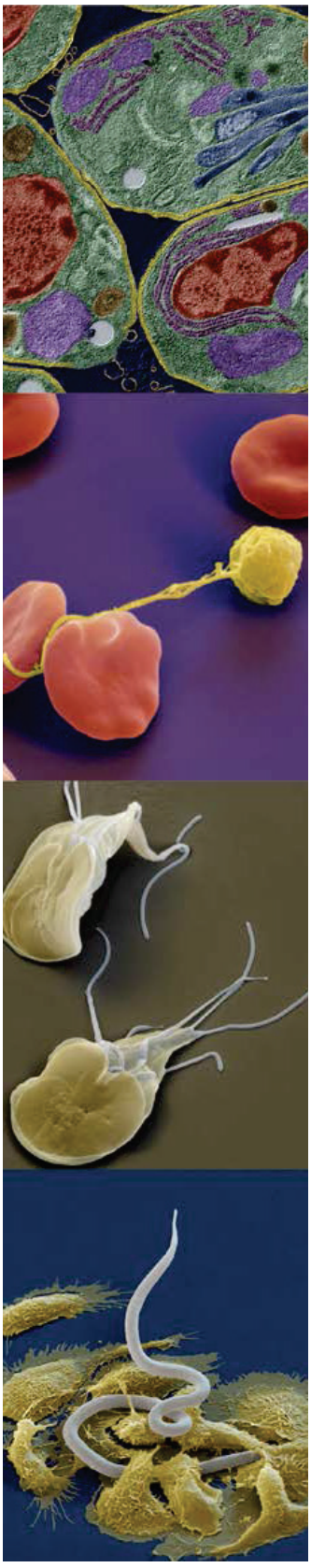
GRK 2046 Newsletter
June 2020



Summary, Update and News

Please enjoy the 9th edition of our biannual GRK 2046 newsletter. As usual, we report from recent travel with conferences/workshops, seminars/lectures, publications and more.
However, everything is clouded now by the coronavirus situation. In response, we had to cancel or postpone talks for the BPS and Role Models series. Many PhD students (if not all) could not work in the laboratory for many weeks or even month, which means all loose precious time. We are very grateful that the DFG offers to grant three more month of paying personnel costs for all PhD students who were severely delayed. The GRK 2046 will applicate for this supporting money in 2021. In addition, in response to the general hygiene and social distancing rules, we will start to go online with talks and lectures if necessary. We hope to restart the BPS and Role Model talks in September. Depending on the travel restrictions of the German ministry of foreign affairs, we might not be able to bring all international guest speakers to Berlin. Then, online talks will be available.
Stay safe, stay healthy!

– Marko

Travel & Conferences

DRS PhD Symposium

27 September 2019
Berlin, Germany

This event was very beneficial for PhD students, because it aims to bring all PhD students together. It was organized by doctoral candidates for doctoral candidates. Participants have the chance to present their project, either as presentation or poster. It provided a good opportunity for scientific discussions between postgraduates. At the end of day, there was a social event with DJ and cocktails!

– Sharareh Salehi

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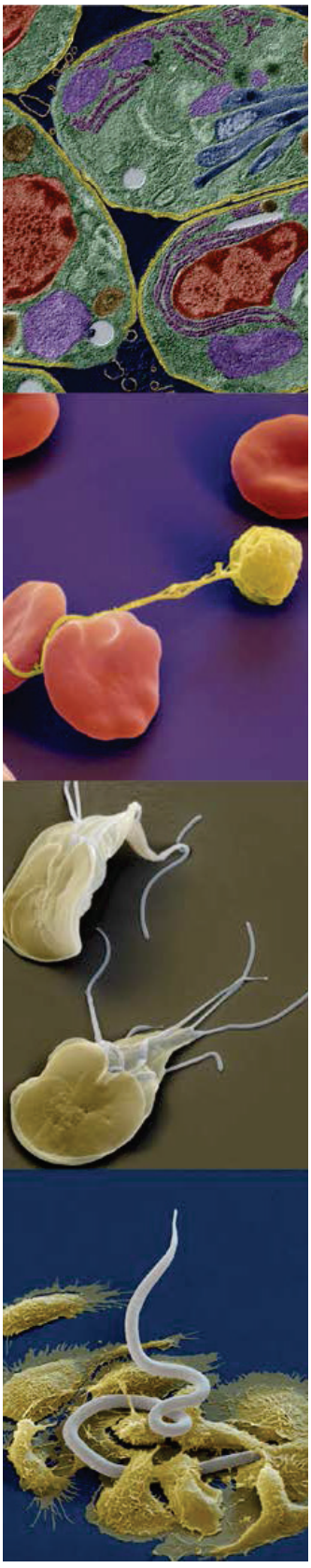


