

NEWSLETTER

Volume - June 2023

Gefördert durch

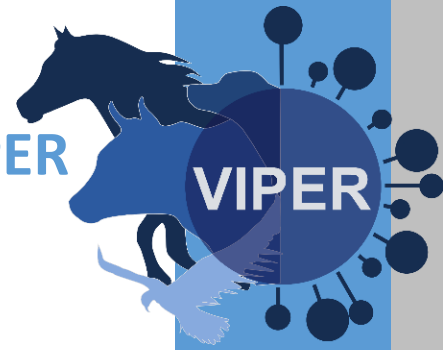
DFG Deutsche
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We are proud to release the fourth annual VIPER newsletter four years after the official start of the Research Training Group in April 2019. Within this issue, we will recap the first year of the second cohort of VIPER students, all their experiences and achievements during their VIPER journey.

Content

- On-site visit for the prolongation of VIPER 2
- En-block schools
 - Freshman class 5
 - Sophomore class 7
- Travel reports of VIPER students
 - Biodiversity: Excursion to the Crau/Camargue 9
 - 32nd Annual Meeting of the Society for Virology in Ulm 12
 - Next Generation Sequencing Bioinformatics Course in Cambridgeshire 13
 - Next Generation Sequencing Course at the FLI in Greifswald 13
 - 66th Annual meeting of the DVG-group of veterinary pathology in Fulda 16
- Recent activities – social interactions
 - Christmas party and neon mini golf 17
 - The treasure of the Incas - an evening in the escape room 18
- Achievements: Congratulation to our new VIPER PhDs 19
- Recent VIPER publications 21
- Outlook and announcements 25
- Impressum 25

On-site visit for the prolongation of VIPER on 9th and 10th of March 2023



GRK 2485

What will the future of VIPER be like?

Agenda of the on-site visit

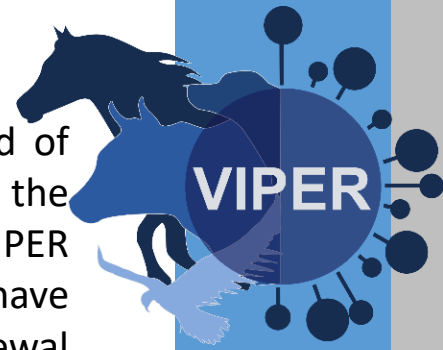
Thursday, 9th of March 2023

- 15:00 Welcome address by the president of the University of Veterinary Medicine Hannover Dr. Dr. h. c. mult. **G. Greif**
- 15:05 Welcome and introduction of VIPER by the future speaker of the research training group Prof. Dr. **A. Beineke**
- 15:15 Presentation of the Research Training Group and Discussion - **oral presentations** given by VIPER students
André Gömer (1st cohort): “Evolution and host-immune response in hepatitis C virus infection”
Laura Heydemann (2nd cohort): “Long term consequences of SARS-CoV-2 infection in the lung and the CNS in the golden Syrian hamster model”
Aparna Shandheep (2nd cohort): “RNA-based in vivo expression of monoclonal antibodies”
- 16:15 Coffee break
- 16:30 Presentation of the Research Training Group and Discussion - **poster presentations** given by VIPER students
- 18:30 Discussion among doctoral researchers and reviewers

Friday, 10th of March 2023

- 10:15 Plenary discussion (Reviewers, VIPER students, VIPER PIs, representative of the responsible ministry and president of the University of Veterinary Medicine Hannover)





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DFG-funded Research Training Groups have a funding period of 4.5 years. After expiration of the first funding period, there is the possibility for an extension for another 4.5 years. We in VIPER would like to build on the successful first period and have therefore submitted a detailed progress report and renewal proposal to the DFG in September 2022.

On 9th and 10th of March 2023, the on-site visit took place with representatives of the DFG and external reviewers selected by the DFG.



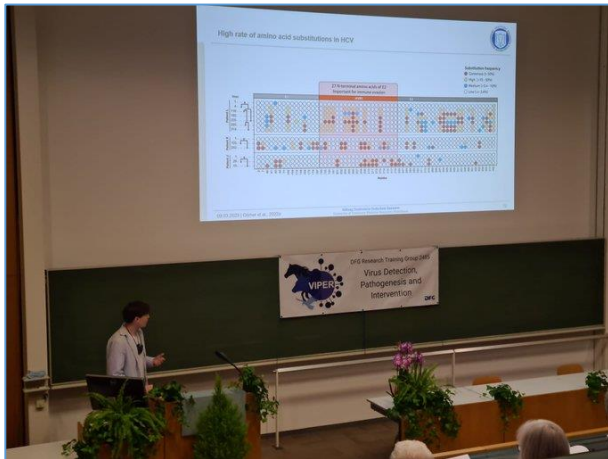
We had prepared a detailed schedule for the two days. The first day started with a welcome speech by the president of University of Veterinary Medicine Hannover, Dr. Gerhard Greif.

Afterwards, Professor Andreas Beineke, the future speaker of VIPER, gave an enthusiastic presentation about the adapted and improved concept of our research training group. Thereafter, the VIPER students were in the focus.

First, 3 students presented their projects in a 15 minute presentation.



André Gömer (Department of Molecular & Medical Virology, Ruhr University Bochum) from the 1st cohort presented his work on evolution and host-immune response in hepaciviral infections. Laura Heydemann (Department of Pathology, University of Veterinary Medicine Hannover) from the 2nd cohort gave a talk on long term consequences of SARS-CoV-2 infection in the lung and the



central nervous system in the golden Syrian hamster model. Afterwards, Aparna Shandheep (Twincore – Centre for Experimental and Clinical Infection Research) from the 2nd cohort presented her project on RNA-based in vivo expression of monoclonal antibodies.

These lectures were followed by the poster presentations and discussions, for which each student had prepared a poster about their project. Afterwards, there was a discussion about the research training group between reviewers and VIPER students.



