SYMPOSIUM CAPSULES

International Feline Retrovirus Research Symposium & International Society for Companion Animal Infectious Diseases
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The International Feline Retrovirus Research Symposium (IFRRS) & International Society for Companion Animal Infectious Diseases (ISCAID) are dedicated to promoting research about, controlling the spread of, and improving the care of pets with infectious diseases.

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Spike gene mutations in feline coronavirus and their correlation to feline infectious peritonitis

Feline coronaviruses (FCoV) occur as 2 pathotypes: the low-virulence or nonvirulent feline enteric coronavirus (FECV) and the frequently lethal feline infectious peritonitis virus (FIPV). Although the relationship between the 2 pathotypes is debated, recently, spike gene mutations were found to correlate with the mutated form of FCoV (FIPV) that leads to the clinical presentation of feline infectious peritonitis (FIP). The development and validation of a real-time PCR typing test to identify separate mutations is described. Samples from 203 FCoV-positive European cats (healthy or with clinical FIP) were examined to determine sensitivity and specificity. Of 187 positive samples on the FCoV RealPCR Test, 13 did not pass quality control, and 17 had virus levels below PCR detection levels. Of the remaining 157 samples, 156 were biotyped with 99.4% accuracy. One FIP-characterized sample was typed FECV; all healthy cats were typed FECV, yielding a diagnostic specificity of 100%. Samples from cats in the United States were examined to verify that spike gene mutations were not unique to European cats with FIP. Additional testing of tissue biopsies and abdominal fluid from cats with high clinical suspicion of FIP provided further data establishing the diagnostic accuracy of this test. These studies demonstrate that the FCoV RealPCR Test with FIPV biotyping has good potential for identifying FIP, a diagnostically challenging disease entity.—Leutenegger CM, Sanders N, Robertson J, et al

Feline foamy virus infection of cats: Time course of infection and implications for disease

Feline foamy virus (FFV) is a retrovirus from the genus Spumavirus. FFV has not been associated with clinical disease. This study aimed to verify the apathogenicity of FFV to determine its applicability as a vaccine vector. Cats (n = 4/group) were vaccinated with either wild-type FFV or a chimeric FFV replicative virus containing the feline immunodeficiency virus vif gene instead of the FFV bet gene. The vif and bet genes antagonize enzyme restriction factors expressed by retrovirus host species via different mechanisms. After inoculation with the retrovirus, serial analysis of blood, saliva, urine, and tissues was performed to determine viral presence and kinetics, immune response, tissue tropism, and histopathology. Virus was identified in wild-type FFV-vaccinated cats as early as 21 days post-inoculation and throughout the study (176 days). No FFV-inoculated cats developed clinical disease or clinicopathological abnormalities. Negative-control cats remained uninfected as did one cat housed with an FFV-infected cat. This preliminary study demonstrated
apathogenicity of FFV in cats despite persistent infection, and substantiated the potential utility of FFV in vaccine vector development.—Ledesma-Feliciano C, Troyer R, Musselman E, et al

Lymphoid tissue reservoirs in asymptomatic FIV-infected cats
It has been demonstrated that CD4+T-cell numbers in the blood of chronically infected cats with FIV decline progressively over time, despite peripheral viral latency in these cells. This study investigated this duality by analyzing FIV viral replication in lymph nodal tissue, and comparing it to blood. Both popliteal lymph nodes (LN) were surgically removed from 4 chronically FIV-infected and 2 uninfected cats. T- and B-lymphocytes, as well as monocyte/macrophage populations, were isolated from LN and blood samples from each cat, and enumerated using flow cytometry. CD4+T cells, CD21+B cells, and CD11b macrophages obtained from LNs were evaluated for viral replication by real-time PCR, and that data compared to blood-derived leukocytes. Results showed that FIV-infected cats had a significantly lower number of CD4+T cells in blood and LNs compared to uninfected cats. In addition, active viral transcription was present in LNs from FIV-infected cats, while viral transcription in peripheral blood leukocytes was either undetectable, or present in low amounts. These findings suggest that although latency apparently occurs in peripheral blood mononuclear cells in the asymptomatic phase of FIV infection, viral transcription remains active in the LNs, likely contributing to the decline of CD4+T cells seen in this disease process.—Eckstrand C, Smith A, Hillman C, Murphy B

