

Summary, Update and News

Good evening everybody, welcome to the 13th edition of our GRK 2046 newsletter. Now, finding back together in person (at least for some events), our 3rd generation PhD students can start to get to know each other. Socializing and project discussion is a very important must have. Though the first events are successfully done in person, our PhD students plan a self-organized student symposium to get to know each other, discuss their scientific projects, plan cooperations and socialize. This symposium will take place in August.

Unfortunately, we had to postpone our Africa field workshop to 2023, because the pandemic rules and regulations in Germany and Africa did not allow travel and field work. So, we just hosted a mini symposium giving a detailed introduction for everyone about possible scientific field work projects and the local environment in Africa.

As usual, in this edition we report on workshops, conferences and all GRK 2046 events in detail.

Have fun!

- Marko

New Student

Lilla Jordán (Project C1, IZW)

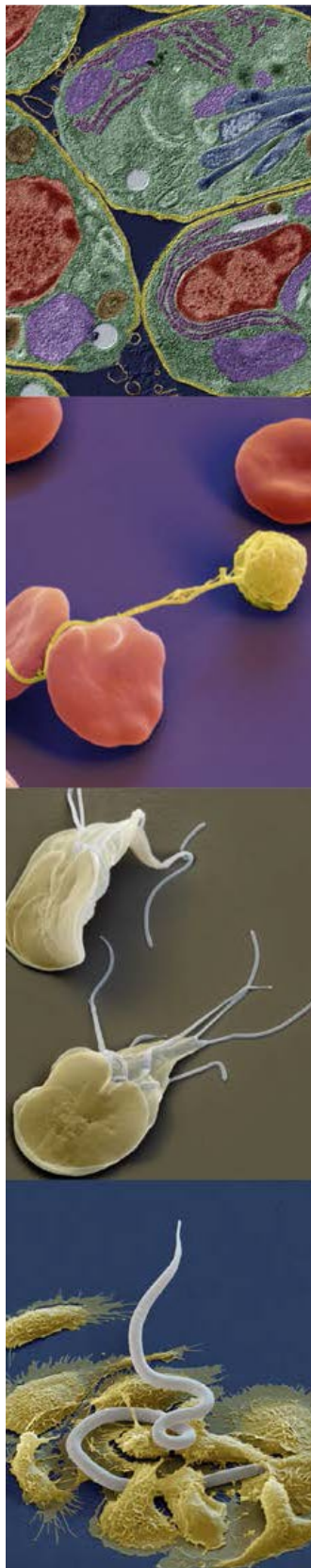
Hello everyone! My name is Lilla and I joined the GRK 2046 in January 2022. I completed my bachelor's and master's in Biology in Hungary, focusing on the ecophysiology of lizards. In order to gain experience and a deeper understanding in the field of ecoimmunology, I first joined the Leibniz Institute for Zoo- and Wildlife Research (IZW) in Berlin as an intern in 2020. Now, as part of the Cheetah Research Project of the IZW, in my PhD project I am focusing on investigating different aspects of the effects of parasitic infections in a wild host, the cheetah.



private photo

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10315 Berlin

Email: Jordan@izw-berlin.de



Conferences & Workshops

German language course TUB (B1.3)

November 2021 – February 2023 online



Photo from boredpanda.com

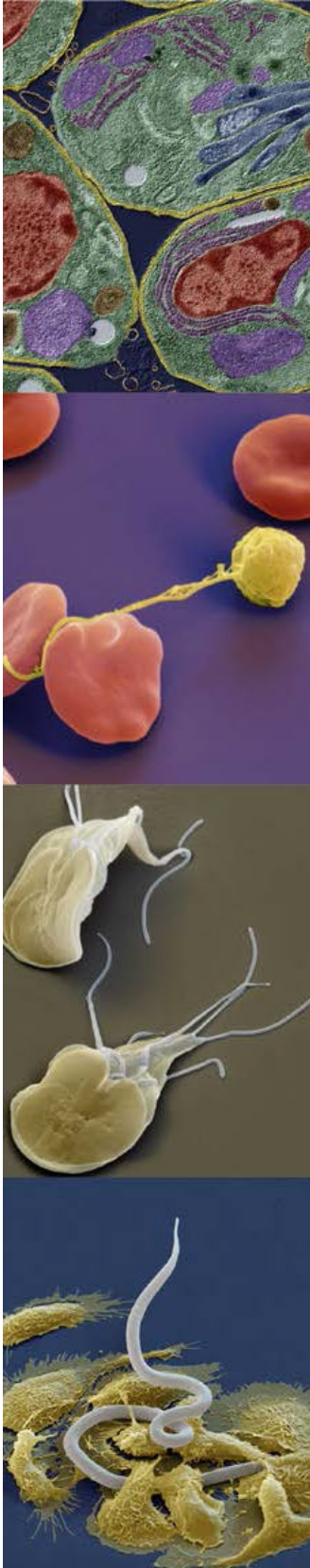
For anyone who's taken language classes before, B1.3 sounds odd. This is a kind of special offer from TU Berlin that prepares you for a B2 course. Since I hadn't taken courses in a while, I saw it fit to take this one before jumping into the more daunting B2.1 course. Another reason was that it was shorter (3 h/week), and the enrolment process was far simpler than the ones at FU (which are normally 4 h/week and project based, plus you need to take a proficiency test).

This course was mostly a conversation class with lots of tailored error corrections and *ad-hoc* instruction. During my time there, there was a special emphasis on phonics.

With that in mind, I would recommend it in case you are looking for conversation classes offering flexibility and phonics training. The cool thing is that we got to really ask for instruction/feedback on specific topics that we were struggling with, so if you know where you need to improve, this course is great. You could also bring your own conversation topics.

On the other hand, I'm personally not a huge fan of phonics or instruction styles that rely too much on independent interactions with the language. So if you're taking language courses at TU Berlin, make sure to ask about the teacher's methods during the interview.

- Marta Silva Muniz



Workshop HGS “Improved reading”

February 16 + March 16, 2022



Photo from improved-reading.de

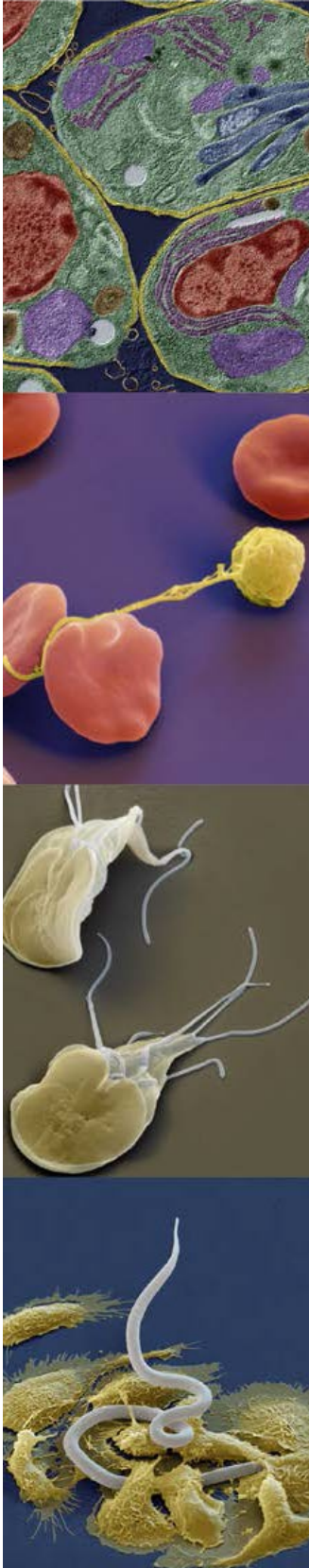
Do you know the feeling when you read a text and already after a short time your thoughts wander off? By the time you realize what's happening, you've lost track of the content. And then? You have to read the whole text again! Of course, this is frustrating and very time consuming. During the course students were taught not only on how to prevent the mind from wandering off, but also on how to speed up quite a bit and still understand and memorize the whole text. Simple tricks such as not reading every single word but focusing on groups of words were used to achieve a higher reading speed. The course was taught online at a self-paced speed. Every lesson took about 45min – 1h so it was easy to integrate it into the daily work life. After having obtained this knowledge, it will only take a couple of minutes to finish the newsletter!

