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Respiratory physiological perturbations after acute smoke-induced lung injury and during extracorporeal membrane oxygenation support in sheep

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Numerous successful therapies developed for human medicine involve animal experimentation. Animal studies that are focused solely on translational potential, may not sufficiently document unexpected outcomes. Such studies often involve hastily developed methods, thereby leading to considerable amounts of archived data that could be used to advance veterinary science or to refine the base animal model. For example, sheep are increasingly being used as models of intensive care and therefore, any experimental data arising from such models must be interpreted and published.

In this study, the hypothesis is that there is little information describing physiological data from multifaceted sheep models of intensive care and the author aimed to analyse such data to provide biological information that is currently not available for sheep that received extracorporeal life support (ECLS) following acute smoke-induced lung injury. Data from 19 mechanically ventilated adult ewes that were undergoing intensive care in a study that evaluated a form of ECLS (treatment) for acute lung injury were used to collate clinical observations. Eight sheep were injured by acute smoke inhalation prior to treatment (injured/treated), while another eight were not injured but treated (uninjured/treated). Two sheep were injured but not treated (injured/untreated), while one received room air instead of smoke as the injury and was not treated (placebo/untreated). The data were then analysed for eleven physiological categories and compared between the two treated groups. Compared with the baseline, treatment contributed to and exacerbated the deterioration of pulmonary pathology by reducing lung compliance and the arterial oxygen partial pressure to fractional inspired oxygen (PaO2/FiO2) ratio. The oxygen extraction index changes mirrored those of the PaO2/FiO2 ratio. Decreasing coronary perfusion pressure predicted the severity of cardiopulmonary injury.

These novel observations could help in understanding similar pathology such as that which occurs in animal victims of smoke inhalation from house or bush fires, aspiration pneumonia secondary to tick paralysis and in the management of the severe coronavirus disease 2019 (COVID-19) in humans.
Polyneuropathy, ocular abnormalities and neuronal vacuolation in a Rottweiler

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Polyneuropathy, ocular abnormalities and neuronal vacuolation (POANV) is a rare autosomal recessive genetic disorder that has been reported in Rottweilers, Black Russian terriers, and Alaskan huskies.

We present the case of a 14-week-old Rottweiler who was referred to the Emergency and Critical Care department of a specialist hospital in New Zealand. The patient had a five-day history of progressive expiratory stridor, lethargy, exercise intolerance, and a recent episode of acute onset retching, vomiting, dyspnoea, and subsequent cyanosis.

Physical examination revealed proprioceptive ataxia, miotic pupils, subjective microphthalmia, ventral strabismus, and no menace response. A second acute respiratory obstructive event, in which laryngeal dysfunction was suspected, occurred in hospital requiring intubation and mechanical ventilation. The puppy was euthanised due to grave prognosis.

Post-mortem examination revealed gross and histologic characteristics typical of POANV. A genetic test was performed which confirmed the presence of an abnormality in the RAB3GAP1 gene that is the typical cause of this disease.

POANV is a reported but not commonly encountered disease in veterinary medicine. Breeding guidelines in Australia and New Zealand dictate that the sire and dam of known affected breeds must be tested prior to mating, however this is not a legal requirement. While the disease is suspected to be present in Australia and New Zealand, this is the first formal case report of an affected patient in these countries. Further research into the presence and genetic basis of this disease in other breeds is currently being conducted.

**References**


Cricothyrotomy vs tracheostomy for emergency front-of-neck airway access in dogs

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An upper airway obstruction not responsive to conventional oxygen supplementation or airway management is termed a ‘cannot intubate, cannot oxygenate’ event. Surgical airway access, known as emergency front-of-neck airway access (eFONA) is indicated to provide oxygen as soon as possible. Until now, the only broadly recommended eFONA technique in veterinary medicine is the tracheostomy (TT).

The primary objectives of this study were to: (1) compare the procedure time between a novel cricothyrotomy (CTT) technique and an abbreviated TT technique in canine cadavers and (2) assess the success rate of each procedure.

A prospective, cross-over, block randomized trial was performed, where veterinary students completed CTT and TT procedures on cadaver dogs. A general estimating equation approach was used to model the procedure time. Eight students were recruited and performed 32 procedures on 16 dogs.