Field trip to Africa

30 August – 22 December 2019
Huye, Rwanda

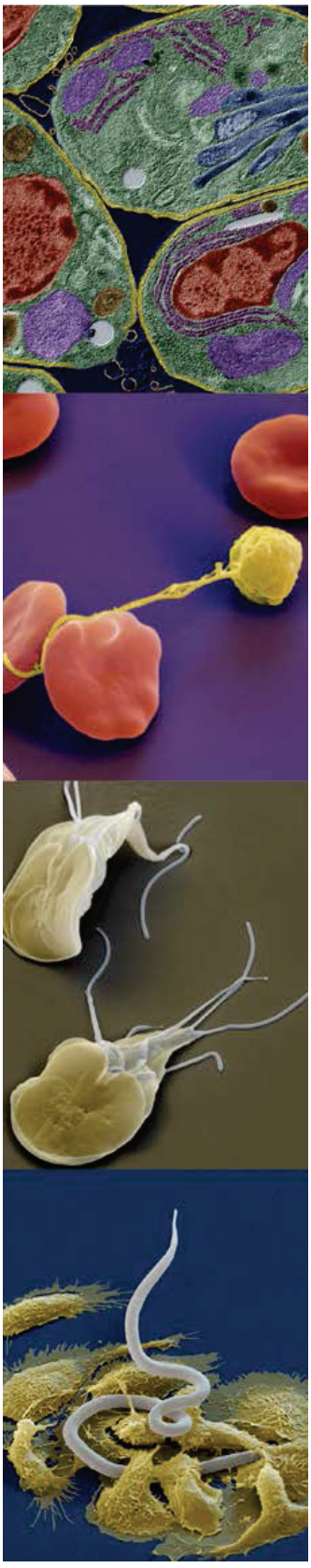
"Heeey sister! Umuzungu! Tickets to Huye? Leaving in cinq minutes! Now, now! Sister!"

Loaded with four bags full of medical and lab consumables and equipment –each just under the airline's weight limit, making my luggage 2x my weigth! – I traveled from Berlin to the southern highlands of Rwanda at the end of August 2019. Together with Clara, a medical student doing her doctoral thesis in our group, we would continue what Costanza (GKR 2046, 1st generation) started in 2018: a malaria field study in the Huye District, Rwanda. I had visited Rwanda a year before and spend months on preparing this project. While seeing the green hills unrolling as I approached my new hometown, I felt excited and couldn't wait; I realized this is where a new chapter was about to start (in the chronicles of "A PhD's bumpy road").

Our associate Felix Habarugira and Clara, the medical student that I conducted this project with, awaited me in Huye. We unpacked and went for a Rwandan mountain coffee; the best way to start, continue and end the day. In a week's time all loose ends fused: we met all our collaborators, assembled a local team, prepared the lab, distributed materials: ready, action, start!

Sunny days, rainy days, muddy roads, dusty roads: the team would be working almost every day. We recruited malaria patients and healthy controls, collected blood samples, clinical data, socio-economic data, processed the samples in the lab and followed up on the patients. Because of the unexpected low malaria prevalence, we would enrol a study participant in the health centre at any moment of the day. Transporting blood samples in a crispy evening sun during a frog-orchestra? Check! Holding a torch to fill in clinical forms in the hospital by night? Check!

I am grateful for the opportunity to work with dedicated people that make Rwanda's health system as one of Africa's best. It has been an honor to be part of the long-time collaboration of the Mockenhaupt-group and the University Hospital in Huye. I learned so much, got to know the bottle necks of a field study, discovered how to be creative in the lab, made



new friends. During coordinating this field project, I realized that this might very well be the career direction to strive for.

Currently, we are in the last phase of a manuscript that describes the presence of mutations causing artemisinin resistance the parasites we collected. Needless to say, I often reminisce the fascinating sceneries, creative working conditions and beautiful teamwork. Ready for the next chapter!

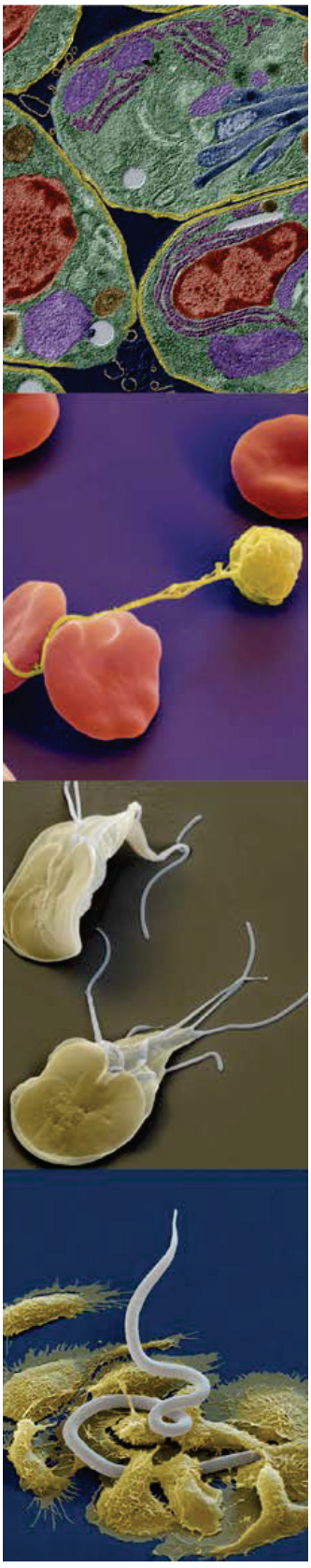
– Welmoed van Loon

Lab exchange in Spain

30 September – 1 October 2019
Ciudad Real, Spain

After arriving in central spain located Ciudad Real, I was warmley welcomed by the whole team of Prof. José de la Fuente at the Sanidad y Biotecnologìa department of the University of Castilla- La Mancha. Here, I was offered an Anaplasma phagocytophilum training supervised by Pilar Alberdi, PhD, who worked for eight years on tick cell cultivation at the laboratory of Lesley Bell-Sakyi in the UK. She gave me an introduction in cultivation of different tick cell lines originated from *I. scapularis* and *I. ricinus* and furthermore in mammalian cell cultivation. Here, I had a hands-on training on infecting tick and mammalian cells. The aim of this training was to learn and practice cell cultivation of *A. phagocytophilum* to transform this technique to establish an *in vitro* infection model of *I. ricinus* ticks by artificial tick feeding system. This visit was a perfect oppurtunity get practical information on cell culture, to exchange knowledge, and discuss with experts on study designs.