On the second day of the on-site visit, a large plenary discussion with all reviewers, VIPER students, VIPER PIs, as well as the president of the TiHo and a representative of the responsible ministry took place.

In summary, we performed great in all aspects and we are sure that the reviewers and the representatives of the DFG feel the same.

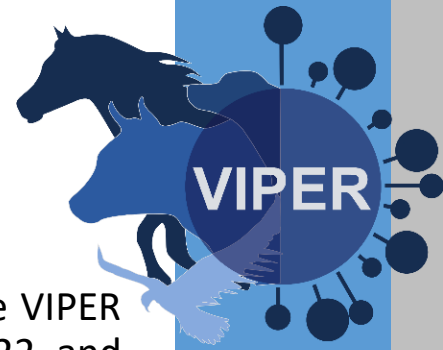
At the beginning of May we finally received the confirmation that VIPER will be extended.

We are excited and very much looking forward to continuing the success story of our research training group VIPER for another 4.5 years.

En-block schools

Freshman class (26.-30.09.2022)

The first one-week en-block school for the second cohort, the VIPER freshman class took place on September 26th to 30th, 2022 and covered aspects regarding basics in virology, basics in gross pathology and histology, basics in immunology, ethics and biodiversity (see schedule).



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Monday	Tuesday	Wednesday	Thursday	Friday
9.00 – 9.15 Welcome 9:15 - 10:15 Paul Becher “Virus evolution” 10:45 – 12:00 Toni Meister “Recent progress on stability & inactivation of SARS-CoV-2”	8:00 – 08:30 Wolfgang Baumgärtner “Introduction into pathology” 08:30 - 11:30 Necropsy (5 groups) 11:30 - 12:15 Discussion and summary of the necropsy cases	9:00-10:15 Mariana González Hernández “Innate immunity: Host restriction factors” 10:45-12:00 Prajeeth Chittappen Kandiylil “Adaptive immunity: T cells”	9:00 - 11:30 Peter Kunzmann “Ethics in Science”	9:00 – 11:00 Bernd Schierwater “Interdisciplinary Science: From the Urmetazoan to space research and cancer genetics”
14:00-14:45: Get-together with coffee and cake 14:45-15:30: Pathology lab tour (3 groups; diagnostic lab, scanner, elmi)	14:00-15:00: Andreas Beineke Preparation and staining of slides/ Basics in histology 15:00-16.00 Gross findings in virus-induced diseases	13:00-17:00 Arne Jung Sample collection and storage (Clinic for Poultry; 2 groups)	13:00-17:00 Stefanie Becker Field trip: Flagging for ticks, Microscopy/ Classifying “male”, “female”, “nymphs”, Insectarium	13:00-17:00 Klaus Jung Bioinformatics, Data analytics and Data Science

Invited speakers of the VIPER freshman class:

Toni Meister (Department of Molecular&Medical Virology, Ruhr University Bochum)

Mariana González Hernández (Research Center for Emerging Infections and Zoonoses (RIZ), University of Veterinary Medicine, Hannover)

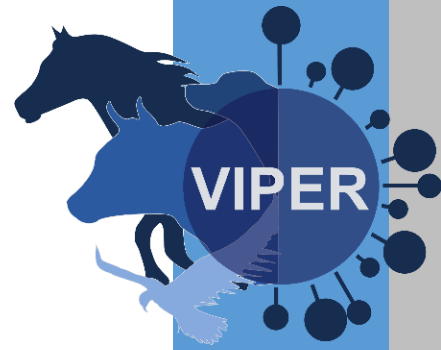
Prajeeth Chittappen Kandiylil (RIZ, University of Veterinary Medicine, Hannover)

Arne Jung (Clinic for Poultry, University of Veterinary Medicine, Hannover)

Peter Kunzmann (Institute for Animal Hygiene, Animal Welfare and Farm Animal Behaviour, University of Veterinary Medicine, Hannover)

Bernd Schierwater (Institute for Animal Ecology, University of Veterinary Medicine, Hannover)

Students' opinions on the freshman class



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Necropsy:
This was awesome! Especially
for someone who has never
done this before.

I liked this a lot, it
was very easy to
follow and
understand

Interesting lectures with a
good, understandable intro
with final entry into complex,
contemporary topics

Gross findings
was awesome!

I enjoyed most of the
courses and I am happy
to have had the
opportunity to learn a bit
about other research
topics.

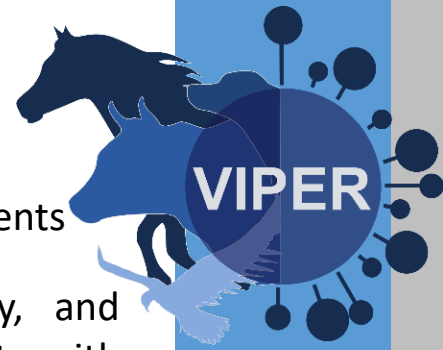
Sample collection and
storage: Very enthusiastic
presentation and a great
amount of information
delivered (very much) on
necropsy! More than I
expected.

Interdisciplinary Science: From the Urmetazoan
to space research and cancer genetics:
The talk was a nice excurs into other scientific fields.
Although not really related to viruses, it was a fresh
wind compared to other talks. It showed potential for
further also virological studies.

"Innate immunity: Host restriction factors":
Outstanding job done by Mariana :) Loved her lecture.

Sophomore class (06.-10.02.2023)

In the second one-week en-block school in February, students were introduced to specific topics such as neuropathology, parasitology, animal husbandry, biodiversity, epidemiology, and mathematical modeling. Hands-on courses provided students with the opportunity to practice their skills in mosquito biology and infection and fluorescence activated cell sorting (FACS) analysis (see schedule).



