
ence in phagocytosis or respiratory burst between RES and placebo.
No significant difference was found in TNF or IL-1beta production
between RES and placebo.
Conclusion: At this time we cannot conclude that RES at the rou-
tinely recommended clinical dose modulates phagocytosis, respi-
atory burst function or leukocyte cytokine production in horses.
Further investigations are needed to evaluate bioavailability and
effective administration concentrations.

EVALUATION OF PERITONEAL FLUID
PARAMETERS FOR PREDICTION OF
INTESTINAL ISCHEMIA LESIONS IN HORSES
WITH ABDOMINAL DISEASE
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Introduction: Intestinal ischemia is a severe cause of colic in horses
that must be quickly corrected by surgery to minimize morbidity
and mortality. The purpose of this study was to compare the
diagnostic performance of several peritoneal fluid parameters in
predicting the presence of intestinal ischemia.
Methods: Seven hundred thirty eight horses having peritoneal fluid
collected and analyzed for evaluation of various abdominal dis-
eases between December 2007 and April 2011 were included in
this study. Recorded information included signalment, presenting
examination findings, blood lactate, peritoneal fluid parameters,
clinical diagnosis, treatment, and outcome. ANOVAs and receiver
operating characteristic curves were used to compare diagnostic
tests for the identification of intestinal ischemia.
Results: There were 169 intestinal ischemia diagnoses (126 small
intestine, 38 large intestine, 5 small colon) and 569 non-ischemic
diagnoses (including 34 rupture or septic peritonitis). Ischemia pre-
diction index, peritoneal lactate, and peritoneal-blood lactate differ-
ence were significantly better than peritoneal fluid pH, peritoneal-
lactate ratio, peritoneal total protein, and peritoneal nucle-
ated cell count for predicting intestinal ischemia, if rupture and
septic peritonitis cases were excluded. Ischemia prediction index
and peritoneal-blood lactate difference were significantly different
between ischemic lesions involving the small intestine and large
intestine.
Conclusion: Measurement of peritoneal fluid lactate, either alone
or as part of the ischemia prediction index and peritoneal-blood
lactate difference, can be helpful in the identification of intestinal
ischemia. However, these values should not be used in isolation
and are confounded by the location of the ischemic lesion or the
presence of septic peritonitis.

OBSERVATIONAL STUDY OF EXPLORATORY
LAPAROTOMY FOR EQUINE COLIC OVER A TEN
YEAR PERIOD: 2001–2011
Dressel L, Kleine S, Quandt J
Introduction: Colic is a common surgical emergency in equine practice; however there is limited studies evaluating patient demographics and types of lesions that require surgery.

Methods: A comprehensive survey was completed for all equine colics undergoing surgery from 2001–2011 at the University of Georgia Veterinary Teaching Hospital.

Results: This retrospective study included 1187 horses. Of these patients 63% were male (52% gelding; 11% stallion) and 37% were mares (2% pregnant). The most common breeds were Thoroughbreds (19%), Warmbloods (14%) and Quarter Horses (35%). Patient age ranged from 1 month to 37 years of age; 34% of these were between 4–9 years of age. Patients weighing between 450 to 550 lbs made up 48% of the patients that required surgery. The types of lesions found were small intestinal (38%), large intestinal (48%) or both (10%). The three most common types of lesions were large colon displacement (19%), large colon torsion (15%) and small intestinal impaction (11%). Recovery was assisted or unassisted and scored based on the number of attempts to stand. Sixty-one% of horses had an excellent recovery, 30% had a fair recovery and 4.5% had a rough recovery. Sixteen% of all the cases were euthanized or died in the perioperative period, 46% were SI, 36% were LI and 21% had both SI and LI.

Conclusion: This study shows that patients with small intestinal lesions are less likely to survive than patients with large intestinal lesions.

REVIEW OF FLUID STRATEGIES IN HUMAN MEDICINE FOR HEMORRHAGIC SHOCK

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Introduction: The objective of this review was to evaluate fluid plans for management of hemorrhagic shock in veterinary patients by reviewing fluid methods currently utilized in human medicine.

Methods: A review of literature from the past ten years describing fluid type and volume administered in hemorrhagic shock in human medicine was performed.

Results: Damage Control Resuscitation (DCR) is the strategy currently utilized in human medicine to resuscitate patients with hemorrhagic shock. The goal of DCR is to achieve permissive hypotension. Intravascular fluid replacement is administered to maintain mean arterial blood pressure at 50 mmHg and systolic blood pressure at 80 mmHg. These pressures are sufficient to maintain organ perfusion, but low enough to prevent disrupting clot formation and potentiating hemorrhage. Studies indicate 40% survival rate when DCR is utilized versus 16% survival rate with other resuscitative strategies. Plasma is the initial resuscitation fluid and helps prevent coagulopathies associated with acute hemorrhage. Studies describe 46% reduction in mortality when plasma is used in a 1:1 ratio with blood as opposed to using more blood than plasma.

Conclusion: Utilizing DCR in veterinary medicine guides practitioners in volume and type of resuscitative fluid used in hemorrhagic shock. Evaluating blood pressure (using blood pressure monitors or palpation of peripheral pulses) aids in achieving the acceptable level of permissive hypotension to provide organ perfusion without potentiating further hemorrhage. Plasma should be the initial resuscitation fluid, although financial constraints may limit the volume of plasma administered in veterinary medicine and crystalloid fluids may also be utilized.

POSTOPERATIVE HEMOPERITONEUM IN EQUINE COLIC

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Introduction: Hemoperitoneum, although uncommon, is a potentially life threatening condition with multiple etiologies. Postoperative hemoperitoneum following colic surgery has not been well described as a surgical complication. The objective of this paper was to investigate postoperative hemoperitoneum in a population of surgical colic patients. We hypothesized that hemoperitoneum would be more common following intestinal resections, and that sequelae would include septic peritonitis and adhesions.

Methods: Preoperative, intraoperative and postoperative information was obtained following a computerized search of medical records from 1985–2012 for patients with postoperative hemoperitoneum. Pre-existing hemoperitoneum at the time of surgery and nonsurgical hemoperitoneum were excluded.