– Nina Militzer



Zoonose symposium

16 October – 18 October 2019
Berlin, Germany

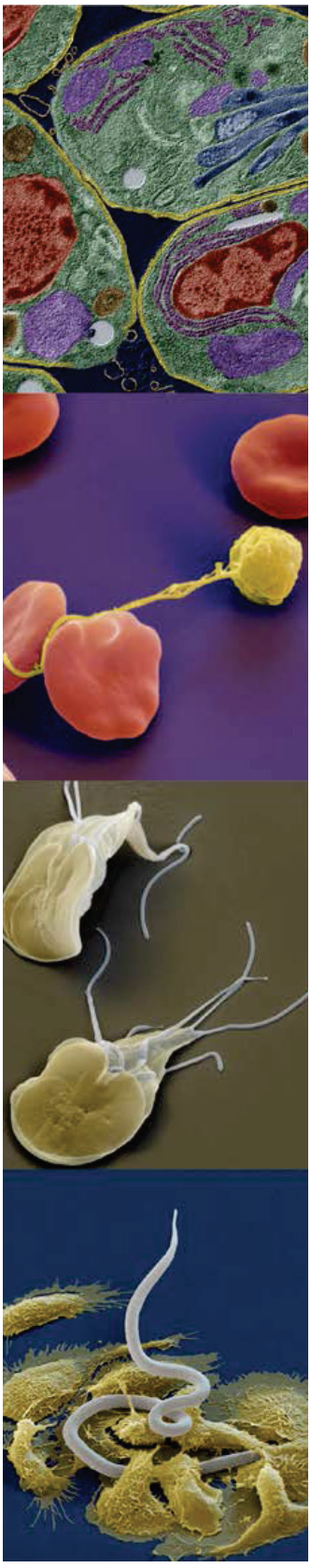
This is an international symposium on zoonoses research. The symposium aims to contribute to this task by addressing researchers from all related fields, such as human and veterinary medicine or infection biology. It addressed scientists that work with known or newly emerging zoonotic diseases, with zoonoses caused by viruses, bacteria, parasites or prions, transmitted directly or via vectors. The young scientists can benefit by attending this symposium, particulary those you who present their project in a poster session, because they can have informal straightforward chats to senior scientists from different research institutes. Besides, the junior scientists have the chance to attend Young Scientific Breakfast and discuss their career planning with experinced researchers during a casual breakfast session.

– Sharareh Salehi

Lab exchange USA

22 February – 4 March 2020
Lexington, Kentucky, USA

In February, I had the opportunity to visit the research group of Professor Martin Nielsen at the University of Kentucky, Maxwell H. Gluck Equine Research Center, Lexington, Kentucky for two weeks to participate in sections of horse yearlings and collect samples for my study. I got a comprehensive insight into the research projects and had the opportunity to visit the two research herds.



One research herd is infected with multi-resistant parasites and the other has been kept without deworming since 1979. These research herds provide a unique resource worldwide for research into parasite population, anthelmintic resistance, and equine parasite control. I was trained in the morphological identification of the cyathostomins, which can only be reliably determined by a few experts worldwide. Additionally to the research, I acquired an impression of the teaching of veterinary students in parasitology. During the two weeks in the "horse capital of the world" I had the opportunity to obtain valuable samples to understand the population composition and dynamics, as well as species-specific tropism of cyathostomins in the large intestine of horses. These data are essential for further research on species-specific pathogenicity, resistance development and control. I am very grateful for the great time there and especially for the possibility of this laboratory stay.

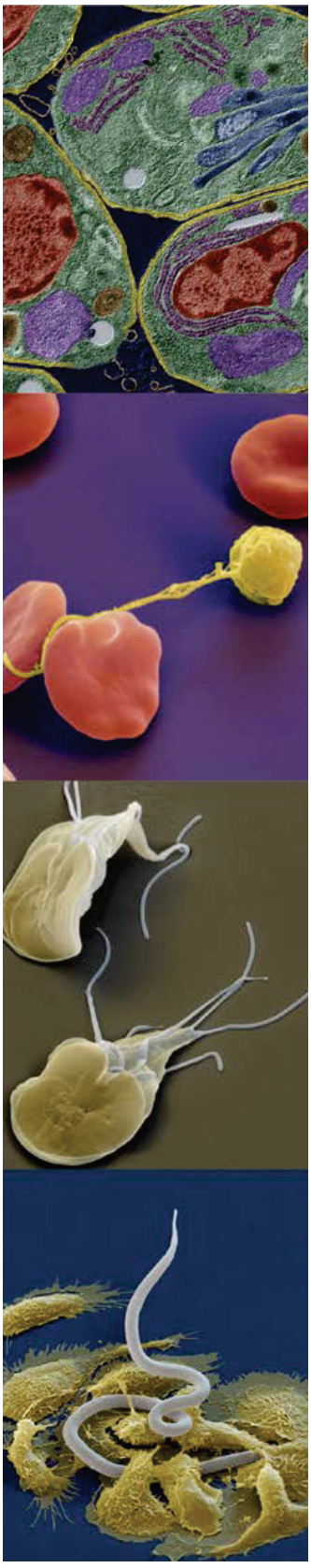
– Irina Diekmann

Serengeti Field Training Course, 2019

The Serengeti field training course in 2019 was a great success for all participating PhD students, who were evidently very happy about this opportunity to study wildlife animals. Small experiments and analysis of animal samples could take place in the welcoming and friendly location in the Serengeti.