- Larissa Oser

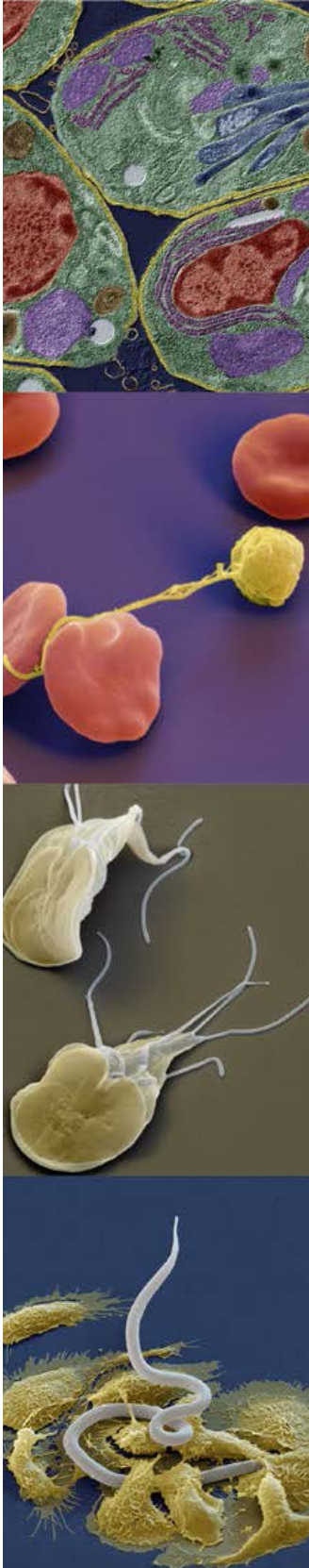
Workshop HGS “Presenting Science online”

February 23 – 25, 2022

The presenting science online is perhaps one of my best workshops on acquiring apt presentation skills for academia. The workshop was organized by the Humboldt graduate school and handled by Millie Baker. It was a 3-day session which featured areas like developing a good body language during presentations, building confidence and impact, slide design and several interactive sessions among others. The best parts of the workshop in my opinion were the several groupworks and different presentation rounds by the participants. The practical nature of the workshop makes you learn by doing with massive feedback and critique from the group that build your confidence and increase your desire to become a better presenter. An aspect of the course that was novel and



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very helpful to me was the session that dealt with answering questions when the question is unclear, or you don't know the answer or is aggressive. In summary I would recommend this workshop to anyone interested in improving their presentation skills.



Photo by Joshua Adjah

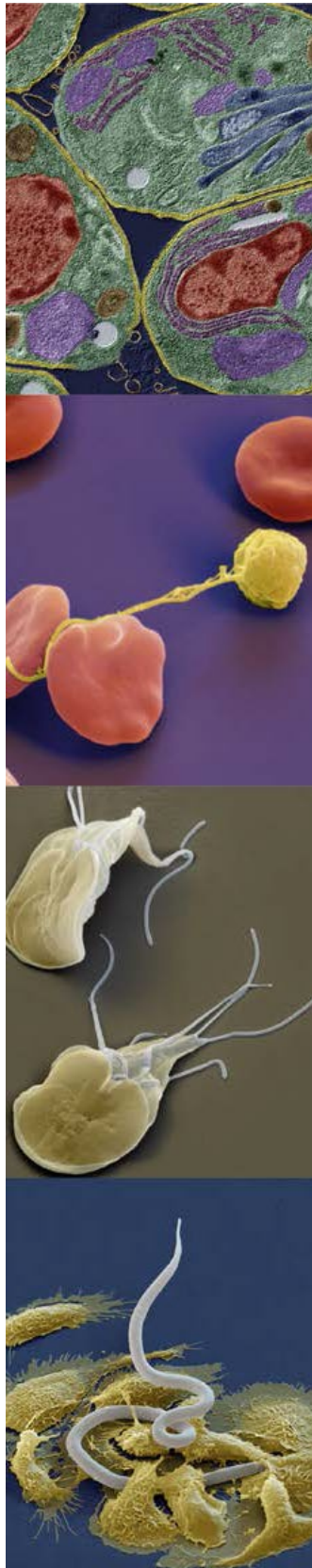
- Joshua Adjah

Workshop IMPRS-IDI „Good Manufacturing Practice basic course“
March 07 – 11, 2022

I participated in the online course: "Good Manufacturing Practice" which was organized by the GMP Academy and took place in March 2022. The five-day course included a wide range of topics such as quality management systems, quality control and insurance, production, manufacturing, GxP, application advice and statistics. Due to speakers from the industry, the course was particularly up-to-date and practical. Besides imparting specialist knowledge, the course also served as a networking event. Company presentations were an integral part of the course program and gave participants the opportunity to make direct contact with renowned companies. I recommend the course to those who wants to get in touch with GMP regulations within the EU in the future.

- Arkadi Kundik

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Workshop HGS „Secrets of Impactful Poster Design“

March 22 – 23, 2022

This two-day workshop was a great opportunity to learn how to prepare a poster. Although it was online, we had lots of opportunities to interact and give feedback to examples of posters we were shown. The course showed us simple steps to follow when designing a new poster and highlighted how important it is to define the content of the poster based on the audience.

Some topics that we went through that were very interesting were how to create an effective layout and a bit of color theory. I definitely recommend this course to anyone new to poster design.

- Estefanía Delgado Betancourt

Workshop ZIBI “Reproducible Research with R” (Ulf Tölch)

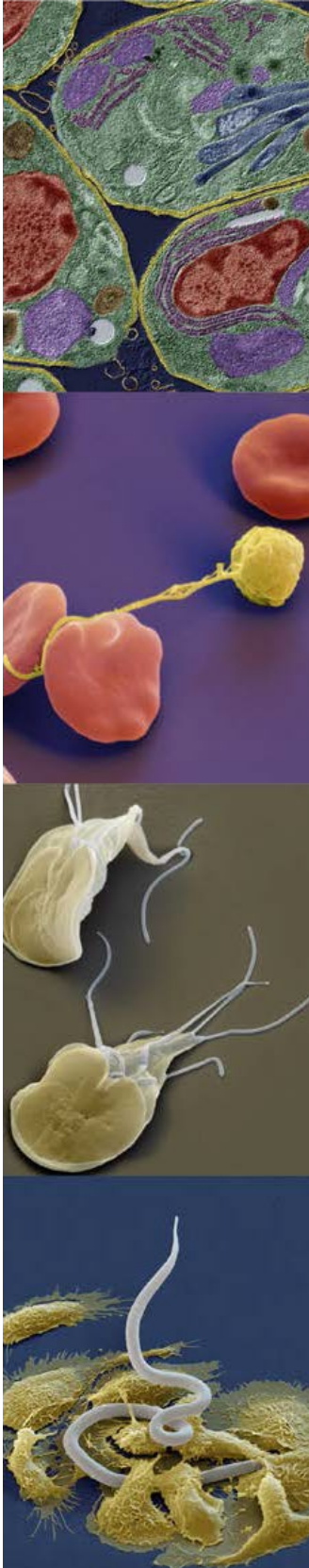
April 6, 2022

In April 2022 I had the opportunity to participate in the workshop on "Reproducible Research with R" instructed by Dr. Ulf Tölch. We started with a detailed introduction to R and RStudio, the subsequent sessions were mainly dedicated to tidyverse and ggplot2. Consequently, I can now effortlessly visualize and analyze data using R. The final session on R markdown was instrumental in my research as I learned how to prepare my data and analyses so that other researchers can understand (and eventually reproduce) how figures and statistical tests were created stepwise from raw data.