Results: Twenty three horses met inclusion criteria, resulting in an incidence of 0.5%. Patient characteristics approximated the colic population. Hemoperitoneum was significantly associated with intestinal resection and was recognized a mean of 1.0 +/- 0.7 days after surgery. Postoperative hemoperitoneum was associated with tachycardia, decreasing hematocrit, incisional drainage, and visual or ultrasonographic identification of bloody abdominal fluid. Primary treatments included intravenous fluid therapy (23/23), colloid support (16/23), blood transfusion (13/23) and antifibrinolytic agents (10/23). Short-term survival was 52.2%. Survival to discharge was associated with admission lactate and days of hospitalization.

Conclusion: Postoperative hemoperitoneum is a rare complication of colic surgery that should be considered when a patient is exhibiting abdominal discomfort and a declining hematocrit in the early postoperative period. Supportive care, blood transfusion and antifibrinolytic therapy may be useful, but were not associated with a better outcome in this study. Prognosis is guarded due to potential sequelae of septic peritonitis and adhesions formation.

FACTORS INFLUENCING SURVIVAL FOLLOWING SURGICAL TREATMENT OF ASCENDING COLON VOLVULUS IN THE THOROUBRRED MARE

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Introduction: Ascending colon volvulus is a strangulating disease requiring surgical treatment. The objectives of this study were to describe the clinical and clinicopathologic features of mares with ascending colon volvulus and determine factors contributing to survival.

Methods: Medical records of Thoroughbred mares undergoing surgical treatment for ascending colon volvulus between 1986 and
2011 were reviewed retrospectively. Logistic regression modeling was used to identify factors associated with survival.

**Results:** Nine hundred and forty mares undergoing 1093 surgeries met the selection criteria. Median duration of colic signs prior to admission was 2 hours. Median time from admission to anesthetic induction was 25 minutes. Median surgical time was 68 minutes. In most cases, the surgical treatment was simple correction of the colonic volvulus followed by replacement of the colon in its correct anatomic orientation. Overall survival rate was 88%. The final model containing risk factors significantly associated with survival included colic duration prior to admission, PCV at admission, anesthetic time, length of intra-anesthetic hypotension, heart rate 48 hours post-operatively, post-operative manure consistency, and days hospitalized.

**Conclusion:** The population of mares described in this report had a high rate of survival with ascending colon volvulus surgical disease. The improved survival rate is attributed in part to rapid referral and timely surgical intervention. Other variables significantly associated with survival in mares with ascending colon volvulus were related to disease severity and degree of colonic compromise.

**CHARACTERISTICS AND SURVIVAL OF EQUIDS ATTACKED BY DOGS: 11 CASES (2008–2013)**

**Mayer J, Fielding L**

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**Introduction:** Dog attacks have been associated with morbidity and mortality in humans, companion animals, small ruminants, and camelids. Dog attack trauma is unique due to the degree of contamination and damage to tissue that may not be evident at the skin surface. The purpose of this study is to describe the clinical features and outcomes of equids presenting for emergency veterinary care following dog attacks.

**Methods:** The medical records from Loomis Basin Equine Medical Center were searched for patients presenting for trauma due to dog attacks between 2008 and 2013. Signalment, clinical signs, bite location, severity of wounds, laboratory data, treatment, hospitalization length, complications, and outcome were recorded. Data are reported as median (range).

**Results:** Eleven equids fulfilled the inclusion criteria with a median age of 12 years (0.04 – 24). Six horses, two miniature donkeys, two ponies, and one miniature horse were included in the study with 8/11 animals (73%) surviving to discharge. Blood lactate concentration was 5.0 (3.0–14.7) mmol/L in six patients at admission. All non-surviving patients had a lactate concentration >6.0 mmol/L and a CK concentration >15,000 IU/L. Infection (n = 11), cardiac arrhythmias (n = 1), respiratory distress (n = 1), and seizures (n = 1) were reported complications following the attacks.

**Conclusion:** Equids presenting for emergency care following a dog attack should be carefully assessed and stabilized as the injuries can be severe and life-threatening. A larger study is needed to assess the prognostic value of venous lactate and creatine kinase concentration in these patients.

**HORSE SINGLE RADIAL IMMUNODIFFUSION ASSAY FOR QUANTIFICATION OF HORSE AND DONKEY IMMUNOGLOBULIN G**

**Norton P, Waghela S, Thompson J, Matthews N, Chaffin K**

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**Introduction:** Quantification of IgG is used routinely in foals to determine if adequate passive transfer has been achieved. Low levels of IgG have been associated with morbidity and mortality in neonatal foals. Donkey IgG has not previously been evaluated on horse SRID assays.

**Methods:** Serial dilutions of horse and donkey purified IgG powder were made. Dilutions of donkey and horse IgG, manufacturer controls, and the USDA reference serum were plated for 10 repetitions each. Ring diameters of diffusion were measured at 24 and 48 hours.

**Results:** Results of the study indicated that the SRID was not precise or accurate for the measurement of immunoglobulins of horses or donkeys. The manufacturer provided control serum and the USDA reference serum were inaccurate as well.

**Conclusion:** To the authors’ knowledge, no previous study has documented the accuracy or precision of the horse SRID assay for the evaluation of either horse or donkey IgG. Results indicate that the gold standard assay is neither accurate nor precise for the evaluation of horse or donkey IgG.
BACTERIOLOGICAL AND PATHOLOGICAL STUDIES ON CLOSTRIDIAL INFECTION AMONG SHEEP

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Introduction: *Clostridium perfringens* is known to cause enterotoxemia in sheep. This study was conducted to characterize the etiological agent and the pathological changes of this disease.

Methods: We used 600 sheep from 3 farms during 2 years. Intestinal contents and intestinal specimens from each sheep were collected. Gram-stained smears and cultures on blood agar of intestinal contents were carried out. Toxigenic typing for the isolated strains was done using dermonecrotic test. The intestinal tract, liver, spleen, lung, heart, brain, and kidney were fixed in paraffin blocks. Sections were prepared and stained with haematoxylin and eosin for histopathological examination.