Now, our PhD students and their supervisors publish a Serengeti diary along with their project reports in one Serengeti booklet. Printed copies will be available soon.

Please find below an official glimpse on the first two days of the Serengeti adventure diary:



Saturday, 23rd of February
By: Richard Lucius

At 4.15am we met at Tegel airport for the flight to Amsterdam, there is already quite a long queue in front of the counter. Everyone* except Georg is there (he comes from Hannover and joins us in Amsterdam). At 6am, the plane leaves, at 7am we arrive in Amsterdam. The flight should continue at 10am, but due to a delay, it does not arrive until 11am. Due to our tiredness lots of coffee is consumed. Last opportunity for shopping.

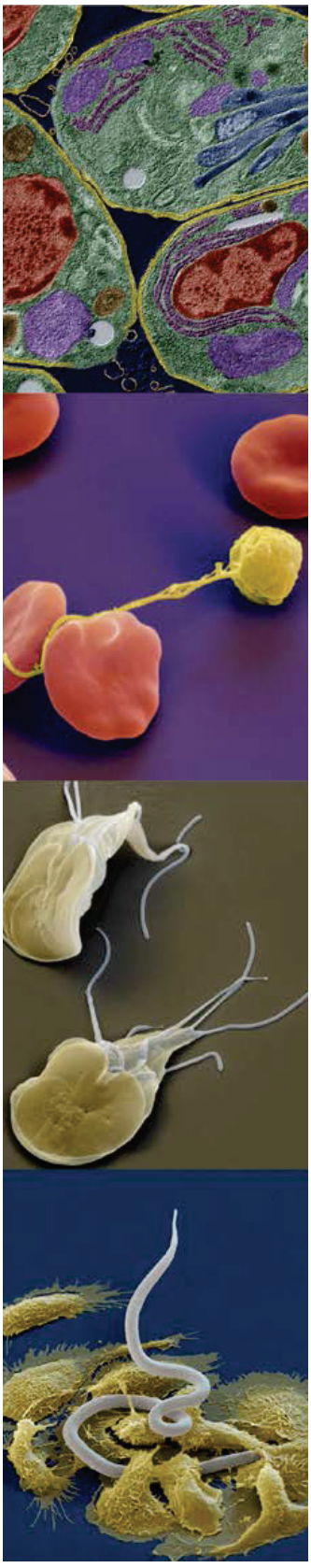
Arrival at Kilimanjaro airport at 9.30pm (with two hours' time difference). Getting out of the plane and breathing the humid air is wonderful. It takes (felt) eternally (but in reality only 1h) until we are through the controls. Our bus with a friendly driver waits outside and takes us for about an hour to the Milimani Lodge in Arusha. We arrive just in time for getting a very late dinner and a beer. "Kilimanjaro" or "Serengeti" that is the question! The air is warm and there are no mosquitoes, this is Africa at its best after a long German winter! The only discord is the neighbor's dog that howls all night long without any interruption.

"Kilimanjaro" and "Serengeti" beers, with allusive labels to the region

*Everyone are: Heribert, Susanne, Georg, Emanuel and Richard as supervisors. Alex, Ankur, Ben F., Ben H., Irina, Ivet, Livia, Lubomír and Miguel as students.

Sunday, 24th of February
By: Ankur Midha

We started our day with breakfast at the Milimani Lodge in Arusha, where we spent the night after travelling to Kilimanjaro Airport via Amsterdam. After breakfast, we made our way to Arusha Airport by bus, which gave us the opportunity to briefly see the city during daylight. After passing through two rounds of security without any problems, we boarded two Cessna C208B airplanes (capacity: 12 passengers) to travel to the Seronera Airstrip in the Serengeti National Park. Due to the size of our group, we were split into two groups. Livia, Richard, and Susanne travelled in one plane with some other travelers while the rest travelled together. With our bird's-eye perspective, we were fortunate enough to see several interesting sights, with Heribert providing context for our aerial views of Tanzania.



Cessna C208B airplane

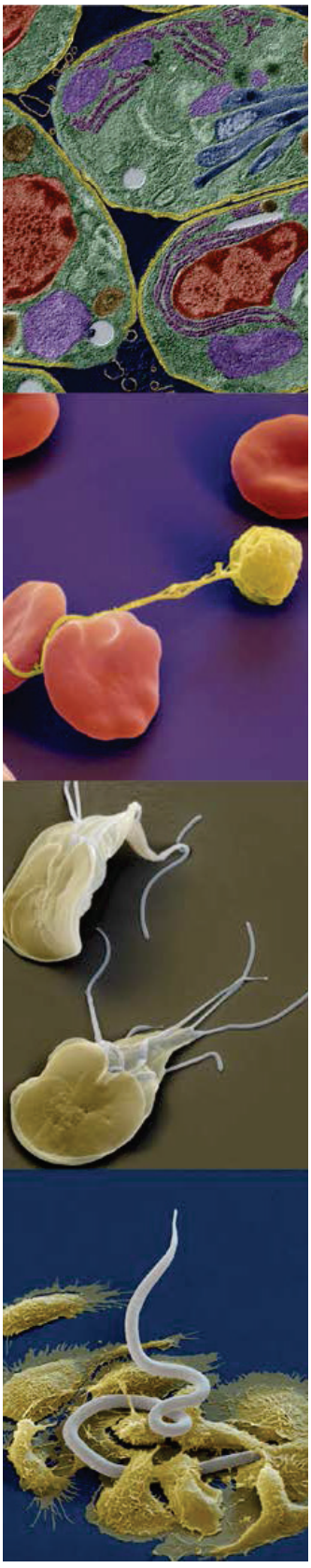
Just west of Arusha we saw A to Z Textile Mills, the largest African manufacturer of mosquito nets. Throughout the countryside, we saw several Maasai settlements. As we flew over the southeastern corner of the park, we passed the Ngorongoro Crater, the world's largest inactive volcanic caldera (Estesa RD *et al,* 2006).