- Robert Mugo



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Workshop ZIBI Academic and Scientific Writing (Ruth Willmott)

May 18 – 20, 2022



<https://www.mariatornroos.fi/phases-of-doctoral-studies/>

In this beautiful spring, from May 18th to 20th, I participated in the course "Academic and Scientific Writing", which fortunately took place in person on Humboldt University campus for the two full days.

In this course, we learned how to organize, structure and write research articles effectively and efficiently instead of slowly and painfully. Getting started should not be too complicated if we get organized before we even start writing. For example, by bringing all the graphs to the same design and with a good quality during the experiments to avoid wasting time repeating experiments or editing the graphs during the writing phase. We also learned how to make a well-structured writing plan.

In addition, elements of writing style, such as using the correct tense, being concise and precise were discussed. We learned how to structure sentences and paragraphs, as well as how to use the right punctuation. Finally, Dr. R. Willmott gave us tools to edit and polish the articles elegantly and scientifically.

We were able to apply many of the concepts learned in some of the scientific articles from participants, who brought them voluntarily with the permission of the PIs.

I can really recommend this course to all students. The encouragement, joy and kindness of the teacher also made the course very enjoyable.

- Marly Erazo

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16th International Congress on Toxoplasmosis and *T. gondii* Research

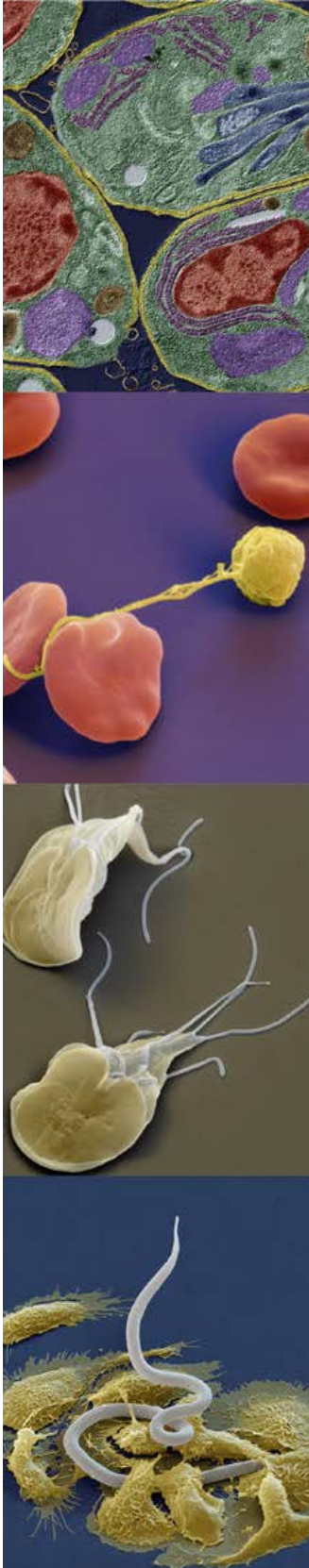
May 22 – 26, Riverside, CA, USA

In May, I had the opportunity to attend the biennial 16th International Congress on Toxoplasmosis and *Toxoplasma gondii* Research, which took place as an in-person event in Riverside, CA after it was postponed by one year due to the COVID-19 pandemic. For the congress, renowned scientists and young researchers of the toxoplasma community from around the world gathered at a picturesque hotel in Riverside, California, 90 minutes from Los Angeles by car, to (re-)connect, discuss their *Toxoplasma* research and present their newest findings.

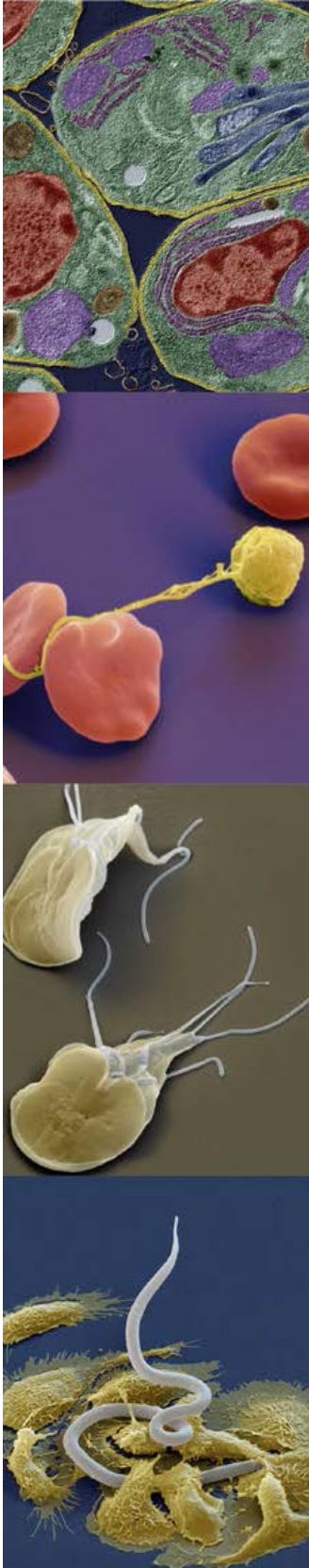


Photo by David Warschkau

The conference program was densely packed with talks and poster sessions that covered a comprehensive spectrum of *Toxoplasma* research and allowed me to get great new and deep insights. I was able to share my research results on the role of late embryogenesis abundant proteins for the resilience of *T. gondii* oocysts to environmental pressures. Furthermore, I had the chance to meet outstanding researchers and discuss my research interests with them, which gave me valuable input, pointed out future directions and helped me build my scientific network. In particular, I was able to discuss issues I faced in my experiments that were also experienced by other researchers from different labs. We agreed to join forces and set up a WhatsApp group chat to share our protocols and findings.



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This was the first Toxoplasma conference that I have attended, and I really enjoyed the scientific exchange, made great contacts and think it will have many positive impacts on my own research.