Results: The examined sheep included lambs and adults with prevalence of infection of 45.9% and 38.8% and mortality of 30.6% and 20.9%, respectively. Clinical signs like nervousness, depression, and recumbent behavior were observed in all sheep. Moreover, watery diarrhea and dehydration were observed in lambs. Postmortem examination revealed petechial to ecchymotic haemorrhages beneath the epicardium, hydropericardium, and catarrhal gastroenteritis. Toxigenic typing revealed that 63.3%, 36.6%, and 0% of the lamb and 29.52%, 43.8%, and 26.66% of the adult were belonged to type B, C, and D, respectively. Histopathological examination showed marked abnormalities in most tissues.

Conclusion: *Clostridium perfringens* is considered one of the common pathogen isolated from enterotoxemic sheep.
CAUDAL VENA CAVA AND AORTIC DIAMETER RATIO (CVC/Ao) AS AN INDEX TO PREDICT FLUID VOLUME DEFICIT IN ANAESTHETIZED INJURED DOGS*

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Introduction: The objective of this study was to find the correlation between systolic pressure variation (SPV) and CVC/Ao and to establish whether this index can be used to predict fluid volume deficit in anaesthetized injured dogs.

Methods: Data were collected from 10 dogs presented with hypovolemic shock and hospitalized to surgically repair recent wounds. Anesthesia was induced and maintained with propofol only in normotensive patients. Mechanical ventilation was started. During measurement the peak inspiratory pressure of ventilation was constantly maintained at 8 cmH2O, whereas respiratory frequency was modiﬁed to maintain normocapnia.

CVC/Ao was measured by a transverse right lateral intercostal ultrasonographic view. If the SPV was ≥ 4 mm Hg one or more boluses of 6% hydroxyethyl starch solution at 2–5 ml kg−1 were administered IV over one minute. SPV and CVC/Ao were measured at the end of each bolus until normalization of the SPV (2–3 mm Hg).

Results: After anaesthesia induction hemodynamic values pre-fluid administration (FA): median heart rate 96 (75–145) bpm; median blood systolic pressure 98 (86–138) mmHg. CVC/Ao pre-FA 0.52 (0.23–0.79) vs post-FA 0.95 (0.77–1.08) (P = 0.002). Median time to obtain images was 60 (25–120) seconds. Correlation coefficient r between SPV and CVC/Ao −0.926 (P < 0.0001). Regression analysis with the total bolus doses as dependent variable and the difference in CVC/Ao difference between and after hemodynamic optimization as independent predictor was r² 0.70 (y = 2.5470 + 31.8996x) (P = 0.003).

Conclusion: Ultrasonographic CVC/Ao ratio assessment is a simple, quickly, non-invasive and feasible method to estimate volume in both anesthetized and awake hypovolemic dogs.

*Awarded best small animal oral presentation
shown in human studies to improve patient care. The POC Analyzer used (POCCA) (Stat Sensor Xpress CREA, NOVA Biomedical) utilized electrochemistry and does not rely on a colorimetric technique so is not affected by non-creatinine chromogens. Acute Kidney Injury (AKI) is a poorly defined term in veterinary medicine but studies have shown that a relative increase in creatinine from baseline impacts survival in hospitalized dogs.

Methods: Samples (n = 46) from dogs (n = 44) referred to the Medicine Department/ICU were included in the study if residual blood was available following sampling for diagnostic purposes. Residual blood of non-standard volume (0.15–1.0 mL) was placed in 1 mL capacity Lithium-Heparin blood tubes for analysis using the POCCA. Serum creatinine concentration was assayed at the clinical laboratory as a “gold standard” for comparison. POC samples were run in accordance with manufacturers’ instructions. All samples were run within 24 hours of collection. Pearson’s correlation coefficient and a Bland-Altman plot was calculated from the data.

Results: Pearson’s coefficient between the clinical laboratory (median: 62, range: 27–610 μmol/L) and POCCA (median: 91.5, range: 42–501 μmol/L) was 0.954 (P < 0.0001). Bland Altman difference plot revealed a positive bias by the POCCA (mean ±20.09, 95% limits of agreement: -53.30 to 93.46 μmol/L) compared to the clinical laboratory.

Conclusion: The POCCA showed good correlation with laboratory values for creatinine despite non-standard heparinisation, however reference ranges for the two methods are not interchangeable. Use of such a machine to detect AKI should be evaluated further.

EVALUATING AGREEMENT BETWEEN HEMATOCRIT ASSAYS IN CANINE PATIENTS WHEN PRESENTING TO PRIVATE VETERINARY HOSPITALS

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Introduction: Clinical decisions are influenced by hematocrit. Packed-cell volume via centrifugation, and hematocrit via optical, impedance, and conductivity methods are used interchangeably. The effect of hypoalbuminemia, which affects conductivity, has not been evaluated for level of agreement between assays in dogs.

Methods: Canine venous blood was collected from clinical cases and measured by centrifugation and conductivity, and either impedance or optical methods. Sub-analyses were performed on dogs with albumin <3.0 g/dL. An Olympus AU640 measured albumin concentrations. Bland-Altman analysis determined bias (+/-SD) and level-of-agreement (LOA) between methods.

Results: Samples were collected from 37 dogs, including 9 with hypoalbuminemia. In the 28 normo-albuminemic dogs conductivity, impedance and optical methods underestimated centrifugation by 0.99 +/- 2.38 (LOA: -3.7–5.6), 0.78 +/- 4.3 (LOA: -7.7–9.2), and 2.30 +/- 4.1 (LOA: -5.7–10.3), respectively. With hypoalbuminemia, conductivity and optical methods underestimated centrifugation by 1.77 +/- 5.0 (LOA: -8.1–11.7), and 2.88 +/- 1.83 (LOA: -0.7–6.5), respectively. The mean albumin for the normal group (3.64 g/dL +/-0.98) was significantly higher than the mean for the hypoalbuminemia group (2.64 +/-0.90; t28 = 6.13, P < 0.001).