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Monday	Tuesday	Wednesday	Thursday	Friday
8:00 - 8:15 Welcome address	Stefanie Becker 10:00 – 12:00 Inside insects: intruders, immunity and ill behaviour	Claudia Schulz 9:00 – 11:00 Ferret Husbandry and Handling, Cage Systems, Hygiene Protocols	Dennis Rubbenstroth 10:15 – 12:00 Bornaviruses and rustrela virus (RusV): causes of fatal encephalitis in a broad range of mammals	Michael Böer 09:15 – 10:45 Biodiversity
Wolfgang Baumgärtner 08:15 – 09:30 10:00 – 11.30 11:45 - 13:00 Pathology of viral disease of the central nervous system in domestic animals				Terry Jones 11:00 – 13:15 Computational approaches to virology: why you can and should learn to code
14:00-17:00 Imke Steffen/ MartinLudlow Case report, Sequence analyses, cloning exercises	Group A: 13:00 - 16:00 Stefanie Becker Insect Injections, Brain Preparations, Insectarium Group B: 14:00-17:00 Ulrich Kalinke FACS analyses	Group B: 13:00 - 16:00 Stefanie Becker Insect Injections, Brain Preparations, Insectarium Group A: 14:00-17:00 Ulrich Kalinke FACS analyses	Pizza break 12:30-14:30 Michael Böer 15:15 – 16:45 Biodiversity	Andreas Beineke 13:15-13:45 Final discussion and closing remarks

Invited speakers of the VIPER sophomore class:

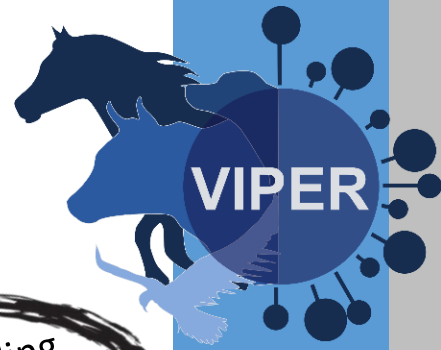
Claudia Schulz (Research Center for Emerging Infections and Zoonoses (RIZ), University of Veterinary Medicine, Hannover)

Dennis Rubbenstroth (Friedrich-Loeffler-Institute, Institute of Diagnostic Virology, Greifswald - Island of Riems)

Michael Böer (former director of the Osnabrück Zoo and extracurricular Professor at the University of Veterinary Medicine Hannover)

Terry Jones (Institute of Virology, Computational virology, ancient viruses, virus evolution, virus discovery, virus ecology, computational virus diagnostics, Charité, Berlin)

Students' opinions on the sophomore class



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The lectures were very interesting, and it's nice to know what other colleagues do.

Some courses were including a lot o themes. Class was structured and the topics selected were relevant.

"Inside insects: intruders, immunity and ill behavior": Phenomenal talk! 😊

"Pathology of viral disease of the central nervous system in domestic animals": The course was intensive and had a lot of material. I am personally glad to get an overview of neuropathology in such a short period of time.

"Computational approaches to virology: why you can and should learn to code": One of the best interactive bioinformatics course on Friday afternoon :)

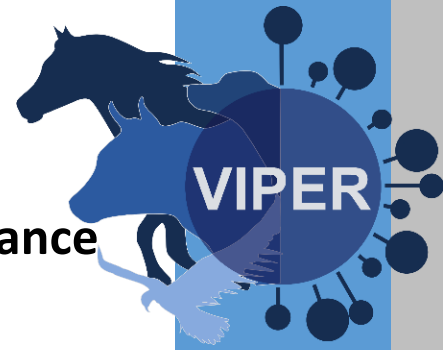
"Computational approaches to virology: why you can and should learn to code": This one was very interesting and good. Please include more external speakers like him in the future.

"Ferret Husbandry and Handling, Cage Systems, Hygiene Protocols": Ferrets are very cute.

Travel reports of VIPER students

Biodiversity: Excursion to the Crau/Camargue, France

(Tom Schreiner)



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The excursion to the Crau/Camargue region as a facultative training course for the VIPER students was an adventurous field-trip, offering me an hands-on occasion to get insights into the origin, biodiversity and maintenance of this unique European region.

Broadly, the excursion focused on the fragile and precious biodiversity with special emphasis on endemic species to this region and critically enlightened the past, contemporary and future ecological human impact. Specifically, to gain a broad overview of human impact to the rural region, we visited on our



Visit of the dry Crau

first day the local weekly market in Arles and were encouraged to speak to local merchants about the origin, production, treatment etc. of their merchandise. Subsequently, we critically discussed with the researchers and professors the ecological and economical aspect of the offered foods and wares. Throughout the excursion, by visiting



Visit of the wet Crau

every day different locations of interest in the area, we gained a geographical overview of the region with the dry Crau, the wet Crau, the alpilles together with its man-made impacts (highways, industry, racing tracks, waste dumps etc.) and were given locally guided tours on an almost daily basis. For example, we had a guided tour in the National

Nature Reserve of *Marais du Viguierat*, a part of the wet Crau, where we had the opportunity to observe the variety of avian species living in the Camargue, as well as a guided tour in the *Salin d'Aigues-Mortes*, where the famous southern French salt originates.

