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Education

Date	Degree	Institution
2006-2011	Residency, Alternative Training Program	European Veterinary Parasitology College Primary location: Institute of Parasitology, University of Zurich, Switzerland
1999-2000	Dissertation	Cantonal Veterinary Office Ticino and Swiss Federal Veterinary Office (supervision: Prof. K. Stärk)
1993-1999	Veterinary Medicine	Faculty of Veterinary Medicine, University of Zürich, Switzerland
1989-1993	Baccalaureate (type B latinistic)	Liceo cantonale Bellinzona, Ticino, Switzerland

Qualifications

2020	Instructor FVH in Veterinary Laboratory Medicine, Parasitology Swiss Veterinarian Society (SVS) and Swiss Society of Veterinary Laboratory Diagnosticians
2018	Titularprofessorin University of Zurich, Vetsuisse Faculty, Switzerland
2014	Teaching Skills Certificate Postgraduate certification from the Center for University Teaching and Learning, University of Zurich, Switzerland
2013	Habilitation (Venia legend) in Parasitology University of Zurich, Switzerland
2012	Specialisation in Veterinary Laboratory Medicine, Parasitology (Fachtierärztin in Labor- und Grundlagenmedizin FVH) Swiss Veterinarian Society (SVS) and Swiss Society of Veterinary Laboratory Diagnosticians
2011	Diplomate of the European Veterinary Parasitology College Board Certification by examination

- 2001 **Doctor's degree in Veterinary Medicine**
University of Berne, Faculty of Veterinary Medicine, Switzerland
- 1999 **Diploma in Veterinary Medicine**
University of Zurich, Faculty of Veterinary Medicine, Switzerland

Professional Experience

- 2014 – today **Group Leader for Veterinary Parasitology (Wissenschaftliche Abteilungsleiterin)**
Institute of Parasitology (IPZ) *University of Zurich, Switzerland*
- Scientific project development and implementation, group management, funding acquisition, budgeting and management
 - Teaching Veterinary Medicine (Vetsuisse Faculty) and Biology (MNF, Faculty of Science) students in Parasitology; supervision of undergraduate and postgraduate students
 - Lead of the coordination and operative responsibility of the external experimental unit “Stiegenhof” of the Vetsuisse Faculty Zurich
 - Administrative coordination of experimental animal trials (support for new applications, progress and final reports, correspondence with the authorities and the animal welfare unit of the University) and health surveillance of experimental animals at the IPZ
 - Assistance in veterinary diagnostic topics at the Diagnostic Unit of the Institute
 - Advisory service in all matter of Veterinary Parasitology for veterinarians, animal owners and further external requests
 - Provision of continuing education for veterinarians (since 2008)
- 2006-2013 **Senior teaching and research associate (“Oberassistentin”)**
- 2003-2006 **Junior teaching and research associate (“Assistentin”)**
- 2002-2003 **Fellow Employee (“angestellte Tierärztin”)**
Large and small animal practice *V. & P. Spescha & E. Frey, Wängi, CH*
- 2001-2002 **Practical Experience (“nicht-angestellte Tierärztin”)**
Small animal practice *E. Dessieux & M. Blanc, Poitiers, France*
- 2001 **Fellow Employee (“angestellte Tierärztin”)**
Large and small animal practice *M. Cavalli, Locarno, Switzerland*

Teaching Experience

Personal didactic education

In September 2014 I obtained the **Certificate for Teaching Skills**, supported by the Centre for University Teaching and Learning at the University of Zurich, attesting the acquired didactic skills.

The certificate is based on the development of a personal teaching philosophy, which is sustained by attending didactical courses, by reciprocal visits during the class including hospitations by specialised didactic instructors and by a Teaching Portfolio.

Research Interests

Parasites are among the most widespread infectious agents in humans and animals, including livestock and companion animals. This incredibly diverse world of parasites is associated with complex life cycles, constantly evolving epidemiological situations and the resulting diseases need reliable control strategies.

