

Clinical features, allergic, functional and microbial characterization of cats with airway disease

Priv.-Doz. Dr. Bianka Schulz
Clinic of Small Animal Medicine
Centre for Clinical Veterinary Medicine, Faculty of Veterinary Medicine, LMU Munich

Coinvestigators

Prof. Dr. Katrin Hartmann	Clinic of Small Animal Medicine, LMU Munich
Prof. Dr. Ralf Müller	Clinic of Small Animal Medicine, LMU Munich
Dr. Georg Wolf	Institute of Infectious Diseases and Zoonoses at the Department of Veterinary Sciences, LMU Munich
Prof. Dr. Jan Suchodolski	GI Lab, Texas A&M University, USA

Summary

Feline upper airway disease represents a common problem in small animal practice. Clinical signs can be acute or chronic. Feline upper respiratory disease (FURTD) is caused by various viral and bacterial pathogens, most commonly causing acute rhinitis, conjunctivitis, stomatitis, fever, and lethargy. Chronic nasal disease with discharge, epistaxis and nasal obstruction is most commonly caused by neoplasia and inflammatory chronic rhinitis of unknown origin.

Feline bronchial disease (FBD) is a chronic inflammatory condition affecting the lower airways in cats. Mainly two different types of FBD are commonly present in cats: feline asthma (FA), which is characterized by a predominant eosinophilic airway inflammation, airway hyperreactivity, mucosal edema and airway obstruction, and feline chronic bronchitis (CB), defined as a sterile neutrophilic inflammation of the lower airways accompanied by mucosal edema and mucus hypersecretion. The etiology of both conditions is unknown, but environmental allergens are thought to play a role in FA. While a clinical and functional phenotype of FA can be induced experimentally in research cats using sensitization with allergens, CB so far has only been described as a naturally acquired disease with an unknown etiology. Clinical signs associated with FBD are cough, respiratory sounds, and episodes of dyspnoea.

Research Objectives

Research in FURTD has included studies on pathogen involvement, evaluation of diagnostic methods and comparison of locations for sampling. In the last years our research has focused primarily on nasal disease, investigating microbial communities and factors influencing these in cats with nasal neoplasia, FURTD, and healthy cats. Furthermore, we evaluated culture-based bacterial communities in nasal samples comparing different sample locations in cats with different types of nasal disease.

Research investigating feline bronchial disease (FBD) has primarily focused on experimentally induced and less commonly naturally acquired FA. Prospective investigations in cats with CB are rare so far.

One focus of our research was to investigate clinical and diagnostic differences between FA and CB and to evaluate response to therapy in both groups. Another study focuses on differences regarding lung function test parameters using barometric whole body plethysmography (BWBT) in cats with both conditions. BWBT is also currently used in a study correlating clinical parameters and owner perception with functional parameters. Microbiome analysis has been performed on bronchoalveolar-lavage in cats with FA and CB and differences in microbial communities are currently analysed. To investigate a potential allergic origin of FA and CB, allergen-specific IgE and intradermal testing has been performed and is still investigated in ongoing studies in cats with FBD. An in-vitro-study was performed to evaluate different cleaning methods for feline inhalations chambers used for treatment in FBD. In addition, a prospective study currently

evaluates bacterial contamination of feline inhalation chambers in relation to cleaning habits of cat owners.

Key Findings

Studies investigating microbial communities in cats with FURTD and neoplasia in comparison to healthy cats using 16S rRNA sequencing revealed that the feline nose is inhabited by much more variable and diverse microbial communities than previously known based on culture-based investigations. In addition, it could be shown that microbial communities and species richness varied significantly between healthy and diseased cats, underlying the role of bacteria as co-factors in chronic nasal disease.

Our research in FBD was able to show that both inflammatory conditions cannot be distinguished by clinical, radiographic or laboratory features. Lung function testing using BWBT indicated, that both types of FBD are commonly associated with bronchial hyperreactivity and bronchoconstriction. Evaluation of therapeutic response using owner questionnaires revealed that cats with CB more commonly receive antibiotic treatment and need more systemic steroids for control of clinical signs. Data of microbiome analysis and allergen-specific IgE are currently analysed.

Selected Publications

1. Grotheer M, Hirschberger J, Hartmann K, Castelletti N, Schulz B. Comparison of signalment, clinical, laboratory and radiographic parameters in cats with feline asthma and chronic bronchitis. *J Feline Med Surg* 2020; 22(7): 649-55. doi: 10.1177/1098612X19872428.
2. Klenk FK, DeSimoi V, Wolf G, Schulz B. Evaluation of different cleaning methods for feline inhalation chambers after bacterial contamination. *J Feline Med and Surg* 2020: 1098612X20913352. doi: 10.1177/1098612X20913352.
3. Schulz B, Grotheer M. Feline Bronchialerkrankungen – was tun, wenn die Katze hustet? *Kleintiermedizin* 2019; 1: 18-23.
4. Grotheer M, Schulz B. Feline asthma and chronic bronchitis - an overview of diagnostics and therapy. *Tierarztl Prax Ausg K Kleintiere Heimtiere* 2019; 47(3): 175-187.
5. Bergmann M, Ballin A, Schulz B, Dörfelt R, Hartmann K. Treatment of acute viral feline upper respiratory tract infections. *Tierarztl Prax* 2019; 47: 98-109.
6. Dorn ES, Tress B, Suchodolski JS, Nisar T, Ravindran P, Weber K, Hartmann K, Schulz BS. Bacterial microbiome in the nose of healthy cats and in cats with nasal disease. *PLoS One* 2017; 12: e0180299.
7. Schulz C, Hartmann K, Mueller RS, Helps C, Schulz BS. Sampling sites for detection of feline herpesvirus-1, feline calicivirus and *Chlamydia felis* in cats with feline upper respiratory tract disease. *J Feline Med Surg* 2015; 17: 1012-9.
8. Schulz BS, Raufeisen K, Weber K, Laberke S, Hartmann K. Comparison of the prevalence of *Mycoplasma* species in dogs with and without respiratory disease. *Berl Munch Tierarztl Wochenschr* 2015; 128: 304-9.

Funding

Funder	Project title	Start date	End date
VetResearch	Evaluation der Kontamination von Inhalationskammern	2018	2018
Zentrum für klinische Tiermedizin	Finanzierung der Lungenfunktionsmessung bei der Katze	2017	2017