The majority of our trips during our stay was not only accompanied by local guides but also by oral presentations from participating students. Therefore, few weeks prior the start of the



Visit of the alilles

excursion, each student was given a scientific topic related to the excursion to be performed as oral presentations of 10 to 15 minutes with handouts for their fellow students to be held during the excursion in the respective outdoor location. I, for example, had to prepare an oral presentation about *placozoa*, an ancient, multicellular, aquatic

organism and the main research interest of Prof. Dr. Bernd Schierwater. I held my talk on the rocky shore of the bay *Calanque du tamaris* and after my oral presentation, we were equipped with snorkels, fins and masks and proceeded with the practical collection of suitable stones from the ocean to be examined for the presence of these microorganisms. Another main topic of the excursion was the observation and harmless sample-collection of endemic species of dragonflies in different spots. Therefore, we were given



Passage through the "Route des crêtes" while traveling through the region

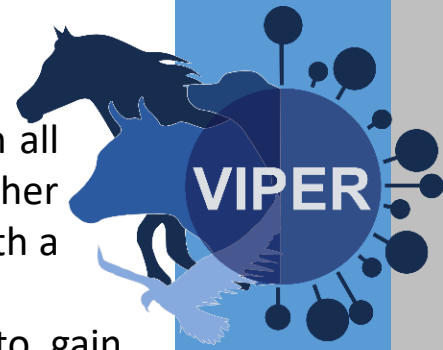
nets to catch the insects and taught how to handle and identify the caught dragonflies. The aim of this was to determine the genetic pool present in the population of a specific species. Towards the end of the excursion, we were given the opportunity to make a bicycle tour around the saltwater lagoon of *Étang de Vaccarès* with a lunch break cooked with regional products at a local

Identification of caught dragonflies with corresponding literature



Identification of caught dragonflies with corresponding literature

restaurant. We were meant to make our own observations in all visited locations during the day and discuss them altogether during a debriefing meeting in the evening at the campsite with a glass of local rosé-wine. Although not closely related to my scientific project, the excursion gave me the opportunity to gain insights into the theoretical and practical works of the VIPER-associated institute for Animal Ecology and to meet and work with the welcoming and kind scientists and personnel from the working groups of Prof. Dr. Heike Hadrys and Prof. Dr. Bernd Schierwater. Finally, I've learned to treat regions I've never been before with a more ecologically conscious and sustainable point of view and I can only recommend this excursion to fellow VIPER students with an interest in ecology, biology and camping.



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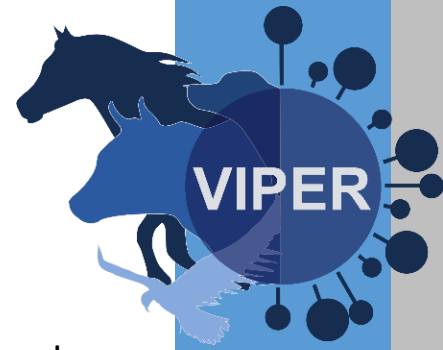


Group photo of some students and myself during the bike tour

32nd Annual Meeting of the Society for Virology in Ulm, Germany

(Michelle Jagst)

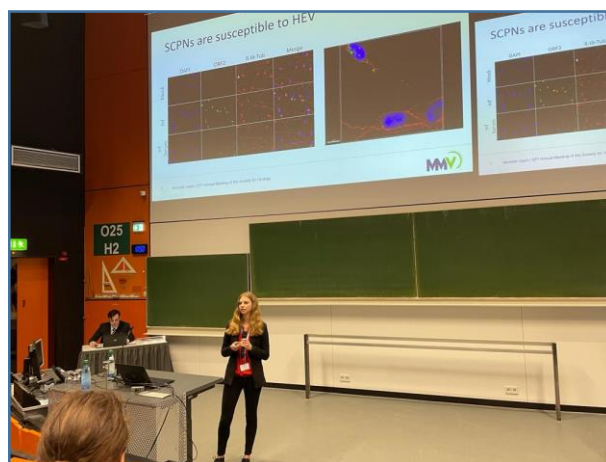
The 32nd Annual Meeting of the Society of Virology was taking place in Ulm, Germany, from March 28 to 31, 2023. You could sense throughout the conference that everyone was very happy to be able to meet in person again for the first time. It was amazing to see that so many virologists had traveled to Ulm for this conference.



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There were many experienced scientists on site, but also a lot of young scientists from all areas of virology. Besides the huge number of posters, there were also many talks during the conference, partly by PhD students or postdocs presenting their projects, but also invited guest speakers like Dr. Andrea Marzi (Hamilton, USA) or Professor Kei Sato (Tokyo, Japan) gave very exciting insights into their field of research during the plenary sessions. For me it was the first participation in a conference where I directly had the opportunity to present my project "Propagation of hepatitis E virus in human neuronal cells as infection model system for extrahepatic manifestations" in a talk. It is really great to have such experience so early in my PhD. Many thanks to VIPER for the opportunity to participate in this conference!



Presentation: "Propagation of hepatitis E virus in human neuronal cells as infection model system for extrahepatic manifestations"

Next Generation Sequencing Bioinformatics Course in Cambridgeshire, United Kingdom

(Josefin Säurich)

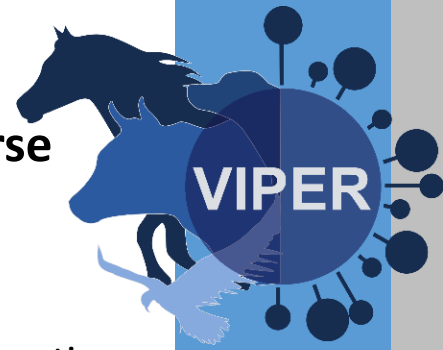
I had the great opportunity to participate in the “Next Generation Sequencing Bioinformatics” workshop which was held by “Wellcome Connecting Science”. Together with 19 other participants, I spent a week at the Wellcome Genome Campus in Hinxton in Cambridgeshire, United Kingdom, learning about bioinformatics tools and techniques used in the analysis of next generation sequencing data. The training involved lectures in the morning and practical sessions in the afternoon, e.g. read alignment, variant calling or RNA-Sequencing. Besides, we got a tour around the facilities on the Campus which involves the “Wellcome Sanger Institute”, the “European Bioinformatics Institute” and “European Molecular Biology Laboratory”, among others.

Overall, the workshop was an intense and incredibly valuable experience. I gained a deeper understanding of the bioinformatics tools and workflows commonly used and I developed practical skills that will be useful for my thesis. I also got the opportunity to get to know inspiring researchers.