Northeast of the crater, we passed the Olduvai Gorge, home to the oldest evidence of human evolution. As we continued on towards Seronera Airstrip in the center of the park, we noticed a relative lack of animals, with no large herds to be seen during our journey. After a scenic and exciting flight, we were greeted by Marion and Sonja who drove us to the guesthouse. Along the way, we caught our first glimpses of the diversity of wildlife that we would continue to enjoy throughout our stay, encountering a herd of Impalas just off the road. The drive was very muddy due to heavy rainfall from the previous night, a feature we would soon become accustomed to in the following days.

Hyena cub at the Pool clan

We arrived at the guesthouse by mid-afternoon, welcomed by the friendly and accommodating staff with a delicious lunch of chicken, fried potatoes and fresh fruit salad. After lunch, we unpacked all the lab supplies that we had travelled with and half of us went out on our first hyena trip. Alex, Emanuel, Miguel, and I accompanied Sonja to the Pools den for what turned out to be a very productive drive. We saw baboons, a fish eagle, a tree full of Marabou storks, giraffes, a hippopotamus, a jackal, impalas, ostriches, buffalo, hartebeest, wart hogs, and a bachelor herd of zebras from whom we managed to collect our first fecal sample. We even caught our first tsetse fly. The hyena cubs were also quite playful and inquisitive. After a very fruitful trip, we enjoyed the drive back to the hostel while lightning lit up the night sky all around us in the distance. After our incredibly satisfying evening meal, we enjoyed our first night in the Serengeti, accompanied by the sounds of chirping crickets and the occasional whooping of hyenas. Foreshadowing the events of the following days, we also heard the unmistakable roaring of lions.

Estesa RD, Atwood JL, Estes AB. Downward trends in Ngorongoro Crater ungulate populations 1986-2005: Conservation concerns and the need for ecological research. *Biological Conservation:* 107. (2006).



Berlin Parasitology Seminars (BPS)

Prof. José de la Fuente
University of Castilla- la Mancha, Ciudad Real, Spain

11 February 2020

Prof. José de la Fuente is an international expert on ticks and tick- borne diseases and gave his presentation on “Targeting host- vector- pathogen interactions to reduce the global burden of tick-borne diseases” on the 11th February 2020. Here, he presented the current research of his laboratory focusing on zoonotic agent *Anaplasma phagocytophilum* as a model tick-borne pathogen to identify and characterize molecular interactions using recent omics technologies. Here, he discussed some recent findings on pathogen-induced tick proteins to increase tick survival and vector competence while altering the ticks’ transcriptome, microbiome, or proteome. At the same time, the tick cell reaction influences the immune response to limit the infection.
Furthermore, he pointed out the alpha- Gal syndrome as a reaction on red meat allergy, which is further influenced by tick bites, as an interesting topic on studying the tick-host- pathogen interactions. The seminar was followed by a discussion and an informal get together.

– Nina Militzer

Due to the Coronavirus situation, we had to postpone BPS and Role Model talks. We hope to restart the talk season in September 2020, having the speakers here in Berlin or online.

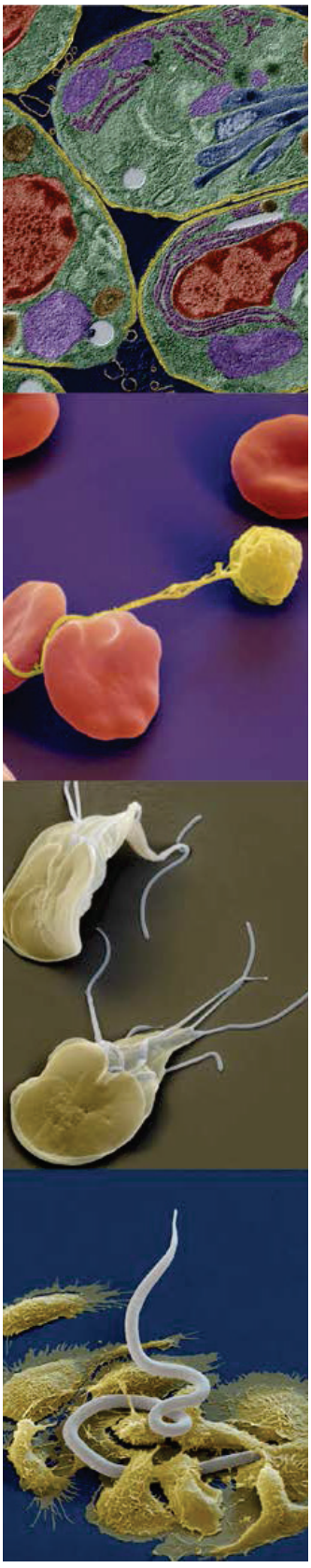
Role Models Seminars

Prof. Christina Strube
Stiftung Tierärztliche Hochschule Hannover, Germany

18th February 2020

On the 18th February, Prof. Christina from the Institute of Parasitology at the Stifrtung Tierärztliche Hochschule Hannover visited us in Düppel and gave a fantastic talk entitled “Worms and brains – an excursion into zoonotic pet roundworms and neuroinfection”.