Discussion: Each mean bias suggests clinically insignificant results, but wide LOA show large discrepancies for individual samples. Hypoalbuminemia appears to impact the differences in hematocrit, although larger samples sizes are needed to reduce random variation and allow statistical analysis of differences between groups. More marked hypoalbuminemia may be required to affect conductivity methods to the point of clinical significance.

Conclusion: Wide LOA show large discrepancies in all comparisons, but larger samples sizes with more marked hypoalbuminemia are required to assess statistical and clinical significance.

A RANDOMISED CONTROLLED CLINICAL TRIAL OF AN INTRAVENOUS LIPID EMULSION FOR THE TREATMENT OF PERMETHRIN TOXICOSIS IN CATS

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Introduction: This study aimed to: 1) Develop and validate a clinical staging system to standardise the assessment of clinical signs in cats with permethrin toxicity, 2) Assess for any clinical benefit to the use of intravenous lipid emulsion (ILE) for permethrin toxicity in cats by comparing the progression of clinical signs in cats with permethrin toxicity before and after treatment with ILE compared to a saline control.

Methods: 1) A clinical staging system was designed assigning a letter from A-F based on the expected progression of clinical signs in cats with permethrin toxicity. The system was validated for intra-observer and inter-observer variability. 2) Cats were randomised to receive 15 mL/kg over 60 minutes (0.25 mL/kg/min) of either 20% ILE or intravenous saline (control). A clinical stage was recorded at set time points before and after the randomised treatment was administered.

Results: 1) The clinical staging system showed excellent repeatability (P = 1.0) and reliability (P = 1.0). 2) There was a significant difference (P < 0.001) in the distribution of clinical stages over time between groups with cats receiving a 20% ILE (n = 20) having lower clinical stages earlier than cats receiving saline (n = 14). There was no significant difference in the signalment, body weight or supportive treatment between the groups.

Conclusion: ILE is a useful adjunctive therapy in the treatment of permethrin toxicity in cats. A clinical staging system applied to cats with permethrin toxicity was repeatable and reliable making it a useful tool to standardise the clinical assessment of cats in this study and for future studies.

EVALUATION OF INITIAL LACTATE AND BASE EXCESS (BE) VALUES AS PREDICTORS OF GASTRIC NECROSIS IN DOGS WITH GASTRIC DILATION VOLVULUS (GDV). A RETROSPECTIVE STUDY

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**Abstracts**

**Introduction/Objectives:** GDV is associated with hypoperfusion and hypoxia. Lac-tate is produced under anaerobic conditions and overall organ damage (e.g. gastric necrosis). The base excess as a represen-tant of metabolic part of acid-base state reflects increase in lactate as well as impaired acid elimination due to other causes. The main objective of our study was to compare initial lactate concentration and base excess with incidence of gastric necrosis in dogs with GDV.

**Methods:** In 58 dogs arterial or venous blood samples were done till 30 minutes after admission and processed immediately. The initial lactate level and base excess were compared with incidence of gastric necrosis and statistically processed by Wilcoxon paired test with significance at $P < 0.05$.

**Results:** In 15 from 58 dogs gastric necrosis was found. Only 5 from these survived. From 43 dogs without gastric necrosis, 42 survived. The initial lactate level in dogs without necrosis (mean 4.09 ± 2.29) was significantly lower ($P < 0.01$) than in dogs with gastric necrosis (mean 7.35 ± 4.02mmol/l). BE was significantly lower ($P < 0.01$) in dogs without necrosis (−2.9 ± 3.24) than in dogs with necrosis (−6.81 ± 4 mmol/l) too.

**Discussion:** Gastric necrosis is usually associated with serious shock (hypoperfusion) and systemic inflammatory response syndrome, which lead to increased lactate level and base deficits. Metabolic acidosis could be worsen by acute renal failure and acute liver failure caused by hypoperfusion and direct chemical damage by stomach content during gastric wall necrosis.

**Conclusions:** BE and lactate are useful as predictors of gastric necrosis in dogs with GDV.

**MORTALITY RATES OF GASTRIC DILATION-VOLVULUS IN PRIVATE EMERGENCY PRACTICE IN THE UNITED KINGDOM**

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**Introduction:** The purpose of this study was to examine the population characteristics and mortality rates of dogs with clinical signs of bloat that were presented to after-hours emergency clinics in the United Kingdom (UK).

**Methods:** Design – Retrospective case series (2001–2012)
Setting – Private after-hours emergency clinics in the UK Animals – 497 dogs with clinical signs of bloat
Procedures – Records were analysed for age, sex, neuter status, weight and breed. Mortality rates (MR) were calculated for the time of initial treatment, at surgery and 2 days post-operatively. MR was calculated for those patients with gastric necrosis.

**Results:** Dogs ≥ 8 years old accounted for 73.6% of all patients. German Shepherds (17.3%) and Weimaraners (12.3%) were the two most frequently affected breeds. Neutered females were significantly more likely to present for bloat than dogs of other sex or neuter status ($P = 0.0001$). 357 (71.8%) of all dogs presented for bloat had a confirmed GDV. Females with GDV had significantly higher mortality rates ($P = 0.0015$). The MR associated with gastric necrosis was 55.6%. For those dogs whose owners elected to proceed with treatment and surgery, the survival rate to discharge was 82%.

**Conclusions:** This is the first large study of the incidence and outcome of GDV in the UK. Of all dogs presenting with clinical signs of bloat in this study, over 70% of them had a confirmed gastric dilation with volvulus. Surgical outcomes from private practice were comparable to previously published results from university and referral practices.

**A COMPARISON OF TRADITIONAL AND QUANTITATIVE ANALYSIS OF ACID-BASE AND ELECTROLYTE IMBALANCES IN CRITICALLY ILL HYPOALBUMINEMIC DOGS**

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**Introduction:** The purpose of this study was to compare the traditional (Henderson Hasselbach-HH) and quantitative (strong ion model) approaches for evaluation of the acid-base balance in different diseases groups of hypoalbuminemic dogs (albumin < 2.5 g/dL).

