Expected and unexpected enteric viruses in the UK dog population; a comprehensive survey by qPCR

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A number of novel viruses have been associated with canine gastroenteritis in recent years, including astroviruses, noroviruses, vesiviruses and kobuviruses. Viral gastroenteritis in dogs worldwide is acknowledged as being predominantly caused by canine parvovirus (CPV) and canine enteric coronavirus (CECoV), with the contribution of recently identified viruses associated with gastroenteritis uncertain. Norovirus and astrovirus strains that infect man cause significant levels of disease in humans and yet canine strains of these viruses have not previously been identified in any dogs in the UK. This study sought to investigate the prevalence and potential significance of both commonly identified viruses, and novel enteric viruses in the UK dog population.

Sixty-nine dogs with severe gastroenteritis were enrolled in the study with an additional 180 dogs recruited as controls.

With owner consent, stool samples were collected and nucleic acid was extracted. Quantitative PCR targeting a range of canine viruses associated with gastroenteritis was used to screen all stool samples. Confirmation of all positive samples was achieved by sequencing.

CPV was identified most frequently in the study population as expected; 14.5% dogs with gastroenteritis were positive. Sequencing showed 30% of CPV strains were type-2a and 70% were type-2b. These results confirm that type-2c is still not identifiable in the UK. CECov was also detected in two cases with gastroenteritis; a similar prevalence level to previous reported. As for viruses for which commercial tests are not available, a single dog with gastroenteritis dog was positive for kobuvirus, and surprisingly, canine astrovirus (CaAstV) was detected in four dogs with gastroenteritis. Two positive CaAstV cases were puppies under 10 weeks old, also co-infected with CPV. The other two cases were in adult dogs with no other viral aetiology identified. Molecular characterisation showed only 80% amino acid identity between CaAstV strains, identifying significant genetic variation.

In summary, this study presents an overview of the prevalence and diversity of canine enteric viruses in the UK in 2012-2014. Importantly, this suggests that CaAstV may be a significant and hitherto unrecognized cause of canine gastroenteritis, in addition to the numerous other viruses identified. It is recommended that veterinarians are aware of these emerging viruses for which there are no commercial tests; isolation of suspicious cases is always advised.

Can we diagnose extra-hepatic biliary obstruction (EHBO) in cats with cholangitis without exploratory laparotomy?

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Cholangitis is one of the most common histological diagnoses in feline liver disease and may occur with or without concurrent EHBO. The presence of EHBO informs treatment, but identifying EHBO without exploratory laparotomy is challenging. Ultrasonography commonly shows biliary dilation, but is not diagnostic in some cases, and the assumption that ultrasound is 100% sensitive for EHBO may lead to cases being misdiagnosed. The aim of this study was to identify distinctive changes on histology, serum biochemistry and haematology which may indicate the presence of obstructive disease in addition to ultrasonography.

The records of three veterinary hospitals were searched

from 2002–2012 for cats with a histopathological diagnosis of cholangitis/cholangiohepatitis. Cats were included in the cholangitis associated with EHBO group (C+EHBO group) if biliary obstruction was confirmed at laparotomy/necropsy. Cats with surgical confirmation of biliary patency or where there was no suspicion of EHBO on ultrasonography were included in the cholangitis group (C group). Serum biochemistry, haematology, coagulation profile and imaging findings were recorded, and histopathology slides were reviewed by a pathologist. Data from the two groups were compared using Fisher's exact test or the Mann-Whitney U test.

Forty cats (C group) and seventeen cats (C+EHBO group) were identified. 9/40 cats in C group had surgical confirmation of biliary patency (CS). Median ALKP, AST, GGT and total bilirubin (TBil) were elevated in both groups but only TBil differed significantly (C+EHBO group: 87.1 $\mu\text{mol/L}$, C group: 19.7 $\mu\text{mol/L}$, $p=0.016$). There was no difference in haematology or coagulation profile between groups. Fewer cats in the C+EHBO group had sonographical abnormalities of the liver parenchyma (C+EHBO group: 25% [4/16], C group: 72% [29/40 including 8/9 CS], $p=0.002$) but cats in this group demonstrated more biliary abnormalities, particularly dilation(>5mm) of the common bile duct (CBD) (C+EHBO group: 94% [15/16], C group 22.5% [9/40 including 4/9 CS], $p<0.001$). Histopathological features in both groups were similar, but there was increased prevalence of neutrophilic bile ductule infiltration in the C+EHBO group (C+EHBO group: 35% [6/16], C group: 5% [2/40 including 1/9 CS], $p=0.029$).