Seroprevalence and risk factors for feline leukemia virus, feline immunodeficiency virus, and heartworm infection in North American cats
Feline retroviral and heartworm (HW) infections are common but easily preventable diseases. Preventive care (eg, topical HW prophylaxis, vaccination) and measures (eg, keeping cats indoors and away from infected animals) help to significantly reduce disease prevalence in pets; unfortunately, owner compliance remains inadequate. This study sought to determine seroprevalence and risk factors for feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), and feline HW infection. A total of 62,301 cats in veterinary clinics and shelters in the United States and Canada were tested using point-of-care ELISA tests for FeLV antigen, FIV antibody, and HW antigen. Seroprevalence was found to be 3.6% for FIV, 3.1% for FeLV, and 0.4% for HW. Primary risk factors for all 3 diseases included adult age, outdoor access, and male sex, with the most important risk factor the presence of clinical disease; for example, seroprevalence rates were highest among shelter cats with abscesses, respiratory disease, and oral disease. Co-infection with FeLV and FIV was a risk factor for heartworm disease.—Burling A, Levy JK, Scott M, et al

Pathogens involved in the development of the canine infectious respiratory disease complex in 5 Canadian small animal clinics
A study was conducted in 5 Canadian small animal clinics in 2013 and 2014 investigating respiratory pathogens in canine infectious respiratory disease complex (CIRDC). Criteria for exclusion included pre-existing of a chronic cough, antibiotic use prior to study inclusion, any concomitant cough-producing condition, or administration of a CIRDC vaccine within 1 month prior. Swabs from 64 dogs were collected from areas with the most predominant clinical signs, and a PCR canine respiratory disease profile was run. *Mycoplasma cynos* was found most frequently (81%), followed by canine parainfluenza virus (42%), *Bordetella bronchiseptica* (11%), and canine respiratory coronavirus (9.4%). One case each of canine herpesvirus and distemper virus were also found. Co-infection with at least 2 pathogens was identified in 42%. Six patients did not test positive for the pathogens on the panel of the dogs.—Joffe D, Lelewski R, Weese JS et al

Adherence of methicillin-resistant *Staphylococcus pseudintermedius* to commonly used suture materials in veterinary surgery
Methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) is becoming a leading cause of surgical-site infections (SSIs) in dogs. As suture is most commonly used to close surgery sites, and different types of suture carry different risks, a study was initiated to determine adherence of MRSP to 5 different suture materials: Monocryl (ethicon.com), Vicryl (ethicon.com), barbed polydioxanone, polydioxanone, and triclosan-coated (TC) polydioxanone. Segments of each suture type were rinsed to remove non-adherent bacteria and incubated. Adherent bacteria were dislodged via sonication, plated on blood agar, and incubated for 24 hours. Colony-forming units between each suture type were analyzed. Results indicated that TC polydioxanone had the least MRSP adherence. There was significantly less adherence with Monocryl versus Vicryl. Barbed suture did not show increased MRSP adherence in spite of its greater surface area. The authors advise that TC polydioxanone should be considered in high-risk surgeries as part of procedural strategy to decrease SSIs.—Morrison S, Singh A, Rousseau J, Weese JS

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**Angiostrongylus vasorum**—An emerging threat for dogs in North America?

Dogs affected with *Angiostrongylus vasorum* present with severe respiratory disease, coagulopathy, and/or a wide range of clinical signs. This potentially fatal disease is challenging to diagnose. Adult nematodes live in the right heart and pulmonary arteries of dogs and wild carnivores, with gastropods as intermediate hosts. Areas of high endemicity exist in Europe, but autochthonous cases have been identified in Newfoundland and Labrador, Canada. Lung lesions and first-stage larvae have been identified in a fox in West Virginia, United States. Diagnosis in dogs currently relies on larval detection in fecal samples via larval migration techniques. A sandwich-ELISA for detection of circulating antigen and an ELISA for specific antibody detection were developed and tested on 25,000 European serum samples. PCR assays were used to detect DNA in tracheal swabs, fecal, or blood samples. A rapid in-clinic assay for the serologic detection of antigen was also examined. Serologic methods were superior to Baermann tests or PCR assays (fecal, blood, or sputum). The in-clinic assay is likely to prove useful for rapid results in cases demonstrating clinical disease. Serologic methods are valuable to detect the spread of *A vasorum* to new geographic areas, allowing for screening and anthelmintic intervention.—*Schnyder M*