Prof. Strube’s lab has a broad range of research interests, centered around the field of veterinary public health. In particular, her group is focused on the epidemiology of tick-borne and helminthic diseases in



pets, livestock and wild animals in Germany, and novel molecular diagnostic methods. Other research interests include the impact of Ascariasis on intestinal nutrient transport, and *Toxocara*-associated neuropathology. In Berlin, she mostly presented recent findings relating to her work on *Toxocara*, including some interesting insights into the prevalence of the parasite at childrens' playgrounds in Germany.

This was followed up by a memorable careers' discussion, in which Prof. Strube told us about her career path, leading up to recently accepting her current professorship position. Prof. Strube's situation was very unique, taking over leadership of the department in which she previously worked as a postdoc following the unfortunate death of her advisor. However, she gave a lot of general advice, which would still be applicable to others. One highlight was that we should never be afraid to negotiate for more money instead of just accepting job offers immediately!

– Benjamin Hamid

Upcoming Talks

Berlin Parasitology Seminars

08.09.2020, 17:00 – Kerri Coon HGS (Mitte)*

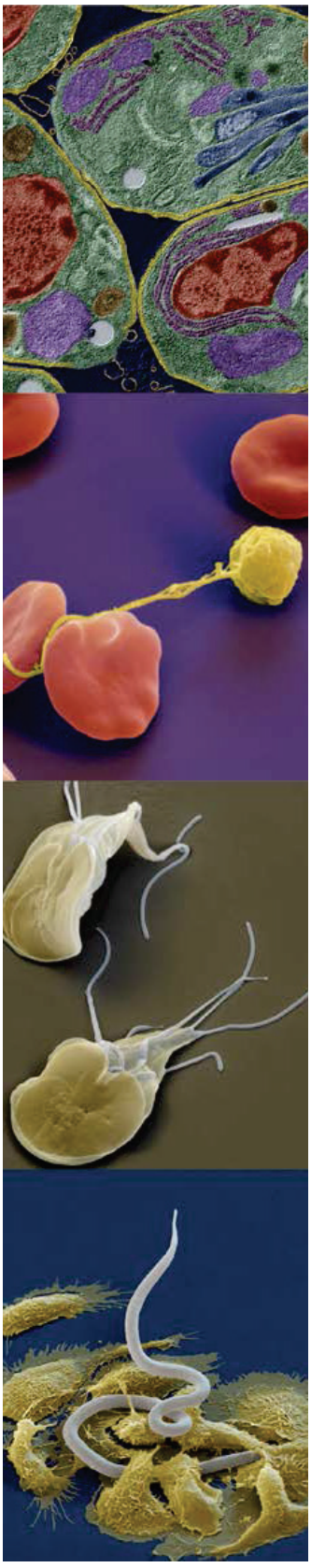
13.10.2020, 17:00 – Jeroen Saeij – RKI*

10.11.2020, 17:00 – Thomas Jacobs – MolPara (Mitte)*

Role Models in Infection Biology

15.09.2020, 09:00 – Paul Selzer – VP (Düppel)*

*to be confirmed, possibly as online talk



Graduated 1st generation students and date of defense

Jonnel Jaurigue – 27.11.2019
Martin Kraft – 17.12.2019
Florence Awamu Ndonglack – 28.01.2020
Caroline Kiuru – 06.02.2020
Totta Ehret Kasemo – 20.02.2020

Congratulations!

Until now, almost all 1st generation GRK 2046 PhD students graduated and hold a *Ph.D*. or *Dr. rer. nat.* title. Especially, we are happy that five GRK 2046 PhD students took and take advantage of DFG support for scientists with young children. We are grateful for that DFG tool.

Publications

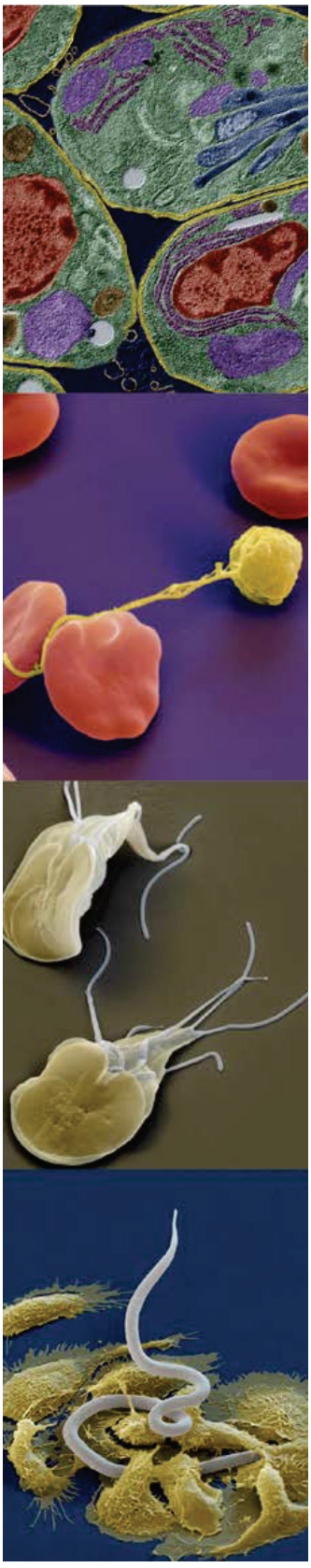
Generalist Eimeria species in rodents: Multilocus analyses indicate inadequate resolution of established markers.