Veterinary Parasitology **including parasites with zoonotic potential (underlined)**

My research is focused on different aspects of parasite infections in a wide array of animals aiming at better animal health, welfare and productivity. The group of 'Veterinary Parasitology' that I am leading at the Institute of Parasitology in Zurich deals with parasitological topics of **companion animals and small pet mammals, horses, livestock, zoo animals and wildlife, comprehending helminths, protozoa and ectoparasites as well.**

We investigate the pathological and pathophysiological processes inducing parasitic diseases, the molecular negotiations between parasites and their hosts, and develop and study the performance of diagnostic tools for individual analyses and epidemiological studies.

Cardiopulmonary nematodes of dogs and cats represents our research focus. Starting with the establishment of challenging experimental models, we also developed novel diagnostic methods. They allowed us to perform international collaborations throughout the world, having the aim to increase epidemiological knowledge, to increase disease awareness for previously neglected parasitoses and to support data collection for the evaluation of the efficacy of anthelmintics. Currently, in addition to the SNF project in which we investigate immunological aspects, we also perform studies on the host-parasite interactions and the pathogenesis, which are, among others, supported by -omics analyses.

In further projects we investigate the biological aspects of vector-transmitted filarioses of dogs for the development of alternative control strategies.

In the field of horses and livestock the focus is on measures for the reduction of anthelmintic use to limit the spread of anthelmintic resistances. Furthermore, we investigate the excretion dynamics of parasitic protozoa and the correlations between diarrhoea and calves, aiming at better and more cost-efficient management.

The research areas are complemented with topics that result on **ongoing issues** resulting in exchange with other researchers, veterinary practitioners, and animal owners. Practitioners and animal owners very frequently rely on the expertise available within my group: our **advisory service** is regularly praised and acknowledged. We deliver diagnostic options, advise on parasitological findings and the necessary measures, and are strongly connected with the diagnostic unit of the institute and the clinical section of the Animal Hospital of the Vetsuisse Faculty Zurich. These networks allow us a **research based and practicable teaching.**

Our overall goal is to **understand the pathogenesis of parasitoses and to identify appropriate therapies and control measures.**

Cardiopulmonary nematodes of carnivores

I started in 2008 with this completely new field of research: meanwhile I am a worldwide reference person for heart and lungworms in dogs and cats. We were the first group establishing an **experimental model** for the canine nematode *Angiostrongylus vasorum*, which also became the topic of my habilitation. The diagnostic tests that have then been developed at the institute lead to international collaborations for risk

analyses and large screenings of populations for the presence of lungworms in dogs, cats and wild carnivores. The same serological methods more and more also complement the methods for the evaluation of anthelmintic efficacies in registration procedures.

We were able to show that ***A. vasorum* is clinically highly significant for dogs** and that the parasite is meanwhile present Europe-wide. Supplementary molecular analyses revealed interesting epidemiological aspects based on our description of the genome, which was supported by the industry. The genome also is our basis for the research on immunological aspects, with the goal of developing new intervention methods.

Further genetic analyses on dogs and the wildlife reservoir helped to clarify the transmission ways and the already occurred spread of the parasite.

With the collaboration with Dr. L. Tritten, we performed serum proteomics of infected dogs, which gave us the direction of research to be deepened aiming to **unravel coagulopathies in *A. vasorum* infected dogs**, a very interesting aspect of this multi-faceted parasite. This research in fact has been supported through several competitive funding sources. In **collaboration with clinical sections** of the Animal Hospital of the Vetsuisse Faculty we investigated the factors that were leading to high pathogenicity in dogs with canine angiostrongylosis. This should help to optimise the management of clinical cases. We also investigated the host-specific differences between dogs and foxes, the microbiome of the parasite and the genetic diversity of *A. vasorum* to identify modulators of host coagulation. This helped to clarify important mechanisms of **pathogenicity**.

Contemporaneously we are investigating parasite-host interactions and pathogenesis of the most important **lungworm in cats, *Aelurostrongylus abstrusus***, with support of the FGCZ (Functional Genomics Centre Zurich). The diagnosis of this parasite represents a challenge and was therefore neglected: this is particularly relevant for cats that undergo anaesthetic procedures as infected animals have a higher risk of death.