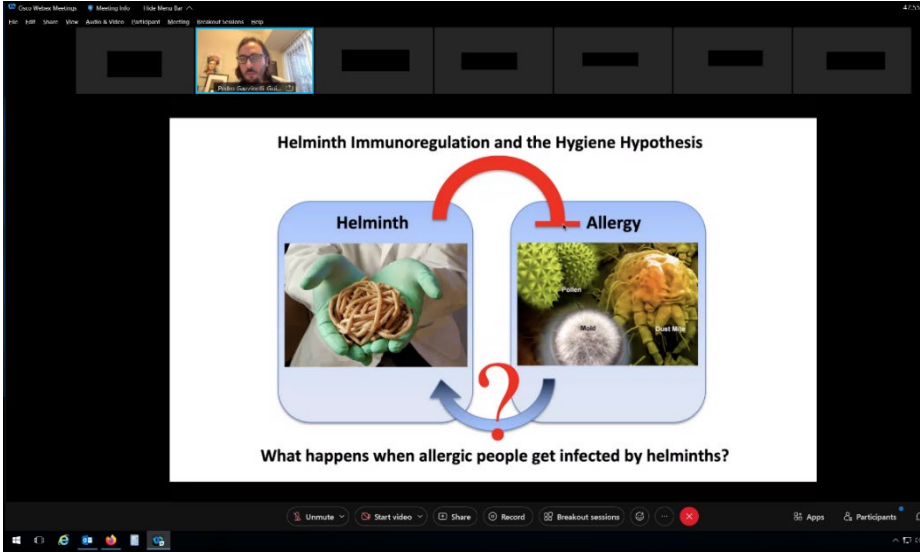
- David Warschkau

Berlin Parasitology Seminars (BPS)

Pedro H Gazzinelli-Guimaraes

National Institute of Health (NIH), Bethesda, MD, USA

February 08, 2022 (virtual)



Screenshot by Marko Janke

On February 08, we could welcome our long expected first BPS guest in 2022, Pedro Gazzinelli-Guimaraes. However, due to pandemic-related rules and regulations, he could not join us in Berlin in person. We could meet him only virtually. Pedro gave a talk entitled “IL-11 regulates innate mucosal immunity in helminth infections”. He brought together two major worldwide health concerns, worm infections with Helminths and allergic responses, which normally do not show up significantly in the same world region. Helminths can modulate the human immune response upon infection to dampen Th2-responses, which are necessary to fight and clear the worm. What if we could use this ability of Helminths to counteract allergic reactions?

- Marko

Jakob von Moltke

University of Washington, Seattle, WA, USA

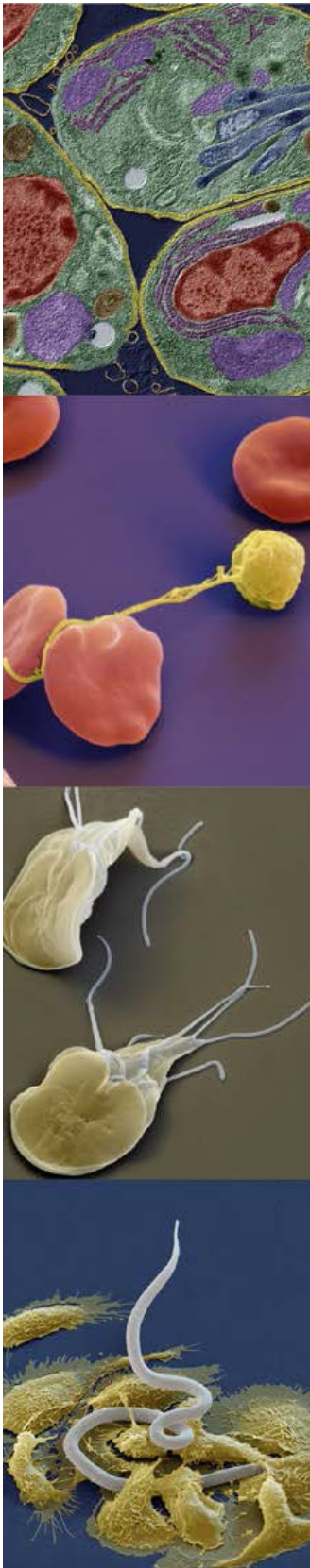
Mach 01, 2022 (hybrid)



Photo by Joshua Adjah

The monthly BPS talk for the GRK 2046 group came off successfully at the Robert-von-Ostertag Straße 7 (RvO SR 0.42) of the Institute of Immunology of Freie Universität Berlin. We were privileged to have Dr. Jakob von Moltke from University of Washington visit us in person and share some interesting findings from his work on “Small Intestinal Tuft Cells: sentinels and effectors of type 2 immunity”. It was an awesome time for students and PI (both in-person and online) to interact with him and discuss aspects of his work especially in relation to intestinal infections like *H. polygyrus* and *Nippostrongylus*. There were also discussions on the impact of these infections on type 2 immune responses against the helminths and allergens since he is particular interested in epithelial cells and gut immune circuits. Before his talk however, interested PhD students and PIs from the Graco were given the opportunity to schedule a meeting with him to either discuss their data or prospective work/experiments with him in order to get some expert feedback and input. This was then followed by a tour of the various labs in the Institute of Immunology. We really had a pleasant time discussing science and also learning about Jakob’s life’s journey through his career.

- Joshua Adjah



Michael J. Yabsley

University of Georgia, Athens, GA, USA

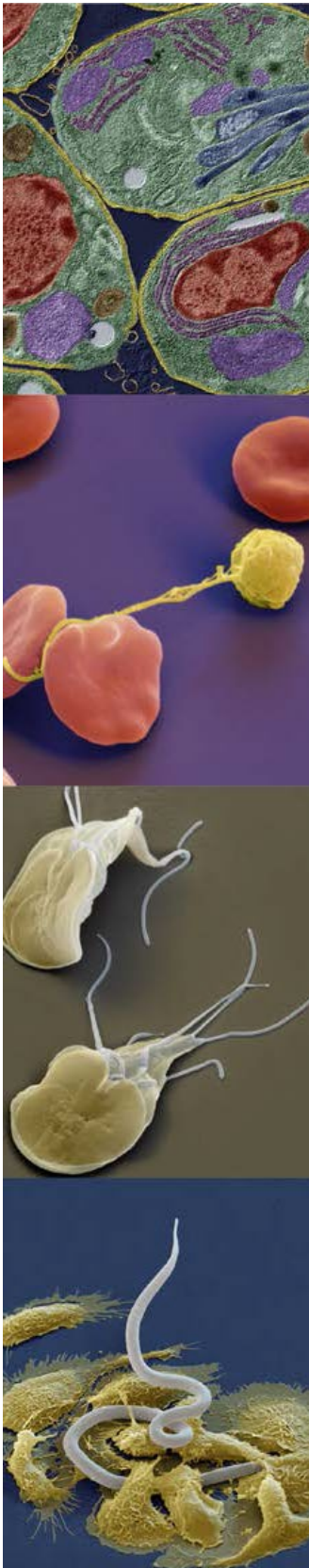
April 12, 2022 (virtual)



Screenshot by Marko Janke

Michael J. Yabsley is Professor of Wildlife Disease Ecology at the University of Georgia. His area of research is wildlife diseases, in particular he investigated animals as reservoirs of hosts for zoonotic and vector-borne pathogens. He is working on ticks, tick-borne pathogens, and raccoon parasites, but he is also a leading scientist in the field of Guinea worm ecology. In his talk: "The wild world of Guinea worms: a One Health approach to Guinea worm eradication", he reviewed the current situation of the eradication program and research. He emphasized the role of paratenic and reservoir hosts, which make the lifecycle more complex and therefore pose a new challenge to eradication.