Next Generation Sequencing Course at the Friedrich-Loeffler-Institute on the Island of Riems, Greifswald, Germany

(Sana Adam, Sophie Kolbe, Monica Mirolo)

Between 23. - 27.01.2023, Sana, Monica and Sophie travelled to the Friedrich-Loeffler-Institute (FLI) on the island of Riems to participate in a Next-Generation-Sequencing (NGS) course in the working group of Dirk Höper, the head of the laboratory for NGS and diagnostic microarrays at the FLI. During the week at the FLI, we ran the complete NGS pipeline at the FLI, from the sample preparation to RNA extraction, and sequencing.



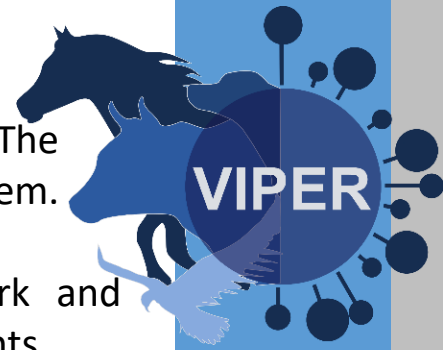
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The samples we analyzed were organs from zoo animals. The NGS sequencing was performed by using the Ion Torrent system. During the incubation times, we got a deeper insight into the



theory of NGS from Dirk and from the technical assistants.

The discussions ranged from the basics to the more advanced concepts of deep sequencing, to evaluate the advantages and limitations of the techniques, and to make them applicable to our research to get better results.



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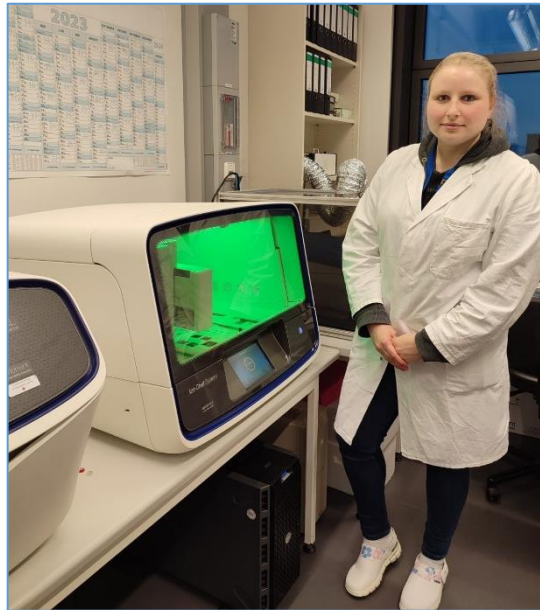
Sana:

“VIPER offered the NGS program as a facultative course in collaboration with the FLI on Riems Island. The course was structured so that after receiving hands-on training, we discussed what we had learned and received a presentation about the theory underlying the work we would be doing the next day. This improved the flow of the course and made it easier to understand. The practical training helps us to identify potential issues that may arise during our research and generates more questions for discussion afterwards, which in turn helps us to identify the source of problems and the appropriate solution provided by the instructor. Although the program was full, they didn't forget to include a tour of the island of Riems.”



Sophie:

“The course offered us an insight into modern next generation sequencing methods. It was helpful to see the workflow in another lab, especially the purification by magnetic beads. The theory sessions provided a broad insight into the history, development and the possible future of NGS. It was very interesting to see the FLI on Riems with its modern laboratories and equipment. We also had the opportunity to get an tour around the FLI and Riems by one of the lab members. We were able to see the facility and could even take a look at the Biosafety Level 4 laboratories from the outside.”



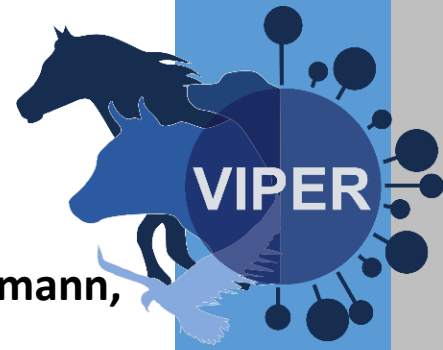
Monica:

“The theory and practice were tailored to our knowledge of NGS. As a PhD student involved in virus discovery, NGS is commonplace. Thus, this course allowed me to improve my basic knowledge of NGS, especially in regards to the sample processing. Besides, working in different laboratories allows you to become aware of new working methods, but also to understand if such a structure could be right for you for a future job.”



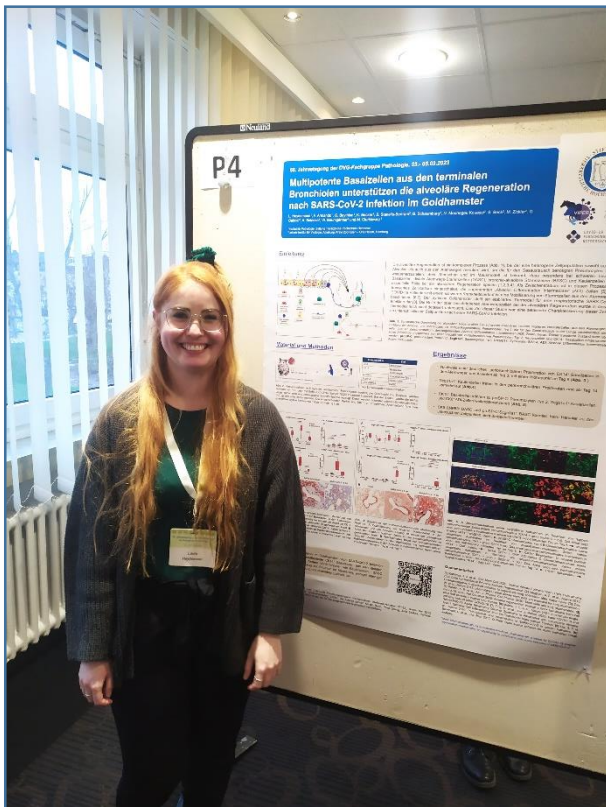
66th Annual meeting of the DVG-group of veterinary pathology in Fulda, Germany