**Detection of Aspergillus-specific antibodies for diagnosis of feline upper respiratory tract aspergillosis**

Feline upper respiratory tract aspergillosis (URTA) is a clinical disease entity with poor prognosis. The detection of fungal antigen galactomannan in serum has poor diagnostic sensitivity. This study aimed to determine if commercial aspergillin derived from mycelia of 3 *Aspergillus* spp could be used to detect serum antibodies against cryptic *Aspergillus* spp. It also investigated the diagnostic value of using agar-gel double immunodiffusion (AGID) assay and indirect IgG ELISA for detection of *Aspergillus*-specific antibodies. Sera from cats with URTA (*n* = 21), other upper respiratory tract diseases (*n* = 25), and negative controls (*n* = 84) were analyzed. Brachycephalic cat breeds were over-represented in the URTA group. Four cryptic *Aspergillus* spp were represented in the URTA group (*A felis, A thermomutatus, A lentulus, and A udagawae*) as were *A fumigatus* and *A flavus*; antibodies were detected by the assays in these cats. AGID was positive in 43% of URTA cats and negative in all others. IgG ELISA was positive in 90% of URTA cats and negative in 96% of cats with other respiratory diseases and 100% of control cats. Based on this study, IgG ELISA has high sensitivity and specificity for diagnosis of URTA. This study also confirmed that feline URTA affects immunocompetent cats.—*Barrs VR, Ujvari B, Dhand NK, et al*

**Potential association of Cystoisospora ohioensis infection with systemic allergic reactions in adult dogs**

An anecdotal association was recognized between allergic reactions and coccidia infection in adult dogs at 2 service-dog breeding and training centers in the western United States. Allergic reactions at these centers occurred at a rate of 25% in adult dogs. The reactions included angioedema, and/or hives, often followed by vomiting and/or diarrhea. Most of the dogs, whether or not they were showing gastrointestinal signs, were found to be shedding large numbers of coccidia, a subset of which was isolated as *Cystoisospora ohioensis*. After leaving the facility as puppies to be fostered, dogs typically returned to the facilities at 14–17 months of age for training. Most of the allergic reactions occurred soon after the dogs’ return to the facilities. At 1 facility, a prospective study has shown low incidence of coccidia shedding at the time of readmission. The authors suggest further study is indicated, and propose considering hypersensitivity to coccidia from exposure as puppies and temporary immunocompromise secondary to stress of relocation as potential factors in these cases.—*Van De Coevering P, Williams J, Gonzales K, et al*

**Evaluation of the impact of biofilm production by Staphylococcus pseudintermedius on antimicrobial susceptibility in vitro**

Methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) is a rapidly emerging commensal and opportunistic pathogen in dogs and a growing cause of postoperative surgical site infections (SSIs). Its ability to produce a biofilm may allow it to elude the host’s immune system and increase its antimicrobial resistance. Antimicrobial susceptibility testing is normally performed on planktonic (ie, free-floating) bacteria. The present study evaluated the effect of biofilm-associated bacteria on conventional in vitro antimicrobial sensitivities. Minimum inhibitory concentrations (MICs) for planktonic vs biofilm-embedded MRSP were determined using standard technique for 4 commonly used antimicrobials. Results showed that MICs were significantly higher in biofilm-embedded bacteria for amikacin, cefazolin, enrofloxacin, and gentamicin. The authors concluded that standard MIC determinations may not be appropriate for infections involving bacteria such as MRSP that form biofilms. Potential treatments for biofilm-associated SSIs should be investigated.—*Walker M, Singh A, Rousseau J, Weese JS*  ■ *cb*