- Irina Diekmann



Role Models in Infection Biology

Sophie Armitage

Freie Universität Berlin

May 10, 2022 (hybrid)



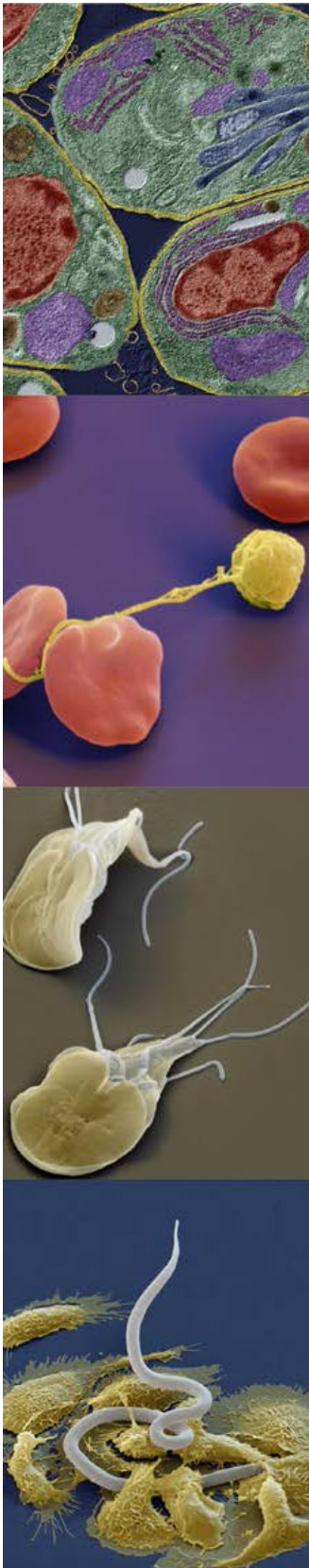
Taken from:
https://www.bcp.fu-berlin.de/en/biologie/arbeitsgruppen/zoologie/ag_armitage/people/armitage/index.html

When I first met Sophie during my masters in 2017, I was amazed by the way she communicates her research topics and how supportive she behaved towards students. Becoming a GRK 2046 PhD student, it was clear to me that Sophie Armitage would be a perfect guest speaker for the Role Models in Infection Biology seminar series.

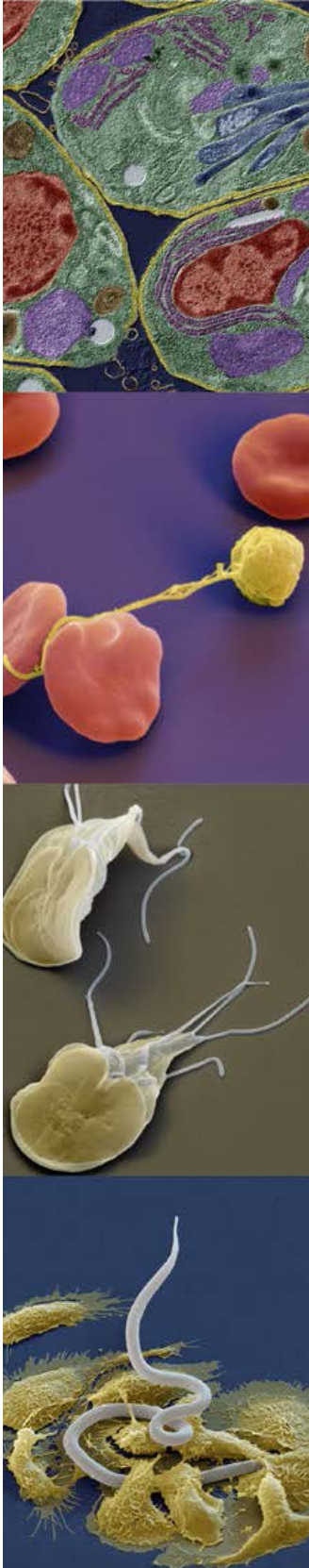
Sophie Armitage is the group leader of the Armitage Lab at Freie Universität Berlin which focuses on the eco-evo-immunology of insects. Her talk entitled “Evolutionary ecology of insect-pathogen interactions: Resistance, tolerance, virulence and the “wild” was an exciting journey into her group’s work

on evolution of resistance and tolerance to pathogens in *D. melanogaster*.

After Sophie answered many questions of interested PhD students, we had a quick, but delicious, brunch and then soon started the career discussion outside the building with a lot of sunshine. We had a nice and



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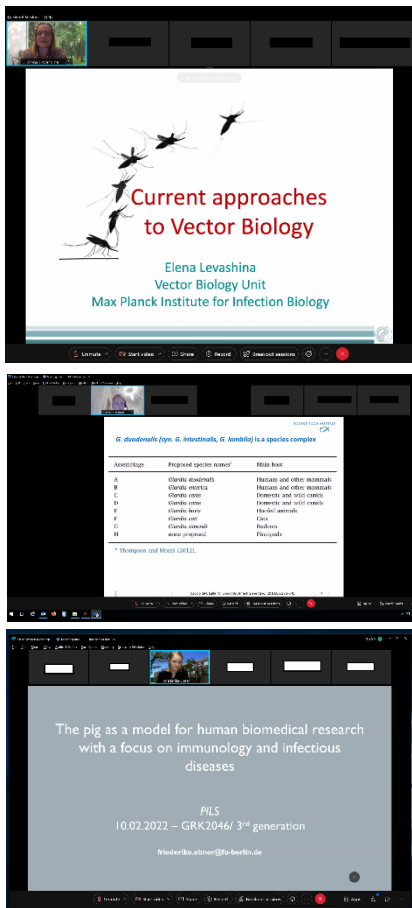


very personal career briefing talking about the challenges and advantages of a scientific career. Sophie's pleasant and professional way to depict her experiences created an atmosphere of trust and comfort that made it easy for us to ask all kinds of questions.

- Maria Serocki

Parasite Infection Lecture Series (PILS)

October 2021 – March 2022 (online)



Screenshots by Marko Janke

The lecture series encompassing the research projects of all GRK 2046 PIs came to an successful end in March this year. Over the course of several months, the PI presented their work, relevant studies and fundamental concepts in their field of research. Going from molecular mechanism to cellular processes and ending with the complex interplay in ecological systems, the series had a wide range of interesting topics. Besides that, it offered a great opportunity to have a look at the different PIs and their past work allowing more in depth discussion and an outlook into possible collaborations. I really liked the idea of a lecture series given interely by GRK 2046 PIs as it gives a good overview of all the fields the graduate school covers. It was interesting to see the different styles of presentations the PIs chose in this really open format of a lecture. I also learnt a lot especially in fields not so familiar to myself, like old forgotten immunology lessons for instance.

- Otto Netzel

Mini symposium on Africa workshop in 2023

May 25, 2022



Photo by Marko Janke

One part of the educational program of our Research Training Group is the Africa workshop (field work), which we offer once per GRK generation. Due to the pandemic situation with corresponding rules and regulations, we could not start our workshop in Africa this year and had to postpone it to early spring 2023.

Nevertheless, we wanted to prepare this workshop early. During this trip, 8 PhD students have the chance to experience field work, which is a major component of many parasite research projects. In Africa, they will start small projects such as collecting and analyzing samples from wild animals. Lectures and seminars of GRK 2046 PIs and local scientists will finalize the ambitious work schedule.

After two workshops in the Serengeti National Park in 2016 and 2019, the Africa workshop for the 3rd generation will take us to Namibia looking for a new challenge.

