LMU LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

Tierärztliche Fakultät

5-year research activities –PI reporting form

Reporting period July 1st, 2015 – June 30th, 2020

Research Title

Vaccination in small animal medicine - studies on antibody testing, protection of the dog and cat population, and owner´s compliance

Research Theme:	Infection and Immunity, Clinical Research
Research Institute/Chair:	Medizinische Kleintierklinik/ Chair: Prof. Dr. Katrin Hartmann
PIs:	Prof. Dr. Katrin Hartmann, Dr. Michèle Bergmann
Coinvestigators:	Simone Eschle, Anna Weidinger, Dr. Monika Freisl, Dr. Anne Gehrig, Anna Rieger, Dr. Yury Zablotski
Cooperations within the Faculty:	Prof. Dr. Reinhard Straubinger, Institut für Infektionsmedizin und Zoonosen an der Tierärztlichen Fakultät der LMU München, Deutschland
External Cooperations:	Prof. Dr. Uwe Truyen, Institut für Tierhygiene und Öffentliches Veterinärwesen der Universität Leipzig, Deutschland

Summary for Lay Reader

Recently, recommendations for routine vaccination protocols of cats and dogs have been the subject of discussions and important questions are being raised about vaccination protocols, such as whether vaccinations are performed too often and whether vaccines are efficacious and safe. Our research in this area focuses on vaccination controversy, prevalence of protective antibodies, quality of pre-vaccination antibody tests, and response to vaccination. Results indicate that antibody testing is very helpful for most viral infection diseases to determine whether an adult animal is already protected. In this context, new antibody point-of-care (POC) tests that determine the individual immune status and thus can be used during health checks in order to avoid unnecessary vaccinations in already protected dogs and cats are being evaluated. Further goals of our research are to investigate the incidence, duration and extent of vaccine pathogen shedding in order to determine diagnostic test interference as well as to compare different modes of vaccine administration.

Research Objectives

To avoid epidemics, a population must reach a certain threshold of immunity, called herd immunity. Owners' compliance towards vaccination is crucial to achieve herd immunity. Similar to human medicine, many animal owners doubt the necessity of vaccinations and are concerned about vaccine-associated adverse events. We recently conducted surveys on dogs and cat owners´ vaccination compliance and were able to demonstrate that adequate veterinary consultation can increase the compliance and thus positively influence vaccination rates.

All cats and dogs should be protected against core vaccine components. There is an excellent correlation between antibody titres and protection against viral core vaccine components, such as canine distemper virus (CDV), canine adenovirus (CAV), and canine parvovirus (CPV) in adult dogs and feline panleukopenia virus (FPV) in adult cats. Thus, our research focuses on the prevalence of antibodies especially against these core components and on factors that influence the presence of antibodies to identify dogs or cats that are particularly susceptible to infection. Although guidelines recommend at least 3-yearly boosters for viral core components, we were able to show that many dogs and cats in the field have antibodies against core vaccine components even if their last vaccination has been performed longer than 3 years ago. Thus, for the individual animal, antibodies can be measured to decide whether re-vaccination is necessary either in a diagnostic laboratory using the reference standards or in the veterinary practice by easy and fast POC tests. To assess the quality of these POC tests, a high specificity and a concomitant low number of false positives are important. Animals with a false positive result would not receive a vaccine, although they might not be protected from infection at the time of the POC test. However, so far only some of these POC tests have been evaluated in independent studies. Aim is to evaluate and compare all POC tests that are available in Europa.

Many cats and dogs are immunosuppressed, e.g. due to chronic diseases or administration of immunosuppressive drugs. In these patients it is questionable if and how long vaccines are effective and safe. Due to lack of data in veterinary medicine as well as in human medicine, our research concentrates on the immune response of immunosuppressed dogs and cats that might also serve as a model for vaccination in immunosuppressed humans. Chronic kidney disease, neoplasia and glucocorticoid therapy in cats have been identified as risk factors for lack of antibodies against FPV. However, we could demonstrate that the humoral immune response after vaccination with modified live virus (MLV) of dogs with hyperadrenocorticism treated with trilostane and of cats with retrovirus infection at least in the early stage was comparable to that of healthy animals.

Interference of vaccination with diagnostic testing is another serious problem in private practice, such as vaccine virus shedding or inability to distinguish vaccine and infection antibodies. We determined that parvoviruses are shed in the feces of dogs and cats for at least 28 days after MLV vaccination against parvovirus, and our current research focusses on shedding of other pathogens in MLV used for vaccination in dogs and cats. In addition, studies on interference of antibodies after *Leptospira* spp. vaccination with testing are currently performed.

Key Findings

Many dogs and cats have antibodies against viral core vaccine components and are thus protected even if their last vaccination has been performed many years ago. Thus, for the individual animal, antibodies can be measured to decide whether re-vaccination is necessary, at least for CPV, CDV, CAV, as well as FPV. Furthermore, we were able to show that dogs with hyperadrenocorticism and retrovirus-infected cats are able to develop antibodies and respond to MLV vaccination similar to healthy animals. Adequate veterinary consultation on preventive measures can increase owners´ vaccination compliance and thus positively influence the vaccination rate of the dog and cat population. Our research has immediate impact on current vaccination guidelines for dogs and cats.