Filarioses of dogs

We are investigating **fundamental biological aspects** of vector-transmitted filarioses of dogs. Their relevance is increasing in parallel with their spread which is partially conducive to climate changes. Our research aims at supporting the development of novel procedures in an experimental model to investigate therapeutic and prophylactic procedures. This needs the **intense collaboration between parasitologists and clinician**, which I strongly support and for which we are perfectly equipped at the Vetsuisse Faculty in Zurich. In addition to their clinical relevance for infected animals, they have zoonotic potential. We focus on **parasitic zoonoses** that also increase due to increased animal import and global travel activities.

Livestock parasitoses

In the field of livestock parasitoses we are running investigations on parasites causing **diarrhoea in calves**. We analyse the excretion dynamics of different **protozoan parasites** and the correlation with diarrhoea in fattening calves, with the aim to identify factors that can improve and reduce costs of their management.

Under the lead of PD Dr. H. Hertzberg a group of clinicians and veterinary parasitologists of both Vetsuisse Zurich and Bern have promoted the re-orientation of parasite management in horses. After 10 years, increased diagnostic and advisory activities have contributed to reduced infection pressure on pastures. This in turn is fostering a reduced use of anthelmintics and therefore **limit the spread of anthelmintic resistance**. Further research of H. Hertzberg focused on other applicable management measures.

Similarly, due to the widespread occurrence of anthelmintic resistances against most of the available anthelmintic compounds, it is important to inform and promote alternative control strategies for **gastrointestinal small ruminant parasites**. Among those, especially *Haemonchus contortus* regularly leads to anaemia and death in sheep and goats if they are not appropriately managed.

Projects originating from concrete issues

Several other projects continuously result from concrete and latest research questions. In the following, some examples.

We analysed more in-depth the cumulative occurrence of sneezing dogs and observed that **nasal capillariosis** (caused by *Capillaria boehmi*) also occurs in Switzerland. Most probably dogs have been misdiagnosed before, as we found that the parasite is widely spread in foxes, representing a wildlife reservoir.

We also identified for the first time worldwide a natural infection with **A. vasorum in a cat**: this is a difficult task in a living animal, as the infection does not become patent. However, we learnt that we must count on such findings especially in highly endemic areas.

After diagnosing single cases, our retrospective analysis confirmed an increased finding of dogs infected with the **zoonotic parasite *Strongyloides stercoralis***. Particularly young dogs belonging to 'trendy' breeds (French Bulldog, Chihuahua, Pomeranian) were frequently infected, and they were frequently imported from abroad, where breedings are known to be very profit oriented. Interestingly, we also observed those infections not only lead to intestinal symptoms (diarrhoea, vomiting) but also to respiratory signs (coughing, dyspnoea, sneezing), explainable to migratory stages in the lungs and potentially leading to misdiagnosis.

Past topics (selection):

Lungworms (*Metastrongylus* spp.) and intestinal parasitic stages of two separated Swiss wild boar populations north and south of the Alps

Thelazia callipaeda, an eye worm of dogs, cats and other carnivores with **zoonotic potential**: investigations on epidemiology in definitive and intermediate hosts, clinical relevance, risk factor analysis and prophylactic efficacy studies

Control strategies for sheep scab (*Psoroptes ovis*)

Epidemiological investigations on *Sarcoptes* mange in foxes from Geneva

Ticks and *Babesia* spp. in domestic and wild ruminants

Adopting experimental models for the **fox and the dog tape worm** in treatment efficacy studies and for *Cryptosporidium parvum* for prophylaxis in calves

The tropical rat mite (*Ornithonyssus bacoti*) spread through commercial pet shops causing infestation in rodents and humans in several households

Differentiating the diagnosis of round worms (*Toxocara* sp.) in dogs and cats, role of coprophagia

Ongoing and future projects

Leishmania sp. in Switzerland: a survey to assess its presence in wild phlebotomine sand flies and its prevalence in dogs and wildlife