**Methods:** Prospective study of sequentially enrolled dogs admitted to a VTH-ICU. Blood samples from 105 patients and 135 clinically healthy dogs (control group) were collected on admission to determine: TP, Alb, BUN, glucose, PCV, Na+, Cl−, CO2, pH, pCO2, tCO2, HCO3−, AGalb1, AGalb-phos1, BE, SID2, Adeg1, and SIG2. Patients were divided into different groups according to the etiology of the hypoalbuminemia: hepatopathy (n = 8), SIRS/sepsis (n = 36), gastrointestinal (n = 15), renal (n = 25) and endocrine disease (n = 21). All parameters among different disease groups were statistically analyzed for comparison. Alpha level was set at 0.05.

**Results:** Using the HH approach for evaluation of the acid-base status, 89.5% of the studied patients revealed abnormalities. However, using the quantitative approach, acid-base imbalances were detected in all patients. According to the HH approach most frequent imbalances were metabolic acidosis (58.1%) and respiratory alkalosis (17.2%). When using the quantitative method the strong ion gap acidity (96.2%), non-volatile ion buffer metabolic alkalosis (39%), and respiratory alkalosis (17.1%) were the most frequent observed acid-base imbalances. In addition, significant differences were observed between diseases groups.

**Conclusion:** The agreement between the traditional and quantitative methods was poor, and many imbalances were only detected using the quantitative approach. Moreover these imbalances were different according to the characteristics of the disease in each patient.
AUTOMATED PLATELET PARAMETERS ANALYSIS (ADVIA 2120) IN HEALTY AND SIRS DOGS: A RETROSPECTIVE EVALUATION

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Introduction: Platelet activation may play an important role in the pathogenesis of Systemic Inflammatory Response Syndrome (SIRS). ADVIA 2120, a flow-cytometry-based Automated Hematology Systems, provides different platelet parameters (PPs). The clinical significance of PPs in ICU dogs has not been extensively evaluated.

Methods: Dogs admitted with clinical signs of SIRS (T < 38°C or >39°C; HR>120/min; RR>20/min, WBC count>16000 or <6000 cells/µl), and CBC performed on ADVIA 2120 (Siemens, USA) upon admission, were retrospectively selected. Only samples collected with a standardized method and analyzed within 4 hours were included. ADVIA automated PPs analyzed were: Platelet count (PLT, 10³ cells/µl), Mean Platelet Volume (MPV, fl.), Platelet Volume Distribution Width (PDW,%), Mean Platelet Component (MPC, g/dl), Platelet Component Distribution Width (PCDW, g/dl), Mean Platelet Mass (MPM, pg), Platelet Mass Distribution Width (PMDW, pg), number of Large Platelets (volumes greater than 20 fl.; L-PLT, 10³ cells/µl) and Platelet Clumps (PLT-clumps). PPs were also determined in a control group of healthy blood donor dogs. Time elapsed between collection and analysis was recorded.

Results: PPs were available in 38 SIRS and 40 healthy dogs. SIRS dogs presented significantly higher PLT, MPV, PDW, MPC, PCDW and significantly lower MPM compared to controls. SIRS dogs presented also a significantly higher number of L-PLT and PLT-clumps. Among SIRS dogs no statistical differences were detected between survivors (n = 30) and non-survivors (n = 8) except for PLT-clumps number (P < 0.05).

Conclusion: SIRS dogs presented relevant alterations of PPs suggesting large platelets release from the bone marrow. Further studies are required to better clarify pre-analytical variability, diagnostic and prognostic significance of PPs in ICU dogs.

USE OF QUANTITATIVE PCR (QPCR) TO DETECT VIRAL CAUSES OF GASTROENTERITIS IN DOGS ADMITTED TO EMERGENCY VETERINARY CLINICS IN ENGLAND

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Introduction: Canine gastroenteritis is a common presentation to emergency veterinary clinics. A viral cause is rarely confirmed and expected incidence is usually unknown. A preliminary study was performed to investigate the presence and significance of enteric viral infections in dogs admitted to emergency clinics in England. qPCR enables detection of a range of viruses from a single stool sample, and was selected as the most sensitive testing method.

Methods: Stool samples were collected from 61 dogs admitted to emergency clinics in 3 geographically distinct areas with owner consent. The age, breed, gender, presenting complaint and presence of gastrointestinal clinical signs lasting >24hrs was recorded for each case. Control samples were collected from 48 healthy dogs. Samples were screened using qPCR for canine parvovirus (CPV), canine enteric coronavirus and canine norovirus.

Results: Of the emergency clinic in-patient dogs, 56% had diarrhoea lasting >24hrs prior to admission. This was assessed to be primary gastrointestinal disease in 39% of all cases. Haemorrhagic gastroenteritis accounted for 16% of all admitted cases. Enteric viruses were identified in 8.2% of clinical cases admitted to emergency clinics. Prevalence of enteric viruses in the control population was negligible.

Conclusion: This preliminary study has demonstrated that signs of gastrointestinal disease are very common in patients admitted to emergency clinics in England, although enteric viruses are only detected in a small proportion. CPV was the most frequently identified enteric virus, in agreement with previous studies. qPCR was proven to be a reliable and efficient method of detecting a range of viruses from canine stool samples.

CLINICAL EXPERIENCE WITH BACT-ALERT FA AND FN BLOOD CULTURES IN CRITICAL PATIENTS: PRELIMINARY STUDY

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Introduction: Blood culture is an essential test for diagnosis of bacteremia and sepsis. In this study, positivity rates and time to detection (TTD) of growth using Bact Alert FA and FN blood cultures were investigated.

Methods: Blood cultures were performed in patients fulfilling standard SIRS criteria and with suspected sepsis. Blood was harvested from the jugular vein using an aseptic technique. Aerobic and anaerobic BacT/Alert (Biomerieux, Durham,NC,USA) culture bottles were used. The blood was introduced in the culture bottles maintaining the ratio 1 part blood + 9 parts culture media. Each pair of inoculated bottles was incubated and TTD (colour change) was recorded. Positive samples were cultured for organism identification and susceptibility testing.