Víctor Hugo Jarquín-Díaz, Alice Balard, Anna Mácová, Jenny Jost, Tabea Roth von Szepesbéla, Karin Berktold, Steffen Tank, Jana Kvičerová and **Emanuel Heitlinger**, 2020.
Ecology and Evolution, 10:1378-89.

Abstract

- Intracellular parasites of the genus *Eimeria* are described as issue/host-specific. Phylogenetic classification of rodent *Eimeria* suggested that some species have a broader host range than previously assumed. We explore whether *Eimeria* spp. infecting house mice are misclassified by the most widely used molecular markers due to a lack of resolution, or whether, instead, these parasite species are indeed infecting multiple host species.

- With the commonly used markers (18S/COI), we recovered monophyletic clades of *E. falciformis* and *E. vermiformis* from *Mus* that included *E. apionodes* identified in other rodent host species (*Apodemus* spp., *Myodes glareolus*, and *Microtus arvalis*). A lack of internal resolution in these clades could suggest the existence of a species complex with a wide host range infecting murid and cricetid rodents. We question, however, the power of COI and 18S markers to provide adequate resolution for assessing host specificity. In addition to



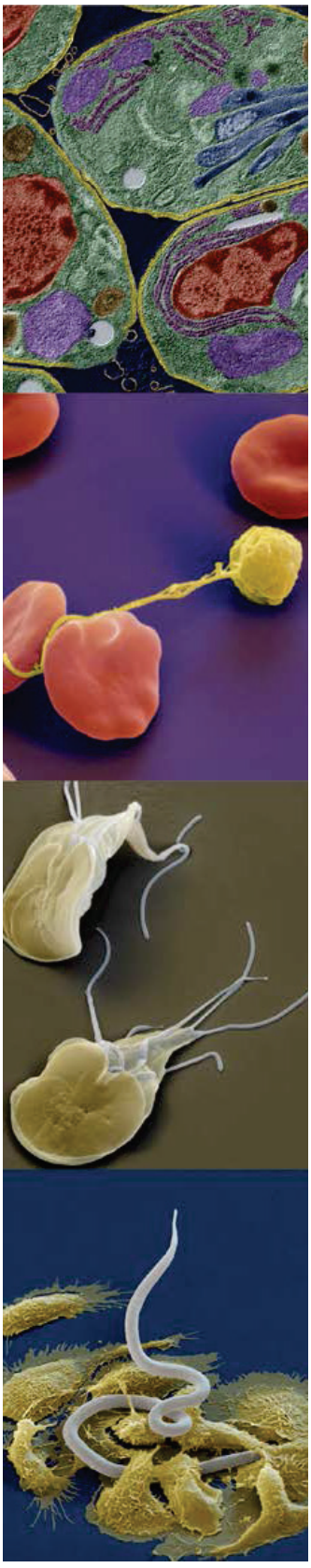
the rarely used marker ORF470 from the apicoplast genome, we present multilocus genotyping as an alternative approach. Phylogenetic analysis of 35 nuclear markers differentiated *E. falciformis* from house mice from isolates from *Apodemus* hosts. Isolates of *E. vermiformis* from *Mus* are still found in clusters interspersed with non-*Mus* isolates, even with this high-resolution data.

- In conclusion, we show that species-level resolution should not be assumed for COI and 18S markers in coccidia. Host–parasite cospeciation at shallow phylogenetic nodes, as well as contemporary coccidian host ranges more generally, is still open questions that need to be addressed using novel genetic markers with higher resolution.

MiRNA-146a Polymorphism Was Not Associated with Malaria in Southern India

Welmoed van Loon, Prabhanjan P. Gai, Suyamindra S. Kulkarni, Rashmi Rasalkar, Konrad Siegert, Jakob Wedam, Archith Boloor, Shantaram Baliga, Arun Kumar, Animesh Jain, Chakrapani Mahabala, Damodara Shenoy, Rajeshwari Devi, Pramod Gai and **Frank P. Mockenhaupt**, 2020.
The American Journal of Tropical Medicine and Hygiene, 102:1072-4.

Abstract
Micro-RNAs (miRNAs) play a crucial role in immune regulation, and a common miRNA-146a polymorphism (rs2910164) increased the odds of falciparum malaria in pregnant African women. Here, we examined whether this association holds true in a different population, that is, 449 mainly male and adult malaria patients and 666 community controls in southwestern India. *Plasmodium vivax* malaria (67%) predominated over falciparum malaria (11%) and mixed species infections (22%). Overall, 59% of the study participants carried the miRNA-146a polymorphism. However, it was not associated with the odds of malaria, irrespective of parasite species. This underlines the importance of considering the complexities of clinical manifestations of malaria, genetic background, and parasite species when disentangling the role of human genetic variation, including those of miRNAs in malaria.



Species-specific differences in *Toxoplasma gondii*, *Neospora caninum* and *Besnoitia besnoiti* seroprevalence in Namibian wildlife

Anne Seltmann, Gereon Schares, Ortwin H. K. Aschenborn, Sonja K. Heinrich, Susanne Thalwitzer, **Bettina Wachter** and **Gábor Á. Czirják**, 2020.
Parasites & Vectors, 13:7.