The procedure time was significantly lower for the cricothyrotomy than the tracheostomy technique (p < 0.001). The mean time taken to complete the cricothyrotomy technique was 46.2 seconds (95% CI: 33.7 to 58.7), which was less than half the mean time of the tracheostomy; 95.7 seconds (95% CI: 71.9 to 119.5). The success rate for both procedures was 100%.

Cricothyrotomy warrants consideration as the primary option for emergency front-of-neck access for dogs.

Figure 1: Pairs plot showing procedure times for each student, by attempt
Prevalence and characteristics of veterinary dog attacks in Melbourne

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In a 1974 USA study, dog attacks were responsible for 10% of the admitted patient population. However more current prevalence and characteristics of dog attack cases in Australia remains largely unknown.

This study aimed to investigate the prevalence, cost to owners and factors associated with risk of attack and survival for dog and cat patients attacked by dogs presenting to veterinary emergency practice.

Data from dog attack victims presenting to four Melbourne veterinary emergency centres throughout 2018 was retrospectively evaluated. Victim factors (species, gender, age, weight, sex, neuter status) were compared to the general population seen at participating centres. Circumstances surrounding attacks (location, attacker known/unknown), treatment costs and survival outcomes were recorded. Chi-square and generalised linear modelling were used to identify victim factors associated with dog attacks and factors influencing likelihood of survival, with p < 0.05 considered significant.

Dog attacks compromised 2.4% (n = 460) of all presenting dog and cat cases. Mortality rate was 13% and median cost to owners $378 (n = 457, range: $0 - $14,706). Cross-breeds (p < 0.001) were at decreased risk of presenting following an attack within the final model for dog victims. Weight of cat cases was higher than cat controls (median 4.5 vs 3.8kg), p = 0.01. Cats had higher injury severity score than dogs (median: 4.0 vs 2.0), p < 0.001.

While the prevalence of dog attack victims in Melbourne veterinary emergency centres was low, they comprise many cases with significant mortality, welfare concerns and costs to owners.

**References**

Severe metabolic acidosis due to acetazolamide toxicity in a dog

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Severe metabolic acidosis due to acetazolamide toxicity in a dog

This case report describes the clinical signs and case management of a 1-year-old neutered male siberian husky that accidentally ingested 63.5 mg kg⁻¹ of the oral carbonic anhydrase inhibitor acetazolamide tablets. The patient presented with severe dyspnoea and later developed hyperchloremic metabolic acidosis and hypokalaemia that persisted for 7 days. Clinical and biochemical changes resolved with adequate intravenous and subsequent oral supplementation of sodium bicarbonate and potassium. The acid base and electrolyte derangements resolved with treatment and the dog made a complete recovery within 9 days of presentation.

To the author’s knowledge this is the first case that reports on the overdose of oral carbonic anhydrase inhibitors in a dog with further evidence of recovery with adequate supplementation and supportive care.
Diagnostic findings of *Pseudonaja textilis* envenomation South-East Queensland

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Eastern Brown snake (*Pseudonaja textilis*) envenomation is a common cause for presentation to veterinary hospitals in South-East Queensland. The clinical utility of tests used to diagnose envenomation in dogs and cats is unknown.

Medical records of two veterinary referral and emergency hospitals were retrospectively reviewed for dogs and cats with *P. textilis* envenomation between January 2010 – March 2020 that had snake venom detection kit (SVDK), activated partial thromboplastin time (aPTT) and creatine kinase (CK) performed. Clinical signs, approximate time to presentation, and results of SVDK, aPTT and CK at presentation were recorded.

Thirty-nine cats (n = 7) and dogs (n = 32) were included. Collapse (38%), tetraparesis (25%) and ataxia (25%) the predominant presenting clinical signs. Five patients had known contact with an unidentified snake.