In conclusion, differentiating cats with EHBO remains

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clinically challenging. This study suggests that severely elevated TBil, ultrasonographic identification of a dilated CBD and histopathological demonstration of neutrophilic bile

ductile infiltration support further investigation into the patency of the biliary tract. No findings were 100% sensitive for EHBO, including ultrasonography.

A retrospective study examining the relationship between biliary sludge and gall bladder mucocoeles

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Gall bladder mucocoele (GBM) is a potentially life-threatening condition whose aetiology has yet to be established. Some authors propose that biliary sludge progresses to GBM, but most consider sludge a benign finding. Some endocrinopathies, including hyperadrenocorticism, are suspected to increase the risk of developing a mucocoele. Whilst several studies have been carried out looking at the disease in the US dog population, to date no studies have been undertaken in the UK.

The aims of this study were to identify breeds predisposed to mucocoele in the UK and to examine the link between gall bladder mucocoeles and biliary sludge.

METHODS

A retrospective study was carried out on dogs with a diagnosis of GBM or biliary sludge at the Queen's Veterinary School Hospital between 2007 and 2014. Cases were included on the

basis of ultrasound examination (GBM and sludge) or post-mortem (GBM only). Non-parametric statistics were used to compare weight and sex of dogs.

RESULTS

Fifteen dogs with GBM and fifteen dogs with sludge were identified. Median weight of dogs with GBM was 7.7 kg, compared with 12.6 kg for dogs with sludge, but this difference was not statistically significant when the two groups were compared using the Mann-Whitney U test ($U=38$, Critical Value = 36). Neutered male dogs were significantly overrepresented in the sludge group compared to the GBM group ($p=0.03$). 7 breeds (Border Terrier, Miniature Schnauzer, Jack Russell Terrier, Cavalier King Charles Spaniel, West Highland White Terrier, Yorkshire Terrier and Cocker Spaniel) were represented in both the GBM and sludge groups.

A single case in a WHWT was identified where progression from sludge to mucocoele was documented ultrasonographically over a period of 10 months; the dog received a course of prednisolone during the intervening period.

CLINICAL SIGNIFICANCE

GBM occurs in similar breeds in the UK to the USA. In this study, GBM was as common as biliary sludge. In one dog, there appeared to be progression from sludge to GBM, which is the first reported case. Consideration should be given to treating biliary sludge in at-risk breeds to try to prevent progression to GBM.

Investigation of trends between thromboelastography profiles, systemic inflammatory response syndrome and outcome in cases of chronic hepatopathy in dogs

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Overt clinical coagulopathies are uncommon in canine liver disease. Chronic hepatopathy has been associated with both hyper and hypocoagulable states. Thromboelastography (TEG) is a global assessment of coagulation. Some of the coagulation changes are thought to be associated with inflammation. Previous research has associated hypercoagulability, identified as increased G-values, with hepatic encephalopathy. Hepatic encephalopathy in congenital

portosystemic shunts has also been associated with the presence of systemic inflammatory response syndrome. Previous studies into identification of prognostic indicators in canine liver disease, using TEG and systemic inflammatory response syndrome (SIRS) scores, have focussed on cases of congenital portosystemic shunt. There has been little investigation into the relationship between SIRS and coagulation in chronic hepatopathy cases. We hypothesised that there may be a relationship between SIRS score and TEG G-value, and that these parameters may have value as predictors of survival to discharge or 2 months.

The TEG database was searched for dogs diagnosed with chronic hepatopathy. The medical record was reviewed to assign SIRS scores. TEGs were obtained using kaolin activation and standard operating procedures. Outcome was categorised as 0 if patients were euthanised at the time of diagnosis, 1 if they were discharged from the hospital with palliative care and 2 if they were still alive at 2 months following diagnosis. None of the dogs showed clinical signs of coagulopathy at presentation.

Calculated mean G-values varied with outcome (Outcome 0, $n=5$, mean G-value = 10,000d/sc; Outcome 1, $n=7$, mean