Results: Blood cultures from 22 patients (21 dogs, 1 cat) were performed, running parallel anaerobic and aerobic. Overall, 7 cultures (30%) were positive, all of them aerobic. In all cases, only one microorganism was isolated. TTD was <24h in all cases except for S.epidermitis (72h); susceptibility results were obtained 24–48h after TTD.

Discussion: Standard culture techniques take a minimum of 3 to 5 days to yield results. In our study, <24 hours were enough to detect a positive culture. Short TTDs are determinant in septic patients, where early replacement of empirical antibiotic therapy is critical for survival. Overall blood culture positivity was 30% for aerobic bacteria which is a quite high rate compared with other methods.

Conclusion: BacT/Alert blood cultures are easy to perform and offer rapid and satisfactory results and TTDs, allowing early implementation of culture/susceptibility based antimicrobial therapy.

HYPOALBUMINEMIA IN DOGS – OUTCOME AND THERAPY, A RETROSPECTIVE ANALYSIS

Doerfelt R¹², Tickert M¹, Auer U¹
¹¹° Veterinary Emergency and Critical Care Society 2013, doi: 10.1111/vec.12088
Hypoalbuminemia is a recognized deviation in critically ill humans and animals and associated with poor prognosis. Aim of this retrospective study was to evaluate outcome of hypoalbuminemic dogs and influence of therapy on survival.

Methods: Medical records of 207 dogs with plasma albumin concentration below 20 g/L were revisited. Statistical analysis was performed by t-test and one-way ANOVA for normally distributed and chi square test and fisher’s exact test for non-normally distributed data.

Results: The 207 dogs aged 7.61 ± 3.79 years weighing 21.42 ± 14.09 kg were presented 11.03 ± 32.58 days after onset of symptoms and hospitalized 6.34 ± 4.14 days. Underlying disease were suffering C14.09 3.79 years weighing 21.42 4.14 days. Underlying disease were suffering C14.09 3.79 years weighing 21.42 4.14 days. Underlying disease were suffering.

Conclusion: Hypoalbuminemia was associated with low survival rate. Critically ill dogs should be screened for hypoalbuminemia. Enteral feeding may improve outcome in affected dogs.

SYSTEMIC INFLAMMATORY ACTIVITY IS FREQUENTLY ABSENT IN DOGS WITH ACUTE INFLAMMATORY CNS DISEASE

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Introduction: Acute inflammatory diseases of the central nervous system (CNS) (meningitis and/or encephalitis) are potentially life-threatening conditions calling for a rapid and accurate diagnosis. Serum C-reactive protein (CRP) has been recommended as a useful marker in dogs with septic meningitis-arteritis. However, the association between inflammatory CNS diseases and markers of systemic inflammation has not been systematically investigated. The aim of this study was to investigate associations and deviations of the systemic inflammatory response in dogs with acute inflammatory CNS disease.

Methods: A retrospective study of 24 dogs with clinical signs of inflammatory CNS disease and a diagnosis established by a CSF white blood cell (WBC) count ≥ 5×10^3/µL. Body temperature, serum CRP and blood WBC were measured as markers of systemic inflammation and associations were statistically investigated by unpaired t-test and linear regression in GraphPad Prism version 4.

Results: 14/23 (61%) presented with normal body temperature (≥39°C) (range 37.8–40.2°C). 9/16 (56%) had normal serum CRP concentrations (range 0–340 mg/L). Normal blood WBC was found in 9/14 (64%) (range 6.73–31.46×10^3/µL). There was a significant exponential correlation between body temperature and serum CRP (r = 0.76; P = 0.0026).

Conclusion: Absence of abnormal values of systemic inflammatory markers were frequent among dogs with acute inflammatory CNS disease, and meningitis/encephalitis cannot be ruled out based on their absence. The significant correlation between serum CRP and body temperature (simultaneous absence of abnormal values) suggests that acute CNS inflammation can be present without a systemic inflammatory response. Diagnosis therefore seems to rely on local inflammatory markers in the CSF.

INFLUENCE OF TIDAL VOLUME VARIATIONS ON END EXPIRATORY LUNG VOLUME MEASUREMENT BY AUTOMATIC NITROGEN WASHIN/WASHOUT TECHNIQUE

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1 Service SIAMLI, VetAgro Sup, Campus Vétérinaire de Lyon, Marcy l’Etoile, France
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5 CERMEP, Imagerie Du Vivant, Hôpital Neurologique, Lyon, France

Introduction: Some ventilators can measure automatically the functional residual capacity by the nitrogen washin/washout technique (FRCwi.wo) and help PEEP setting in an individual manner. The goal of this study is to test the validity of automatic FRCwi.wo measurement at different VT levels.

Methods: Approved by our Institutional Review Board for the care of animal subjects. ARDS was induced with saline lung lavage in 14 pigs. Pigs were submitted to a decremental PEEP trial and randomized into 3 experimental groups: 1. PEEP titrated to achieve the best dynamic compliance, 2. PEEP titrated to achieve the highest FRC, 3. PEEP set using a PEEP-FiO2 table. After PEEP setting, VT was changed. FRC was measured by the ventilator (FRCwi.wo) and on CT scans (FRC-CT) in each following experimental conditions: after lung lavage, during the PEEP trial, at optimal PEEP and during the VT trial.

Results: FRCwi.wo was highly correlated with FRC-CT. Bland-Altman plot revealed a bias of −240 ml and limits of agreement of -714 and 231 ml. Correlation between FRCwi.wo and FRC-CT was highest during the PEEP trial and lowest during the VT trial. Correlation between FRCwi.wo and FRC-CT was lowest when VT = 4 and 5 ml/kg.

Conclusion: FRCwi.wo is well correlated with the CT scan, with an under estimation around 200 ml. However, the reliability of this technique decreases for VT below 150 ml. Measurement of lung volume based on FRCwi.wo is an easy way to help ventilator setting in an individual manner.

* Awarded best poster presentation

EVALUATION OF ALBUMIN, LACTATE, BASE EXCESS (BE), HEMATOCRIT AND WHITE BLOOD CELL AS PREDICTORS OF SURVIVAL IN DOGS WITH GDV A RETROSPECTIVE STUDY

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Abstracts

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2Center for Clinical Veterinary Medicine, Clinic for Small Animal Medicine, Munich, Germany

Introduction: Hypoalbuminemia is a recognized deviation in critically ill humans and animals and associated with poor prognosis. Aim of this retrospective study was to evaluate outcome of hypoalbuminemic dogs and influence of therapy on survival.