(Muhammad Ameen Bianca Kühl, Laura Heydemann, Pauline Pöpperl, Anna Reiß, Tom Schreiner)

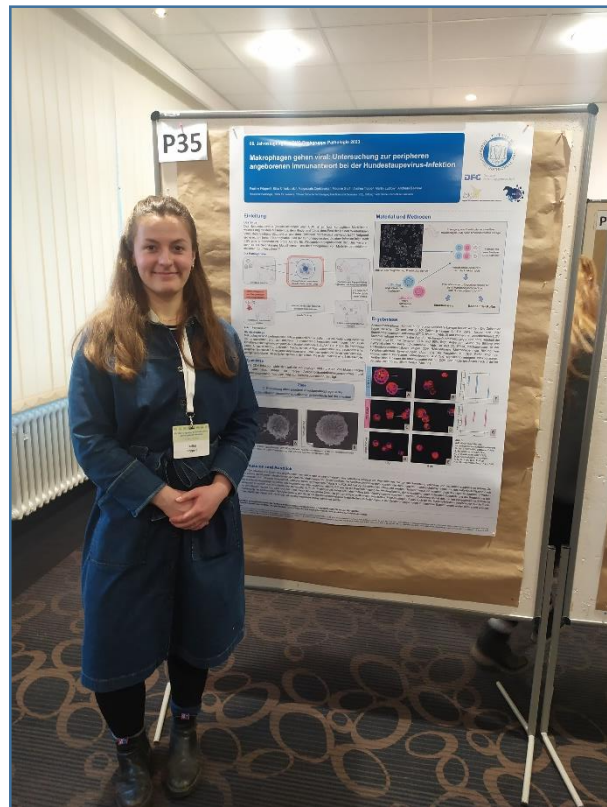


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Six VIPER students visited the DVG pathology conference, which is the largest congress for veterinary pathologists in the German-speaking countries, from 3rd to 5th March in Fulda. The congress was kicked off on Friday afternoon by a full day slide seminar about the endocrine system given by Professor Thomas Rosol (Ohio State University), which ended on Saturday noon. This was followed by a scientific part, including a poster session with case reports and scientific work in the field of veterinary pathology. We presented our work in VIPER as posters. This was a great opportunity for scientific and personal exchange with other participants of the conference. Additionally, there were many interesting talks about infectious diseases and current topics in veterinary pathology. One of the talks was held by the former VIPER student Elisa Chludzinski, who presented her PhD thesis “Phenotyping and transcriptional analysis of the pulmonary immune response in canine distemper virus infection”.

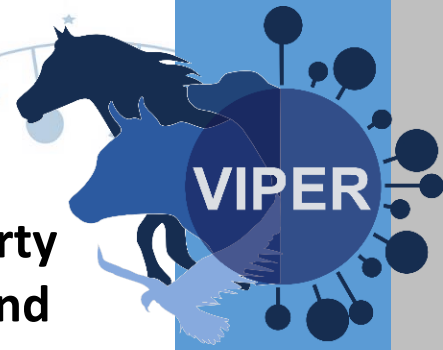


Laura Heydemann: „Multipotent basal cells from the terminal bronchioles support the alveolar regeneration after SARS-CoV-2 infection in the golden hamster“



Pauline Pöpperl: „Macrophages go viral: investigation on the peripheral innate immune response in canine distemper virus infection“

Recent activities – social interactions



The same but somehow different – Christmas party and neon mini golf with the students of the second cohort

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After having so much fun playing neon mini golf with the students of the first VIPER cohort last year, we organized this activity for our new students again this year. So we met in the city center of Hannover for a little Christmas party with a sportive challenge.

In the end, the competition between the individual institutes was a head-to-head race that could not be clearly decided. But of course we had a lot of fun and a nice evening.



After this exciting competition, we ended the evening at the Christmas market in Hannover. Over a cup of mulled wine or punch, the students still had enough time to get to know each other better and to talk about their activities in VIPER and their scientific projects.



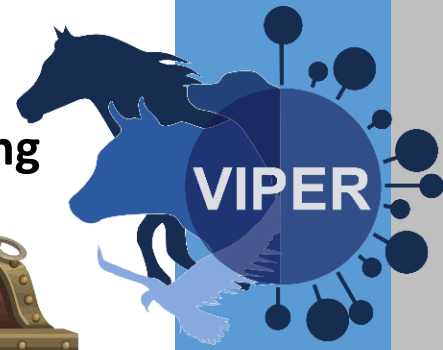


The treasure of the Incas - an evening in the escape room

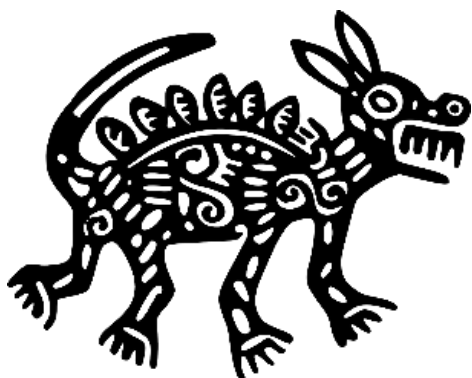
During the sophomore class in February, we took the opportunity to recover from the interesting lectures and exciting hand-on courses, and spend the evening together in an escape room.

Like in an Indiana Jones movie, secrets and dangers awaited us in the jungle, the labyrinth, the Temple of the Sun, the gold mine and the catacombs. Six parts of a map showed us the way to the treasure of Inca-lord Túpac. But time was running out.