This is a collaborative project with the SUPSI (Scuola Universitaria Professionale della Svizzera Italiana). Although other domestic and wild animal species (e.g., cats, equids and rodents) have also been implicated as reservoirs, in the European endemic area dogs are considered the most important reservoir for visceral leishmaniasis in humans and therefore play a major role in **zoonotic leishmaniasis**. Canine leishmaniasis caused by *L. infantum* is endemic to southern and southeastern Europe. In dogs, the disease can manifest itself in many ways, depending on the affected organ, but most cases have a chronic clinical picture in common. Importantly, the follow-up and treatment of affected dogs is challenging and costly, and the parasite cannot be fully eliminated in dogs, despite antiprotozoic treatments. Due to the increased travelling with or translocation of dogs from endemic to non-endemic regions, and adoption of dogs from endemic countries, canine leishmaniasis has also gained importance in Central-Northern Europe and is now one of the most frequently diagnosed import diseases, representing a risk for the local dog and human population.

With this investigation, we want to move the first steps towards a one-health approach of surveillance and control of leishmaniasis, which includes human health (sharing epidemiological data with human medicine and collaborating in an adjustment of the legislation as well as recommendations for the implementation in practice would be desirable), environmental health (geographical distribution, biology and density of the vectors, with particular interest in disease outbreaks; molecular research of CanL and Arbovirus in sand flies) and animal health (monitoring of dogs as reservoirs of *L. infantum*).

The role of *Toxoplasma gondii* and *Encephalitozoon cuniculi* as ocular pathogens in Swiss pet cats and diagnostic evaluations

In recent years cats with therapy-resistant ocular lesions, especially cataracts and uveitis, seem to be an emerging issue in veterinary medicine. Even if in many cases the cause cannot be determined, infectious agents are often suspected. Two pathogens which are discussed to induce these changes are *Toxoplasma gondii* and *Encephalitozoon cuniculi*. The fact that the seroprevalence of *T. gondii* is high in the healthy cat population complicates the interpretation of our previously obtained serological results. Moreover, the role of *E. cuniculi* in causing ocular lesions in cats remains unclear. The major objective of the planned study is to investigate the associations between these pathogens, seroprevalences and ocular manifestations of the diseases of cats in Switzerland.

The ‘true role’ of *Giardia* sp. infections in dogs:

For this project, a collaboration with Prof. S. Unterer, Small Animal Internal Medicine, Vetsuisse Faculty Zurich, is implemented.

Infections with the intestinal protozoan parasite *Giardia* in dogs and cats are very common. Clinical signs vary from subclinical to small bowel diarrhoea and associated discomfort. Disease development is dependent on several host and parasite factors. From the host side, age is an important aspect, as young individuals more often suffer from clinical infections, while stress, malnutrition or other pathogens that impact on the intestinal microbiota may trigger the disease. From the parasite side, isolates may vary in relation to virulence, but contrasting studies do not allow concluding remarks.

A particular role is attributed to the gut flora: differences of the microbiome were suggested to explain different clinical outcomes in *Giardia* affected animals, and to represent an underestimated factor with regards to the development of *Giardia* from harmless commensal to significant pathogen (Tysnes et al., 2014).

The control of infections in dogs is frequently a frustrating issue for animal owners and veterinarians, as re-infections and/or recrudescence are common and the reasons may be attributed to environmental contamination with the highly resistant cysts, to limited efficacy of the antiprotozoic compound or to insufficient compliance. Furthermore, the available treatment options are restricted and could have a negative effect on the gut flora themselves: therefore, especially in case of absent or reduced clinical signs, antiparasitic treatment is questioned.

The goal is to investigate the true role of *Giardia* in dogs with intestinal issues, the influence of different treatment protocols and of faecal transplant to restore the gut flora. Contemporaneously, I am implementing a collaboration with a company to evaluate the usefulness of a diagnostic panel for gastrointestinal parasites differentiating, among others, non-zoonotic from zoonotic *Giardia* dog isolates.