Methods: Medical records of 207 dogs with plasma albumin concentration below 20 g/L were revisited. Statistical analysis was performed by t-test and one-way ANOVA for normally distributed and chi square test and fisher’s exact test for non-normally distributed data.

Results: The 207 dogs aged 7.61 ± 3.79 years weighing 21.42 ± 14.09 kg were presented 11.03 ± 32.58 days after onset of symptoms and hospitalized 6.34 ± 4.14 days. Underlying disease were suffering C14.09 3.79 years weighing 21.42 4.14 days. Underlying disease were suffering C14.09 3.79 years weighing 21.42 4.14 days. Underlying disease were suffering.

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* Awarded best poster presentation

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THE USE OF FLOW CYTOMETRY TO EVALUATE DEA1+ ANTIGEN EXPRESSION AND LIFETIME OF TRANSFUSED RED BLOOD CELLS IN DOGS: A PRELIMINARY STUDY

Reynaud A1, Canard B2, Félix N3, Boisviveau C1, Barthélémy A1, Fournel C4, Ghys-Thollot I1

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2Dianov, Limonest, France
3Department of Clinics, Lisbon Faculty Veterinary Medicine-Technical University, Lisbon, Portugal
4Clinical Pathology Unit, VetAgro Sup, Marcy l’Étoile, France

Introduction: The GDV is resulting in shock, SIRS and MODS, which affect albumin, lactate, BE, HT, WBC and platelet counts. The main objective of our study was to evaluate initial and postoperative levels of these parameters as predictors of survival in dogs with GDV.

Methods: In 58 surgically treated dogs with GDV blood collection was done for biochemical, hematological examination and blood gas analysis. The initial and postoperative albumin and lactate levels, BE, HT and WBC counts were compared between survivors and non-survivors by Mann-Whitney U test with significance at p < 0.05.

Results: Albumin concentration was similar in survivors (means initial/postoperative 27.5/21.1 g/l) than in non-survivors (25.8/18.6 g/l) in both samplings.) In both samplings, lactate levels were significantly lower in surviving (4.1/1.9 mmol/l) than in non-surviving (8.5/4.0 mmol/l) dogs. Similarly, BE was significantly lower in survivors (~3.1/~2.9 mmol/l) than in non-survivors (~7.2/~6.9 mmol/l). In hematologic examination, haematocrit (0.4/0.4 1/l both survivors and non-survivors) and WBC counts (11.6/7.6 and 13.6/7.8 G/l) were not significantly different in both samplings.

Discussion: Impaired perfusion led to increased lactate production and metabolic acidosis. Higher lactate level and lower BE reflect worse metabolic state in non-survivors. Non-significant difference in albumin, HT and WBC between survivors and non-survivors may have origin in short period between onset of disease and samplings.

Conclusions: Lactate level and BE can be used as predictors of survival dogs with GDV. A larger study is required to confirm this finding.

C-REACTIVE PROTEIN IN DOGS AFFECTED BY ANTICOAGULANT RODENTICIDE INTOXICATION: A RETROSPECTIVE CASE-CONTROL STUDY

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THE USE OF FLOW CYTOMETRY TO EVALUATE DEA1+ ANTIGEN EXPRESSION AND LIFETIME OF TRANSFUSED RED BLOOD CELLS IN DOGS: A PRELIMINARY STUDY

Reynaud A1, Canard B2, Félix N3, Boisviveau C1, Barthélémy A1, Fournel C4, Ghys-Thollot I1

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4Clinical Pathology Unit, VetAgro Sup, Marcy l’Étoile, France

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Discussion: Impaired perfusion led to increased lactate production and metabolic acidosis. Higher lactate level and lower BE reflect worse metabolic state in non-survivors. Non-significant difference in albumin, HT and WBC between survivors and non-survivors may have origin in short period between onset of disease and samplings.

Conclusions: Lactate level and BE can be used as predictors of survival dogs with GDV. A larger study is required to confirm this finding.

C-REACTIVE PROTEIN IN DOGS AFFECTED BY ANTICOAGULANT RODENTICIDE INTOXICATION: A RETROSPECTIVE CASE-CONTROL STUDY

Senzolo M1,2, Gentilini P2, Zoia A3, Ceron J3, Caldin M1

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3University of Murcia, Murcia, Spain.
Introduction: The aim of this study is to measure C-reactive protein (CRP) concentration in anticoagulant rodenticide (AR) toxicity in dogs.

Methods: Retrospective case control study including 102 dogs (group 0) diagnosed with AR poisoning and 2 control populations of 102 healthy dogs (group 1) and 102 sick dogs (group 2). Differences in CRP concentrations between the 3 groups were analyzed. CRP was also studied as a prognostic factor evaluating survival at 30-days post-diagnosis in group 0.

Results: Prevalence of AR intoxication was 0.28% with younger, entire female dogs more affected. In group 0, at presentation 6 dogs had no evidence of bleeding, 43 had external bleeding, 35 had internal bleeding, and 18 had external and internal bleeding. CRP concentration was significantly (P < 0.001) higher in group 0 (median, 4.77 mg/dl; range, 0.01 to 19.85 mg/dl) versus group 1 (median, 0.02 mg/dl; range, 0.01 to 0.08 mg/dl) and group 2 (median, 0.37 mg/dl; range, 0.01 to 41.23 mg/dl; reference range, 0.01 to 0.22 mg/dl). Within group 0 only 7 dogs had CRP within the reference range. No difference in mortality was present between groups 0 and 2 (P = 0.12). In group 0 CRP concentration was higher in non survivors vs survivors (P = 0.04).

Discussion: The inflammatory process associated with an hemorrhage is probably responsible for the activation of the acute phase response and the higher CRP concentration in these dogs compared to healthy and sick animals presented for any other diseases.