In 4 teams we searched for the Inca treasure at the same time and tried to be faster than the others. In the end, it was mainly teamwork that led to the goal and the fastest team was finally awarded the Inca treasure.



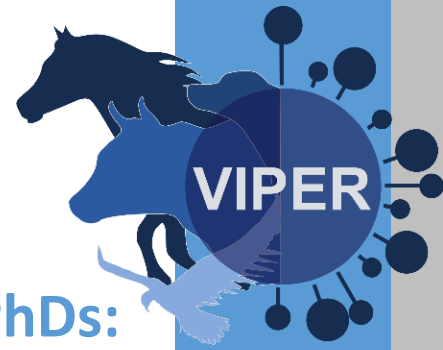
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With cool drinks, good conversations and many new impressions we could relax afterwards from the exciting journey through the empire of the Incas.



Achievements:



Congratulation to our new VIPER PhDs:

During the last year (until the end of April 2023), another 12 VIPER students finished and defended their thesis successfully.

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We wish you success and good luck for your future career.

- **António Camarão:**

“The role of flavivirus NS1 proteins in viral pathogenesis”

- **André Gömer:**

“Hepatitis C virus-related equine hepacivirus cell entry and receptor usage”

- **Franziska Kaiser:**

“Characterization of selected viruses identified in wildlife reservoirs, evaluating their risk to domestic animals and humans”

- **Kathleen Schön:**

“Influence of genome reassortment of mosquito-borne Peribunyaviridae on the interaction with host innate immune responses”

- **Jana Breinfeld:**

“Bovine hepacivirus diversity and determinants of virus replication and translation”

- **Mareike Kubinski:**

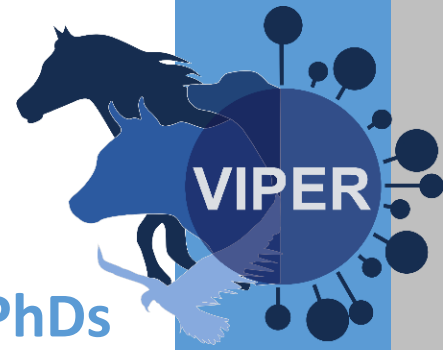
“Tick borne encephalitis virus novel vaccine approaches and search for correlates of protection against an emerging disease”

- **Lucas Wilken:**

“Novel intervention against mosquito borne flaviviruses”



Achievements:



Congratulation to our new VIPER PhDs (continued):

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- **Janina Megan Jansen:**

“Immune evasion of influenza viruses from recognition by T cells”

- **Jana Beicht:**

“Characterization of Langkat virus and vector based vaccine approaches against tick borne encephalitis virus”

- **Elisa Chludzinski:**

“Pulmonary defense responses in morbilliviral diseases: Insights from natural and ex vivo canine distemper virus infection”

- **Nele Gremmel:**

“Hepatitis E virus: isolation of porcine virus strains and characterization of serum antibodies”

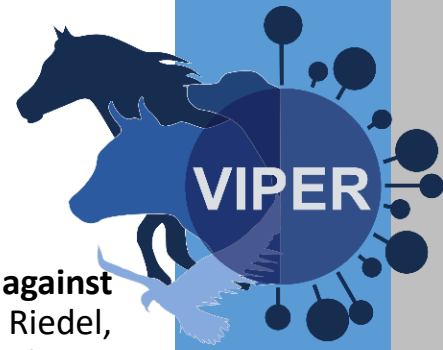
- **Magdalena Kircher:**

“Data augmentation and outlier detection for fitting machine learning models to transcriptomics data from infection research”

Recent VIPER publications

Contributing VIPER students highlighted in *italics*

- **A circular RNA derived from the insulin receptor locus protects against doxorubicin-induced cardiotoxicity.** D. Lu, S. Chatterjee, K. Xiao, I. Riedel, C. K. Huang, A. Costa, S. Cushman, D. Neufeldt, L. Rode, A. Schmidt, M. Juchem, J. Leonardy, G. Büchler, J. Blume, *O. L. Gern*, U. Kalinke, W. L. W. Tan, R. Foo, A. Vink, L. W. van Laake, P. van der Meer, C. Bär and T. Thum. *European Heart* (2022) <https://academic.oup.com/eurheartj/advance-article/doi/10.1093/eurheartj/ehac337/6618365>
- **Isolation of 15 hepatitis E virus strains lacking ORF1 rearrangements from wild boar and pig organ samples and efficient replication in cell culture.** N. Gremmel, O. Keuling, P. Becher and C. Baechlein. *Transboundary and Emerging Diseases* (2022) <https://onlinelibrary.wiley.com/doi/10.1111/tbed.14608>
- **Expanded Diversity and Host Range of Bovine Hepacivirus—Genomic and Serological Evidence in Domestic and Wild Ruminant Species.** J. Breitfeld, N. Fischer, I. Tsachev, P. Marutsov, M. Baymakova, R. Plhal, O. Keuling, P. Becher and C. Baechlein. *Viruses* (2022) <https://www.mdpi.com/1999-4915/14/7/1457>
- **Network meta-analysis of transcriptome expression changes in different manifestations of dengue virus infection.** C. Winter, A. A. R. Camarão, I. Steffen and K. Jung. *BMC Genomics* (2022) <https://bmcbgenomics.biomedcentral.com/articles/10.1186/s12864-022-08390-2>
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- **Vaccine-associated enhanced respiratory pathology in COVID-19 hamsters after TH2-biased immunization.** A. Ebenig, S. Muraleedharan, J. Kazmierski, D. Todt, A. Auste, M. Anzaghe, A. Gömer, D. Postmus, P. Gogesch, M. Niles, R. Plesker, C. Miskey, M. Gellhorn Serra, A. Breithaupt, C. Hörner, C. Kruij, R. Ehmann, Z. Ivics, Z. Waibler, S. Pfaender, E. Wyler, M. Landthaler, A. Kupke, G. Nouailles, C. Goffinet, R. J.P. Brown, M. D. Mühlebach. *Cell Reports* (2022) [https://www.cell.com/cell-reports/fulltext/S2211-1247\(22\)01031-2](https://www.cell.com/cell-reports/fulltext/S2211-1247(22)01031-2)
- **Histochemical staining techniques in *Culex pipiens* and *Drosophila melanogaster* (Diptera) with a comparison to mammals.** K. M. Gregor, S. C. Becker, F. Hellhammer, K. Schön, W. Baumgärtner and C. Puff. *Veterinary Pathology* (2022) <https://journals.sagepub.com/doi/10.1177/03009858221088786>
- **Correcting the Estimation of Viral Taxa Distributions in Next-Generation Sequencing Data after Applying Artificial Neural Networks.** M. Kohls, M. Kircher, J. Krepel, P. Liebig and K. Jung. *Genes* (2021) <https://www.mdpi.com/2073-4425/12/11/1755/htm>