Selected publications in this research area

1. Bergmann M, Freisl M, Hartmann K, Speck S, Truyen U, Zablotski Y, Mayr M, Wehner A. Antibody response to canine parvovirus vaccination in dogs with hyperadrenocorticism treated with trilostane. Vaccines 2020; 19: E547. doi: 10.3390/vaccines8030547.

2. Eschle S, Hartmann K, Rieger A, Fischer S, Klima A, Bergmann M. Canine vaccination in Germany: A survey of owner attitudes and compliance. PLoS One 2020; 15: e0238371.

3. Bergmann M, Speck S, Rieger A, Truyen U, Hartmann K. Antibody response to feline herpesvirus-1 vaccination in healthy adult cats. J Feline Med Surg 2020; 22: 329-38.

4. Bergmann M, Schwertler S, Speck S, Truyen U, Hartmann K. Antibody response to feline panleukopenia virus vaccination in cats with asymptomatic retrovirus infections: a pilot study. J Feline Med Surg 2019; 21: 1094-101.

5. Bergmann M, Schwertler S, Speck S, Truyen U, Reese S, Hartmann K. Faecal shedding of parvovirus deoxyribonucleic acid following modified live feline panleucopenia virus vaccination in healthy cats. Vet Rec 2019; 185: 83.

6. Bergmann M, Speck S, Rieger A, Truyen U, Hartmann K. Antibody response to feline calicivirus vaccination in healthy adult cats. Viruses 2019; 11: e702.

7. Gehrig AC, Hartmann K, Günther F, Klima A, Habacher G, Bergmann M. A survey of vaccine history in German cats and owners' attitudes to vaccination. J Feline Med Surg 2019; 21: 73-83.

8. Bergmann M, Schwertler S, Reese S, Speck S, Truyen U, Hartmann K. Antibody response to feline panleukopenia virus vaccination in healthy adult cats. J Feline Med Surg 2018; 20: 1087-93.

9. Freisl M, Speck S, Truyen U, Reese S, Proksch AL, Hartmann K. Faecal shedding of canine parvovirus after modified-live vaccination in healthy adult dogs. Vet J 2017; 219: 15-21.

Selected Seminars/Talks /Other Information

Selected Invited Talks

Titre testing instead of routine vaccination. Hartmann K, 29th Annual Congress of the European College of Veterinary Internal Medicine (ECVIM-CA). Milano, Italy 19.9.-21.9.2019; Proceedings p. 225.

Best vaccination schedule - how to vaccinate a healthy and an immunosuppressed cat? Hartmann K, Lappin M, 24th Congress of the Federation of Companion Animal Veterinary Associations (FECAVA) Eurocongress. Tallinn, Estonia 14.6.-16.6.2018; Proceedings.

Potential adverse effects of vaccination - feline injection-side sarcoma and chronic kidney disease. Hartmann K, Lappin M, 24th FECAVA Eurocongress. Tallinn, Estonia 14.6.-16.6.2018; Proceedings.

Antikörpermessung anstelle von Routineimpfung - Gesundheitsvorsorge von morgen? 28. Bayerische Tierärztetage. Bergmann M, Nürnberg, Deutschland, 25-28.05.2017; Proceedings p. 54.

Panleukopenie – wie gut sind unsere Katzen geschützt? Bergmann M, Bundesverband praktizierender Tierärzte e.v.- (bpt-) Kongress. München, Deutschland 19.10.-21.10.2017; Proceedings pp. 64-65.

Expert Panel Membership (Prof. Dr. Katrin Hartmann)

Board Member of the Ständige Impfkommission Veterinär (StIKo Vet) (Standing Vaccine Committee in Veterinary Medicine)

Board Member of the European Advisory Board of Cat Diseases (ABCD)

Awards (Simone Eschle)

Award for the best oral presentation, 28. Jahrestagung der Fachgruppe "Innere Medizin und Klinische Labordiagnostik" der DVG (InnLab), 31.01. – 01.02.2020, Gießen, Deutschland.

Award for the third best oral presentation in Infectious Diseases, 26th. ECVIM-CA congress, 02.09 – 05.09.2020, Barcelona, Spain (online).

Current Awards/Research Grants

PIs	Project type/co-applicants/% share	Funder	Project title	Start date	End date
Hartmann	Prospective clinical study/100%	Pharmaceutical company	Comparison of different *Leptospira* spp. antibody tests in healthy dogs after vaccination	2020	2022
Hartmann, Bergmann	Prospective clinical study/100%	Pharmaceutical company	Antibody response to non-adjuvanted canary-pox vectored vaccines in cats	2018	2020
Hartmann	Prospective clinical study/100%	Pharmaceutical company	Antibody response to feline panleukopenia virus vaccination in cats with asymptomatic retrovirus infection	2012	2015