SVDK was the most likely to diagnose *P. textilis* envenomation at presentation (Sensitivity (Se) = 82%, Specificity (Sp) = 100%, Positive Predictive Value (PPV) = 100%) diagnostic test presentation, followed by aPTT (Se = 82%, Sp = 54%, PPV = 63%) and CK (Se = 58%, Sp = 77%, PPV = 66%). Frequency of false negative (17%, 3/17) and false positive (0%, 0/22) SVDK results were in contrast to existing human literature (false negative 8.4%, false positive 36%)1. Six urine, one whole blood and one plasma sample was used for SVDK testing; the remaining 31 sample types were not documented.

No single test is reliable in definitively diagnosing *P. textilis* envenomation. A combination of clinical signs, history and diagnostic test results can guide clinical decision making.

**References**

Feline blood storage lesion and transfusion through micro-aggregate filters

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During storage erythrocytes undergo changes termed the “storage lesion”. The aim of this study was to compare haematological variables and erythrocyte osmotic fragility (OF) in fresh blood and blood stored for 35 days after passage through an 18 μm microaggregate in-line filter.

Nine cats were recruited. 10 ml kg⁻¹ of blood was collected using an open system primed with citrate phosphate dextrose adenine. A simulated transfusion using a syringe driver and filter was performed with half the blood on the day of donation and repeated with the remaining blood after 35 days storage. Wilcoxon signed ranks test was used to compare differences in haematological parameters, percent haemolysis and OF on the day of donation pre-filter passage (D0-) versus day of donation post-filter (D0+) or day 35 storage pre- (D35-) and post-filter (D35+).

There were no statistically significant differences for D0- versus D0+. There were statistically significant increases in percentage haemolysis, RDW % and mean OF and decreases in PCV, erythrocyte count, haemoglobin and haematocrit for D0- versus D35-. The same was found for D0- versus D35+ with the addition of a significant decrease in mean cell haemoglobin (MCH). For D35- versus D35+ only MCH significantly increased. At day 35, 6/9 units had haemolysis percentages that exceeded the human blood banking guideline of 1%. This increased to 8/9 of stored units post-filter passage.

Increased MCH was the only change attributable to the effect of filter passage on stored blood and may represent artefact secondary to haemolysis. All other changes are explained by storage lesion.

References


Pet insurance mitigates pre-surgery euthanasia of dogs with gastric dilatation-volvulus

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Pre-surgical euthanasia is the predominant mode of death in dogs with gastric dilatation-volvulus (GDV).1,2 Our study aimed to determine whether pet insurance, a typical financial instrument to limit the burden of veterinary medical costs, reduces the risk of euthanasia for GDV prior to surgery.

This case-control study included non-referred dogs with GDV and known insurance status that were euthanised prior to surgery (cases) or were treated surgically (controls). Data were retrospectively extracted from a pet insurer’s claim records (insured animals) or from electronic medical records of participating hospitals (non-insured animals) in VIC or NSW. We collected information on hospital characteristics (e.g., size of deposit), animal demographics (e.g., age category in relation to breed’s median life span), insurance status, pre-surgical lactate concentration, comorbidities, and outcome (e.g., pre-surgical euthanasia).

Data from 260 dogs with known insurance status and seen at 24 emergency clinics were analysed. 106 dogs (41%) did not survive to hospital discharge and 82 (77%) of these dogs died before surgery, all through euthanasia. The presurgical euthanasia rate was 10% in insured dogs and 37% in non-insured dogs (p < 0.001). When adjusted for the effect of age, size of deposit, comorbidities and lactate, the absence of insurance increased the odds of pre-surgical euthanasia by 7.42 (p = 0.002). Most surgically treated patients (86%) survived to hospital discharge.

In conclusion, insurance significantly mitigated pre-surgical euthanasia of dogs with GDV. Interventions to lessen economic duress due to veterinary costs have the potential to substantially reduce preventable deaths of dogs with GDV.

References

Acute manifestation of rare pleuroperitoneal hernia after an altitude flight

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Introduction: To describe a case of documented acute onset of respiratory distress in a puppy with right-sided pleuroperitoneal hernia following a 2-hour flight.