Parasitic stages in “ready to eat” products

Parasites have a broad spectrum of transmission routes and several are important food-borne pathogens. The relative importance of different transmission routes is often difficult to assess. There is also considerable variation regarding the perceptions on epidemiological, clinical and economic relevance in different geographic areas. The (re-)emergence of many food-borne parasitic diseases is partially attributed to changing eating habits. During the last decades the increasing demand for healthy, fresh and ready-to-eat food has led to food preferences and eating habits that promote the consumption of vegetables and fruits. Novel, ethnic food and organic farming may promote the ingestion of pathogens. Therefore, better knowledge on fresh-produce supply would contribute to understand how, when and where contamination with food-borne parasites occurs and identify processes which may help to prevent or remove contaminating parasitic stages.

In previous studies at the institute, a sensitive, one-way sequential sieving method to isolate helminth eggs and protozoan oocysts from lettuce for genetic identification has been implemented (Guggisberg et al., 2020). This method was then implemented as a standard operating procedure to investigate the presence of *Echinococcus* spp. and *Taenia* spp. eggs, and we participate in a Europe-wide collaboration project that already delivered interesting results. Currently we are implementing the same procedure for berries, and in future work we will investigate helminth and protozoan zoonotic stages as well.

Investigations on specific parasites of wildlife:

- *Strongyloides* in hedgehogs and raccoons: zoonotic relevance
- The role of foxes as wildlife reservoir of *Babesia vulpes* and *Hepatozoon* sp

Professional Memberships

since 2002	Gesellschaft Schweizer Tierärztinnen und Tierärzte (GST)
since 2007	World Association for the Advancement of Veterinary Parasitology (WAAVP)
since 2008	Swiss Society for Tropical Medicine and Parasitology (SSTMP)
since 2009	Schweizerische Vereinigung der Veterinär-Labordiagnostiker (SVVLD)
since 2011	European Veterinary Parasitology College (EVPC)
since 2010	Schweizerische Vereinigung für Kleintiermedizin (SVK)

Representation and Activity in Professional Associations

ESCCAP

European Scientific Counsel Companion Animal Parasites

Since 2012

President of the Swiss Section and member of ESCCAP Europe

- Providing veterinary professionals with free expert information (guidelines, factsheet, etc.) from independent, continually updated and soundly-based research
- Committed to raising awareness and recommendation of appropriate and proven control measures to protect companion animals and prevent parasitic zoonoses
- Fostering collaboration with the medical profession, allied government bodies and stakeholder partners to address the serious emerging pet parasite control issues faced by an enlarging Europe

Since 2011

Presidential Member of the Swiss Section

Expert group of the Swiss Association for Small Animal Medicine (SVK-ASMPA)

- Promoting ESCCAP and its objectives by producing translations and adaptations of ESCCAP documentation
- Representing ESCCAP Swiss section vs. sponsors, donors and national organisations
- Formulating concepts and implementing yearly strategies
- Organising and attending conferences and smaller events which feature key contributions by providing independent and valuable information to veterinary practitioners, veterinary nurses, animal breeders and owners and media

EVPC

European Veterinary Parasitology College

Since 2017

Member of the Educational Committee (Chair: since September 2020)

- Evaluation of alternative programs of resident candidates
- Evaluation of standard training programs for residents
- Assessment of yearly and final reports of resident trainings
- Evaluation of summer school programs
- Organisation of online seminars for residents and EVPC members
- Support for the development of digital veterinary parasitology teaching tools

Since 2012

Supervisor of EVPC residents (Alternative Training Program)

Since 2016

Summer School Teacher “VIPs in Zurich” (since 2018: main coordinator)

SECB

Federal Swiss Expert Committee for Biosafety

Since 2020

Member

- Advising the federal agencies on the drafting of laws, ordinances, guidelines and recommendations, and on the enforcement of these regulations
- Issuing statements on licence applications for studies with genetically modified, pathogenic or alien organisms

SSTMP

Swiss Society for Tropical Medicine and Parasitology

Since 2019

Member of the Veterinary Parasitology Working Group

2010 – 2016

Committee member and Treasurer

Mid 2021

SVVLD

Swiss Veterinary Association for Veterinary Diagnostics

Member of the Committee