Conclusion: CRP may be a useful diagnostic and prognostic marker in dogs with AR intoxication. Its prognostic value would warrant further study.

METHEMOGLOBIN AND CARBOXYHEMOGLOBIN IN DOGS AND CATS A RETROSPECTIVE ANALYSIS IN AN INTERNAL MEDICINE HOSPITAL POPULATION

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Introduction: Co-oximetry is increasingly being used in diagnosing intoxications in animals. In humans, high Carboxyhaemoglobin (COHb) levels are associated with worsened outcome. The aim of this retrospective study was to evaluate Methaemoglobin (MetHb) and COHb concentrations in dogs and cats, its association with outcome and to identify diseases associated with increased concentrations.

Methods: Records of 225 dogs and cats including co-oximetry were reviewed for underlying disease and outcome. Statistical analysis was performed with Chi square and Mann-Whitney test.

Results: Three hundred co-oximetry results from 137 dogs and 88 cats aged median (m) 7 (IQR 2.5; 11) years, weighing m 7.5 (IQR 4; 24.5) Kg, were analyzed. One hundred and ninety-six animals were discharged and 29 animals were not. Animals were suffering from cardiovascular (n = 38), respiratory (n = 36), neurologic (n = 24), metabolic (n = 38), gastrointestinal (n = 85) and other (n = 79) diseases. COHb ranged form 0.3 to 5.8% (m 2.9%), MetHb from 0 to 4.2% (m 0.7%). Animals with COHb concentrations over or equal 3.5% were more likely to die (19.4%) compared to animals with COHb concentration < 3.5% (9.96%; P = 0.0322). An association between diseases and MetHb or COHb concentrations was not identified. Animals with a hematocrit < 20% had higher MetHb concentrations (m 1.5; IQR 0.8; 1.7%) compared to animals with a hematocrit > 20% (m 0.6 IQR 0.3; 0.9%; P < 0.0001).

Conclusion: In this study, no diagnostic relevance of COHb and MetHb in dogs and cats was evident. Prospective studies are necessary to determine a potential diagnostic and prognostic value of co-oximetry in the intensive care setting.
HIGH-THROUGHPUT LEUKOCYTE EXPRESSION ANALYSIS OF INNATE IMMUNE MEDIATORS IN EQUINE SYSTEMIC INFLAMMATION

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3 Department of Clinical Sciences, Faculty of Veterinary and Agricultural Sciences, Swedish University of Agricultural Sciences, Uppsala, Sweden

Introduction: Today it is recognized that the Systemic Inflammatory Response Syndrome (SIRS) is a complex and dynamic condition orchestrated by a large number of pro- and anti-inflammatory mediators. Characterization of SIRS therefore requires the timed and simultaneous investigation of the regulation of involved pro- and anti-inflammatory mediators. The objective of this study was thus to use a high-throughput RT-qPCR platform for simultaneous mapping of the regulation of a wide range of inflammatory mediators in blood leukocytes from horses with induced systemic inflammation.

Methods: Serial blood samples (n = 12) drawn over 10 hours from one adult experimental horse with lipopolysaccharide-induced (1 ug/kg bwt) inflammation were analysed in a high-throughput RT-qPCR (2304 reaction Fluidigm) system for the expression of innate equine pro- and anti-inflammatory mediators including IL-1beta, IL-4, IL-6, IL-8, IL-10, IL-15, IL-17, IL-18, IL-1ra, TNF-alpha, TLR-4, L-selectin, CD11, TGF-beta, HMGB-1, GM-CSF, and MMIF. Regulation was described as fold changes for each mediator, calculated using the baseline blood sample as a reference.

Results: Systemic inflammation was confirmed by the presence of clinical and paraclinical changes consistent with SIRS (temperature < 36.7 or > 38.6 degrees Celsius, heart rate > 50 bpm, respiratory rate > 25 breaths/min or PaCO2 < 32 mmHg, WBC < 5.000 or > 14.500 cells/mm3). Between 3- and 136-fold changes of up- or down regulation was observed in all samples in the mentioned inflammatory mediators except from TGF-beta, GM-CSF, and HMGB-1.

Conclusion: This study illustrates extensive regulation of leukocyte pro- and anti-inflammatory mediators in equine systemic inflammation and demonstrates a method for the simultaneous investigation of the regulation of these effector molecules. Future studies using high-throughput RT-qPCR may permit a thorough characterization of the complex innate immune processes in SIRS.

* Awarded best equine oral presentation

DETMIDINE AND GUT MOTILITY IN HORSES: CLINICAL DATA

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Introduction: Use of detomidine, potent alpha 2-agonist equine sedative and analgesic is still controversial in colic horses, especially regarding to gut motility or re-administration.

Methods: As preliminary study to learn more about induced ileus and re-administration effects, 10 healthy adult horses were administered nasogastric charcoal (1g/kg) prior to one of 4 detomidine sedation protocols, alternatively given to all of them: S1 = no sedation, S2 = 0.02 mg/kg IV, S3 = 0.04 mg/kg sublingual, S4 = S2+S3 45 min later. HR, sedation and head position (0 to 2), gut motility (auscultation, 0 to 3) were recorded every 5 then 15 mins during 210 mins. Time for dark feces (hours) and side effects were controlled. Statistics used t-test and Wilcoxon signed rank test, P < 0.05 significant.

Results: All protocols induced bradycardia, without statistical difference, except during gel onset of action (20 first mins-p = 0.005). S2, S3 and S4 provided similar profound sedation. S4 induced significant longer sedation (200 mins vs 110 mins/S2-p = 0.01, 140 mins/S3-p = 0.001) and more sweating (p = 0.01). Gut sounds decreased in all protocols, but never disappeared. Gut motility recovered after t80, back to normal after t120/S2 and t200/S3,S4. Time for dark feces was not statistically different (21–23h).

Conclusion: Detomidine did not induce ileus, even with re-administration. Sublingual top-up 45 mins after IV injection allowed prolong sedation and muscle relaxation safely for almost 100 mins. Use of detomidine and re-administrations can be considered safe, regarding gut motility, and its use in colic horses should be considered in other studies.