To prepare everything, we scheduled this mini symposium. After explaining the idea and concept of the workshop, Bettina Wachter (PI, project C1) introduced everyone to our destination Namibia, the local environment and the local fauna, including all relevant wild life animals

Parasite Infections GRK 2046

Freie Universität Berlin

Mini Symposium Africa Workshop

May 25, 2022, 5pm

Preparation of the Africa field work Workshop in March 2023

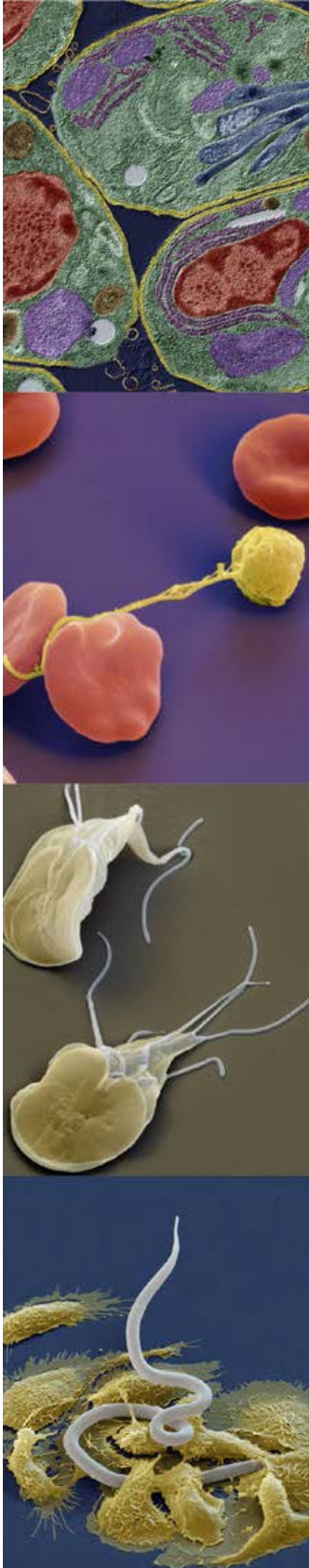
Veterinärmedizin, Campus Döberitz, Freie Universität Berlin
Döberitzweg 119b (Haus 9), 12555 Berlin

Virtual attendance via WebEx video conference
Meeting number (access code): 2752 076 2162
Meeting password: UqjDandZu854

Schedule:

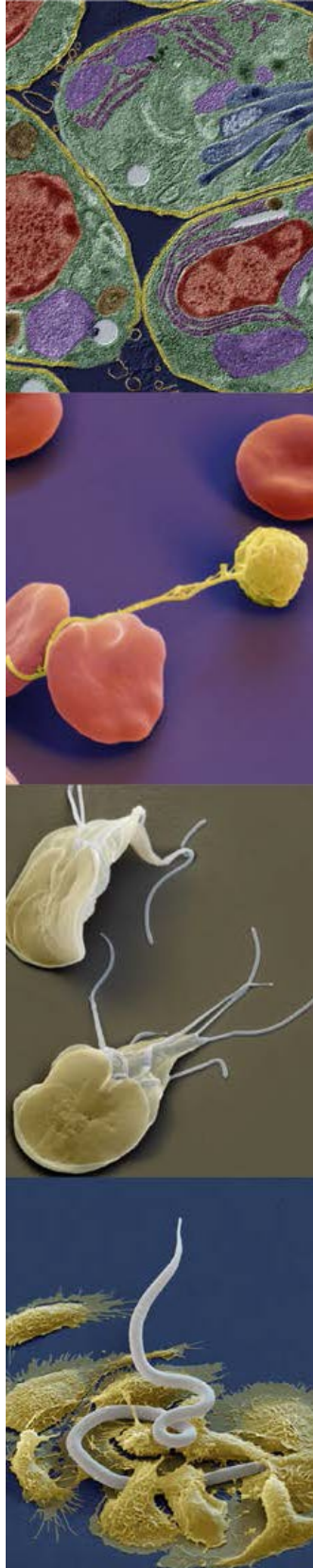
- 1) Introduction on Africa Workshop in general (Marko Janke, Susanne Hürtmann, HeiBERT Hofer)
- 2) Information on location of Workshop – Introduction Namibia (Bettina Wachter)
- 3) Introduction and discussion of planned scientific projects (Bettina Wachter, HeiBERT Hofer, Susanne Hürtmann)
- 4) Questions and Answer session
- 5) Social event (BBQ)

Contact:
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Susanne Hürtmann: susanne.huertmann@fu-berlin.de



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we might encounter during our workshop. Next, Bettina Wachter, Heribert Hofer (PI, project C4) and Susanne Hartmann (PI, project B4) introduced and explained different small research projects, which might be possible to carry out in the short period of time (10 days). After a vital debate, everybody had the chance to discuss the workshop in further details during our social event, a self-organized BBQ.

All GRK 2046 PhD students have the chance now to apply for a spot in this special workshop by submitting a brief proposal for a small scientific project.

- Marko

Upcoming Events

Berlin Parasitology Seminars

September 13, 2022, 5pm – Markus Ganter (hybrid)

October 11, 2022, 5pm – Peter Geldhof (hybrid)

November 8, 2022, 5pm – Daniel Fernandez Ruiz (hybrid)

November 22, 2022, 5pm – Jennifer Keiser (hybrid)

December 13, 2022, 5pm – Mathilde Gendrin (hybrid)

PhD student Symposium

August 1 - 3, 2022, Gut Klostermühle

Due to the Corona Pandemic, our third generation PhD students had little chance to meet each other in person, communicate and interact. Because this interaction is important, especially for PhD students, they developed an idea to meet all together and discuss science and socialize. On August 3-5, 2022, a PhD Symposium will take place, which is self-organized by our PhD students. A location in Gut Klostermühle was found and a schedule was developed. We will report on this Symposium with the next newsletter.

GRK 2046 annual Retreat

October 27-28, 2022, Berlin

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ZIBI Immunology Lecture Series (ongoing)

Every Thursday from 5pm

Berlin Seminar for Resistance Research

October 17, 2022, 11am – Edwin Claerebout (hybrid)

Graduated GRK 2046 students



Congratulations to our associated PhD student Benedikt Fabian (Robert-Koch-Institute, project C3).

Date of defense: 28.02.2022.

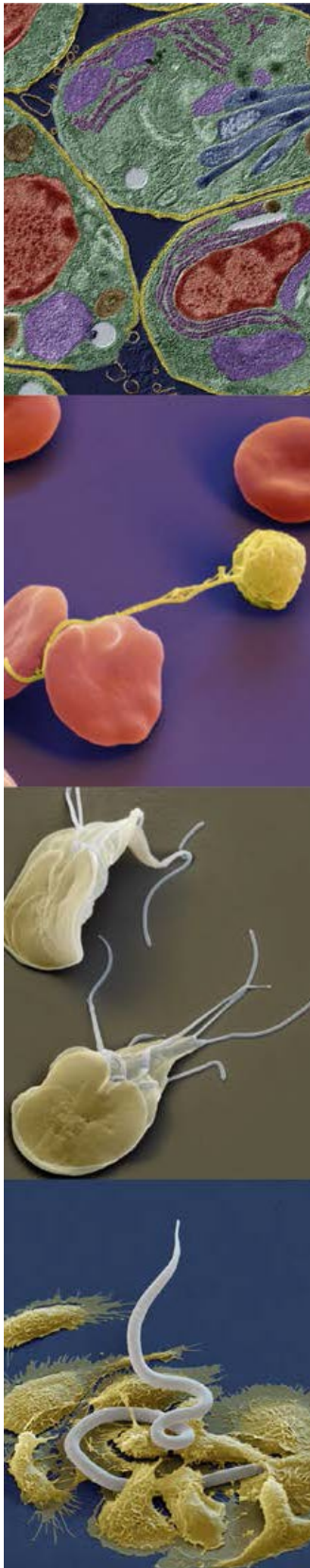
Publications

Whip- and pinworm infections elicit contrasting effector and distinct regulatory responses in wild house mice

Zhang H, Bednář L, Heitlinger E, Hartmann S, Rausch S. (2022). *International Journal for Parasitology* 6:S0020-7519(22)00080-7. doi: 10.1016/j.ijpara.2022.03.006.