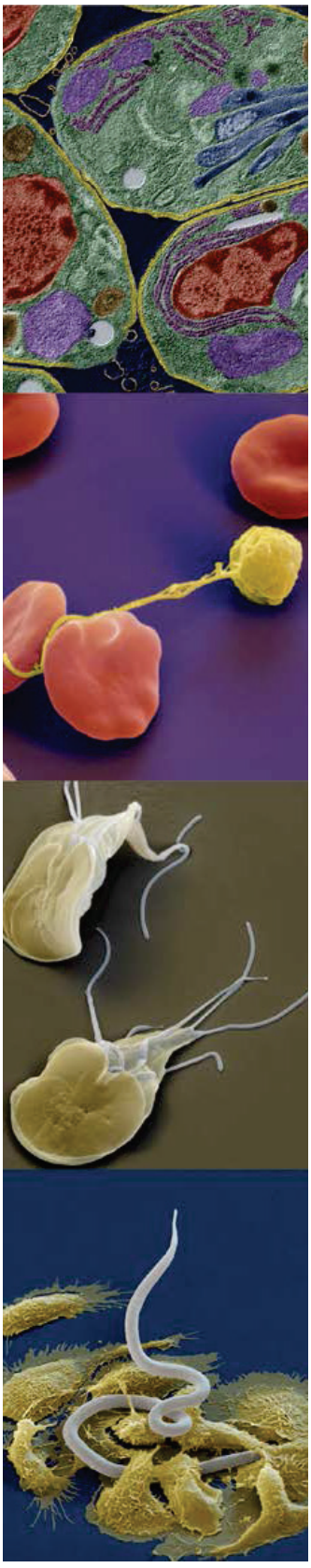
Abstract

Background: Knowledge about parasitic infections is crucial information for animal health, particularly of free-ranging species that might come into contact with livestock and humans.

Methods: We investigated the seroprevalence of three tissue-cyst-forming apicomplexan parasites (*Toxoplasma gondii*, *Neospora caninum* and *Besnoitia besnoiti*) in 506 individuals of 12 wildlife species in Namibia using in-house enzyme linked immunosorbent assays (indirect ELISAs applying purified antigens) for screening and immunoblots as confirmatory tests. We included six species of the suborder Feliformia, four species of the suborder Caniformia and two species of the suborder Ruminantia. For the two species for which we had most samples and life-history information, i.e. cheetahs (*Acinonyx jubatus*, n = 250) and leopards (*Panthera pardus*, n = 58), we investigated *T. gondii* seroprevalence in relation to age class, sex, sociality (solitary, mother-offspring group, independent sibling group, coalition group) and site (natural habitat vs farmland).

Results: All but one carnivore species (bat-eared fox *Otocyon megalotis*, n = 4) were seropositive to *T. gondii*, with a seroprevalence ranging from 52.4% (131/250) in cheetahs to 93.2% (55/59) in African lions (*Panthera leo*). We also detected antibodies to *T. gondii* in 10.0% (2/20) of blue wildebeest (*Connochaetes taurinus*). Adult cheetahs and leopards were more likely to be seropositive to *T. gondii* than subadult conspecifics, whereas seroprevalence did not vary with sex, sociality and site. Furthermore, we measured antibodies to N. caninum in 15.4% (2/13) of brown hyenas (*Hyaena brunnea*) and 2.6% (1/39) of black-backed jackals (*Canis mesomelas*). Antibodies to *B. besnoiti* were detected in 3.4% (2/59) of African lions and 20.0% (4/20) of blue wildebeest.

Conclusions: Our results demonstrate that Namibian wildlife species were exposed to apicomplexan parasites at different prevalences, depending on parasite and host species. In addition to serological work, molecular work is also needed to better understand the sylvatic cycle and the clear role of wildlife in the epidemiology of these parasites in southern Africa.



Visible-light mediated oxidative ring expansion of anellated cyclopropanes to fused endoperoxides with antimalarial activity

Simon Budde, **Felix Goerdeler**, Johannes Floß, Peter Kreitmeier, Elliot F. Hicks, **Oren Moscovitz**, **Peter H. Seeberger**, Huw M. L. Davies and Oliver Reiser, 2020.
Organic chemistry frontiers, doi: 10.3389/fcimb.2019.00046.

Abstract
A visible light mediated ring expansion of readily available carbo- and heterocyclic anellated cyclopropanes by molecular oxygen at ambient pressure has been developed. Tolerating a variety of functional groups, the reaction yields fused 1,2-dioxolanes, which were tested for antimalarial activity given their close analogy to the active principle of approved drugs such as artemisinin.

Malaria According to GARP: A New Trail Towards Anti-disease Vaccination

Calvin Hon and **Kai Matuschewski**, 2020.
Trends in Parasitology, doi: 10.1016/j.pt.2020.05.012.

Abstract
Naturally acquired anti-*Plasmodium falciparum* immunity protects first and foremost against severe disease. Raj *et al*. have established a tantalizing path towards an anti-disease vaccine by identifying glutamic acid-rich protein (GARP) antibodies as signatures of protection against severe malaria in Tanzanian children and demonstrating efficacy in blood cultures and monkey trials.

Outlook - Assessment Center

We are all already very excited for recruiting the 3rd and final generation of young parasitologists for our Research Training Group. The call will open soon and we are looking forward for the Assessment Center, which will take place in November 2020. We hope to find again 15 excellent PhD candidates from all over the world.