Case summary: An 8-week-old female entire cavalier King Charlies developed acute onset of respiratory distress immediately after a 2-hour flight. Thoracic radiographs and full body computer tomography (CT) revealed a right-sided pleuroperitoneal hernia with most of the alimentary tract and the right kidney incarcerated in the hernia sac. Most of the small intestines were markedly dilated with gas causing marked lungs atelectasis. The puppy was managed successfully with surgery and was discharged approximately 24 hours after surgery. No signs of pulmonary hypertension or hypoplasia was noted on thoracic radiographs 2 weeks post-operatively.

Novel information: This report describes the first reported CT findings, diagnosis and successful surgical treatment of a rare right-sided pleuroperitoneal hernia with marked gaseous intestinal dilation in a puppy. It has been speculated that the change in air pressure in high altitude has caused marked gaseous distension of the intestinal tract and subsequently led to acute onset of respiratory distress.

References

Vasopressor use in critically-ill dogs

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There is little known about the current choices made by veterinarians for dogs with vasodilatory shock and if this has changed over time. This study investigated the frequency of vasopressor choices in dogs treated by an Emergency and Critical Care service.

This retrospective, observational study included dogs admitted to The Animal Hospital at Murdoch University’s ICU that had a vasopressor drug administered from 2010 to 2018. Data collected from medical records included: drug type, frequency, patient outcome, complications and identity of prescribing clinician. Fisher’s exact test was used to test associations between vasopressor type, and time period and outcomes.

62 dogs were included in the study. 23 (37%) dogs received norepinephrine, 23 (37%) received dopamine and 16 (26%) received both vasopressors during hospitalisation. 16 (26%) dogs died that received dopamine, 17 (27%) that received norepinephrine and 15 (24%) that received both vasopressors (P = 0.18). Ventricular arrhythmias were recorded in 6/23 (26%) that received dopamine, 4/23 (17%) that received norepinephrine and 2/16 (13%) that received both vasopressors (P = 0.55). Vasopressor usage increased over time, with 10 cases from 2010-2013 and 52 cases from 2014-2018. Significantly more dogs received noradrenaline than dopamine between 2014-2018, compared to dogs between 2010-2013 (P = 0.002).

Dopamine and norepinephrine are used at similar frequencies over the time period of the study however use of noradrenaline increased after 2014, in line with publication of the human Surviving Sepsis Campaign Guidelines. There was no association identified between drug type, and mortality or report of arrhythmias.
Fatal red-bellied black snake envenomation: clinical and pathological findings

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Most cases of red-bellied black snake (RBBS) envenomation in dogs respond favourably to treatment comprising of tiger-brown snake antivenom (TBAV), intravenous fluid therapy (IVFT), analgesia and, if indicated, mechanical ventilation and/or blood transfusion.1

This report describes the clinical and pathological findings in a dog fatally envenomed by a RBBS, despite receiving intensive veterinary care. An eight-year old Staffordshire Bull Terrier dog presented for a 1-day history of vomiting, diarrhoea, haematochezia and weakness. Further investigation revealed evidence of rhabdomyolysis, haemolytic, regenerative anaemia with spherocytosis, azotaemia, bilirubinaemia, pigmenturia, oliguria and a mild coagulopathy. TBAV, analgesia, IVFT, a mannitol infusion and multiple transfusions of packed red blood cells were administered. A gradual improvement in clinical status was achieved, however, 64 hours post-presentation pigmenturia worsened and hypoxaemia, dyspnoea and anuria developed. Serum biochemistry at this time showed worsening azotaemia, and cardiorespiratory arrest occurred shortly afterwards. Post-mortem examination and histopathology revealed diffuse jaundice, bicavitary effusion, renal tubular necrosis and haemosiderosis, hepatic submassive necrosis with cholestasis, adrenal cortical necrosis, pulmonary oedema and skeletal muscle injury. Pre- and post-TBAV serum and urine RBBS venom antigen concentrations were determined, confirming the diagnosis of RBBS envenomation.

This is the second report of acute kidney injury secondary to RBBS envenomation in the dog despite appropriate treatment,2 and the first with evidence of hepatic and adrenal cortical necrosis. Delayed presentation post-envenomation may be a contributing factor to the poor outcome in this case, and repeated TBAV administration and/or early institution of renal replacement therapy may be indicated in future cases.

References

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