Abstract:

Infections with high doses of intestinal nematodes result in protective immunity based on robust type 2 responses in most mouse lines under laboratory conditions. Here, we report on cellular responses of wild house mice from northern Germany. We detected robust Th1 responses in wild house mice naturally infected with the whipworm *Trichuris muris*. In contrast, mice infected with pinworms (*Syphacia*, *Aspicularis*) reported type-2 activity by elevated IgG1 levels and eosinophil counts, but also harbored high frequencies of Foxp3+ regulatory T cells, suggesting that natural whip- and pinworm infections induce distinct immunoregulatory as well as effector profiles.



Sialylated N-glycans mediate monocyte uptake of extracellular vesicles secreted from *Plasmodium falciparum*-infected red blood cells

Ben Ami Pilo H*, Khilji SK*, Lühle J*, Biskup K, Gal BL, Rosenhek Goldian I, Alfandari D, Revach OY, Kiper E, Morandi MI, Rotlopf R, Porat Z, Blanchard V, Seeberger PH, Regev-Rudzki N, Moscovitz O. (2022).

Journal of Extracellular Biology 1:e33. doi: 10.1002/jex2.33. *equal contribution

Abstract:

Glycoconjugates on extracellular vesicles (EVs) play a vital role in internalization and mediate interaction as well as regulation of the host immune system by viruses, bacteria, and parasites. During their intraerythrocytic life-cycle stages, malaria parasites, *Plasmodium falciparum* (Pf) mediate the secretion of EVs by infected red blood cells (RBCs) that carry a diverse range of parasitic and host-derived molecules. These molecules facilitate parasite-parasite and parasite-host interactions to ensure parasite survival.

To date, the number of identified Pf genes associated with glycan synthesis and the repertoire of expressed glycoconjugates is relatively low. Moreover, the role of Pf glycans in pathogenesis is mostly unclear and poorly understood. As a result, the expression of glycoconjugates on Pf-derived EVs or their involvement in the parasite life-cycle has yet to be reported.

Herein, we show that EVs secreted by Pf-infected RBCs carry significantly higher sialylated complex N-glycans than EVs derived from healthy RBCs. Furthermore, we reveal that EV uptake by host monocytes depends on N-glycoproteins and demonstrate that terminal sialic acid on the N-glycans is essential for uptake by human monocytes. Our results provide the first evidence that Pf exploits host sialylated N-glycans to mediate EV uptake by the human immune system cells.

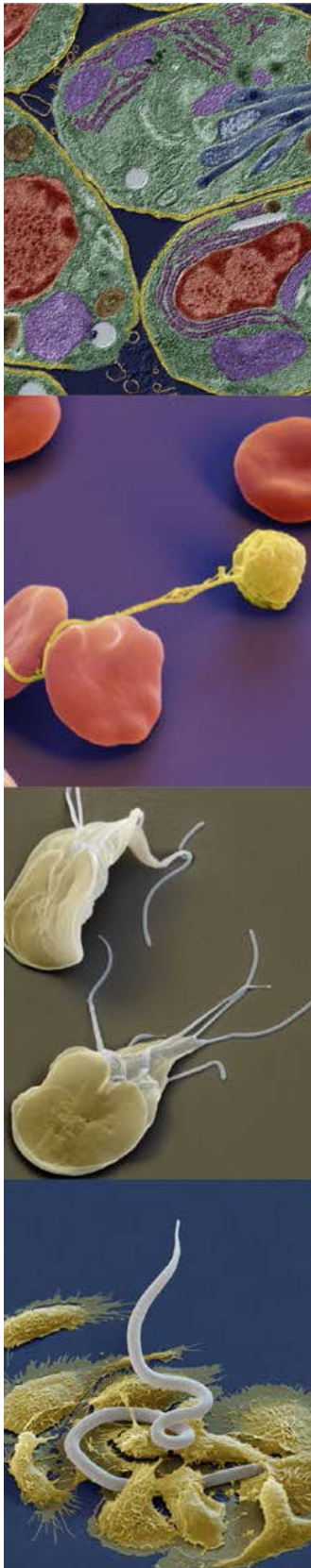
In Vitro Confirmation of Artemisinin Resistance in *Plasmodium falciparum* from Patient Isolates, Southern Rwanda, 2019

van Loon W, Oliveira, R, Bergmann C, Habarugira F, Ndoli J, Sendegeya A, Bayingana C, Mockenhaupt FP. (2022).

Emerging Infectious Diseases 28:852-5. doi: 10.3201/eid2804.212269.

Abstract:

Artemisinin resistance in *Plasmodium falciparum* is conferred by mutations in the *kelch 13* (*K13*) gene. In Rwanda, *K13* mutations have increased over the past decade, including mutations associated with delayed parasite clearance. We document artemisinin resistance in *P. falciparum* patient isolates from Rwanda carrying *K13* R561H, A675V, and C469F mutations.



DNA-based quantification and counting of transmission stages provides different but complementary parasite load estimates: An example from rodent coccidia (*Eimeria*)

Jarquín-Díaz VH, Balard A, Ferreira SCM, Mittné V, Murata JM, Heitlinger E. (2022).

Parasites & Vectors, 15:45. doi: 10.1186/s13071-021-05119-0.

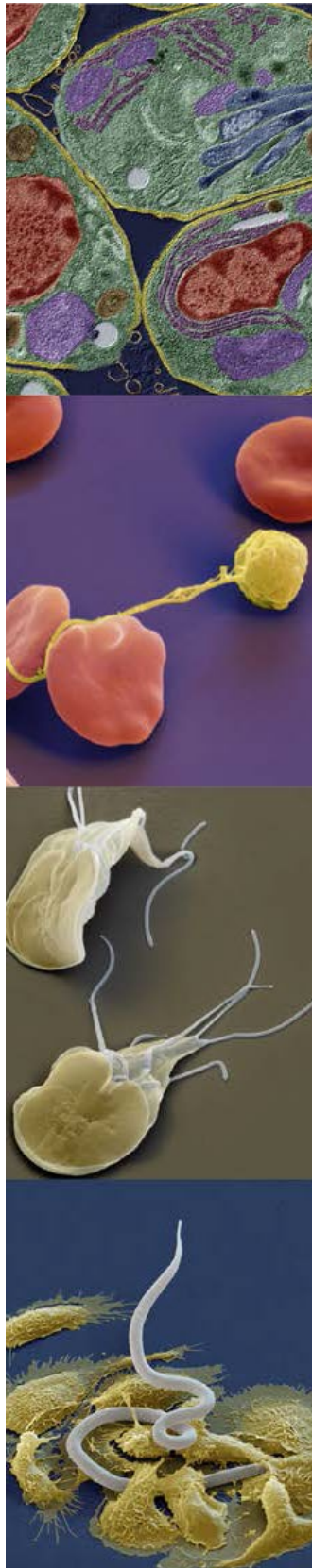
Abstract:

Background: Counting parasite transmission stages in faeces is the classical measurement to quantify "parasite load". DNA-based quantifications of parasite intensities from faecal samples are relatively novel and often validated against such counts. When microscopic and molecular quantifications do not correlate, it is unclear whether oocyst counts or DNA-based intensity better reflects biologically meaningful concepts. Here, we investigate this issue using the example of *Eimeria ferrisi* (Coccidia), an intracellular parasite of house mice (*Mus musculus*).

Methods: We performed an infection experiment of house mice with *E. ferrisi*, in which the intensity of infection correlates with increased health impact on the host, measured as temporary weight loss during infection. We recorded the number of parasite transmissible stages (oocysts) per gram of faeces (OPG) and, as a DNA-based measurement, the number of *Eimeria* genome copies per gram of faeces for 10 days post-infection (dpi). We assessed weight loss relative to the day of experimental infection as a proxy of host health and evaluated whether DNA or oocyst counts are better predictors of host health.

Results: Absolute quantification of *Eimeria* DNA and oocyst counts showed similar but slightly diverging temporal patterns during 10 dpi. We detected *Eimeria* DNA earlier than the first appearance of oocysts in faeces. Additionally, *Eimeria* OPGs within each dpi did not explain parasite DNA intensity. Early dpi were characterized by high DNA intensity with low oocyst counts, while late infections showed the opposite pattern. The intensity of *Eimeria* DNA was consistently a stronger predictor of either maximal weight loss (1 value per animal during the infection course) or weight loss on each day during the experiment when controlling for between-dpi and between-individual variance.

Conclusions: *Eimeria ferrisi* oocyst counts correlate weakly with parasite intensity assessed through DNA quantification. DNA is likely partially derived from life-cycle stages other than transmissible oocysts. DNA-based intensities predict health outcomes of infection for the host more robustly than counts of transmissible stages. We conclude that DNA-based quantifications should not necessarily require validation against counts of transmissible stages. Instead, DNA-based load estimates should be evaluated as complementary sources of information with potential specific biological relevance for each host-parasite system.



From 3D to 2D: Harmonization of Protocols for Two-dimensional Cultures on Cell Culture Inserts of Intestinal Organoids from Various Species

Warschkau D, Delgado-Betancourt E, Holthaus D, Müller A, Kliem G, Krug SM, Schulzke J-D, Aebischer T, Klotz C, Seeber F. (2022). *Bio-Protocol* 12(2):e4295. doi: 10.21769/BioProtoc.4295

Abstract:

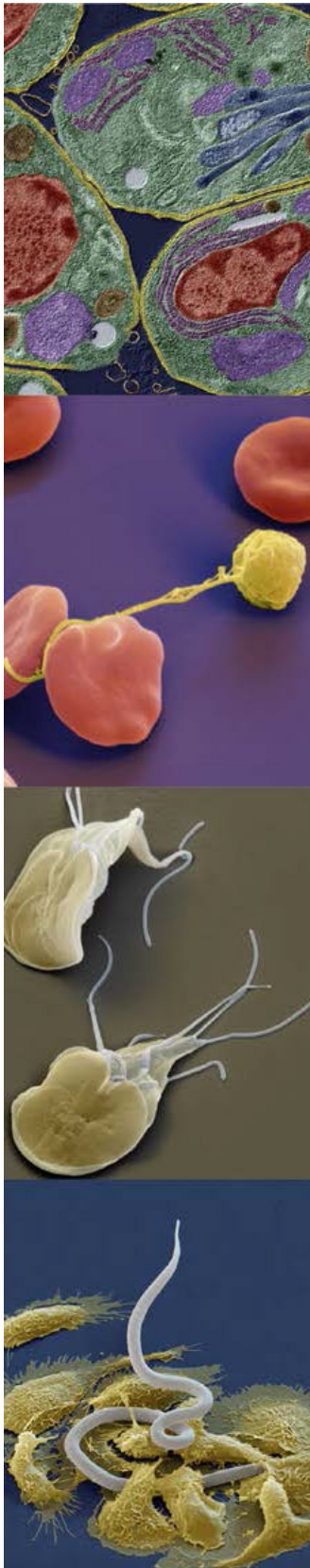
In the expanding field of intestinal organoid research, various protocols for three- and two-dimensional organoid-derived cell cultures exist. Two-dimensional organoid-derived monolayers are used to overcome some limitations of three-dimensional organoid cultures. They are increasingly used also in infection research, to study physiological processes and tissue barrier functions, where easy experimental access of pathogens to the luminal and/or basolateral cell surface is required. This has resulted in an increasing number of publications reporting different protocols and media compositions for organoid manipulation, precluding direct comparisons of research outcomes in some cases. With this in mind, here we describe a protocol aimed at the harmonization of seeding conditions for three-dimensional intestinal organoids of four commonly used research species onto cell culture inserts, to create organoid-derived monolayers that form electrophysiologically tight epithelial barriers. We give an in-depth description of media compositions and culture conditions for creating these monolayers, enabling also the less experienced researchers to obtain reproducible results within a short period of time, and which should simplify the comparison of future studies between labs, but also encourage others to consider these systems as alternative cell culture models in their research.

Age-dependent rise in IFN- γ competence undermines effective type 2 responses to nematode infection.

Kapse B, Zhang H, Affinass N, Ebner F, Hartmann S, Rausch S. (2022). *Mucosal Immunology* doi: 10.1038/s41385-022-00519-6.

Abstract:

The efficient induction of type 2 immune responses is central to the control of helminth infections. Previous studies demonstrated that strong Th1 responses driven by intracellular pathogens as well as a bias for type 1 activity in senescent mice impedes the generation of Th2 responses and the control of intestinal nematode infections. Here, we show that the spontaneous differentiation of Th1 cells and their expansion with age restrains type 2 immunity to infection with the small intestinal nematode *H. polygyrus* much earlier in life than previously anticipated. This includes the more extensive induction of IFN- γ competent, nematode-specific Th2/1 hybrid cells in BALB/c mice older than three months compared to younger animals. In C57BL/6 mice, Th1 cells accumulate more



rapidly at steady state, translating to elevated Th2/1 differentiation and poor control of parasite fitness in primary infections experienced at a young age. Blocking of early IFN- γ and IL-12 signals during the first week of nematode infection leads to sharply decreased Th2/1 differentiation and promotes resistance in both mouse lines. Together, these data suggest that IFN- γ competent, type 1 like effector cells spontaneously accumulating in the vertebrate host progressively curtail the effectiveness of anti-nematode type 2 responses with rising host age.

Generation of glycan-specific nanobodies

Khilji SK, **Goerdeler F**, Frensemeier K, **Warschkau D**, **Lühle J**, Fandi Z, Schirmeister F, Chen ZA, Turak O, Mallagaray A, Boerno S, Timmermann B, Rappsilber J, **Seeberger PH**, **Moscovitz O**. (2022). *Cell Chemical Biology* Jun 6:S2451-9456(22)00199-4. doi: 10.1016/j.chembiol.2022.05.007

Abstract:

The development of antibodies that target specific glycan structures on cancer cells or human pathogens poses a significant challenge due to the immense complexity of naturally occurring glycans. Automated glycan assembly enables the production of structurally homogeneous glycans in amounts that are difficult to derive from natural sources. Nanobodies (Nbs) are the smallest antigen-binding domains of heavy-chain-only antibodies (hcAbs) found in camelids. To date, the development of glycan-specific Nbs using synthetic glycans has not been reported. Here, we use defined synthetic glycans for alpaca immunization to elicit glycan-specific hcAbs, and describe the identification, isolation, and production of a Nb specific for the tumor-associated carbohydrate antigen Globo-H. The Nb binds the terminal fucose of Globo-H and recognizes synthetic Globo-H in solution and native Globo-H on breast cancer cells with high specificity. These results demonstrate the potential of our approach for generating glycan-targeting Nbs to be used in biomedical and biotechnological applications.

Happy holidays!

Well, the summer break is near and temperature is rising like hell in Berlin. Please use sun lotion and stay safe in the shade.

- Otto and Marko