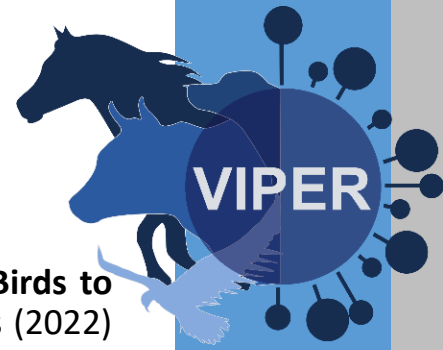


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Recent VIPER publications (continued)

Contributing VIPER students highlighted in *italics*

- **Zoonotic Origins of Human Metapneumovirus: A Journey from Birds to Humans.** *S. T. Jesse*, M. Ludlow and A. D. M. E. Osterhaus. *Viruses* (2022) <https://www.mdpi.com/1999-4915/14/4/677>
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- **Neuropathologic and molecular aspects of a canine distemper epizootic in red foxes in Germany.** *F. Geiselhardt*, M. Peters, S. Kleinschmidt, *E. Chludzinski*, M. Stoff, M. Ludlow & A. Beineke. *Scientific Reports* (2022) <https://www.nature.com/articles/s41598-022-19023-9>
- **Phenotypic and Transcriptional Changes of Pulmonary Immune Responses in Dogs Following Canine Distemper Virus Infection.** *E. Chludzinski*, J. Klemens, M. Ciurkiewicz, R. Geffers, *P. Pöpperl*, M. Stoff, D.-L. Shin, G. Herrler and A. Beineke. *International Journal of Molecular Sciences* (2022) <https://www.mdpi.com/1422-0067/23/17/10019>
- **Intact Type I Interferon Receptor Signaling Prevents Hepatocellular Necrosis but Not Encephalitis in a Dose-Dependent Manner in Rift Valley Fever Virus Infected Mice.** L. M. Michaely, L. Schuwerk, L. Allnoch, *K. Schön*, I. Waltl, P.-K. Larsen, A. Pavlou, C. Kandiyil Prajeeth, G. F. Rimmelzwaan, S. C. Becker, U. Kalinke, W. Baumgärtner and I. Gerhauser. *International Journal of Molecular Sciences* (2022) <https://www.mdpi.com/1422-0067/23/20/12492>
- **Signs of immunosenescence correlate with poor outcome of mRNA COVID-19 vaccination in older adults.** M. Á. Palacios-Pedrero, *J. M. Jansen*, C. Blume, N. Stanislawski, R. Jonczyk, A. Molle, M. Gonzalez Hernandez, *F. K. Kaiser*, K. Jung, A. D. M. E. Osterhaus, G. F. Rimmelzwaan and G. Saletti. *Nature aging* (2022) <https://www.nature.com/articles/s43587-022-00292-y#Abs1>
- **Birch pollen extract enhances human cytomegalovirus replication in monocyte-derived dendritic cells.** *Z. Fneish*, J. Becker, F. Mulenge, B. Costa, L. Krajewski, V. Duran, A. Ziegler, V. Sommer, C. Traidl-Hoffmann, S. Gilles, U. Kalinke. *Allergy* (2022) <https://onlinelibrary.wiley.com/doi/10.1111/all.15497>
- **Assessing Outlier Probabilities in Transcriptomics Data When Evaluating a Classifier.** *M. Kircher*, *J. Säurich*, M. Selle and K. Jung. *Genes* (2022) <https://www.mdpi.com/2073-4425/14/2/387>



GRK 2485

Recent VIPER publications (continued)

Contributing VIPER students highlighted in *italics*

- **Cross-reactive antibodies against Langkat virus protect mice from lethal tick-borne encephalitis virus infection.** *M. Kubinski, J. Beicht, I. A. Zdora, G. Saletti, M. Kircher, M. Petry, I. Steffen, K. Jung, W. Baumgärtner, G. F. Rimmelzwaan, A. D. M. E. Osterhaus, C. K. Prajeeth.* *Frontiers in Immunology* (2023) <https://www.frontiersin.org/articles/10.3389/fimmu.2023.1134371/full>
- **Stabilized recombinant SARS-CoV-2 spike antigen enhances vaccine immunogenicity and protective capacity.** C. Meyer zu Natrup, A. Tscherne, C. Dahlke, M. Ciurkiewicz, D.-L. Shin, A. Fathi, C. Rohde, G. Kalodimou, S. Halwe, L. Limpinsel, J. H. Schwarz, M. Klug, M. Esen, N. Schneiderhan-Marra, A. Dulovic, A. Kupke, K. Brosinski, S. Clever, L.-M. Schünemann, *G. Beythien*, F. Armando, L. Mayer, L. M. Weskamm, S. Jany, A. Freudenstein, T. Tuchel, W. Baumgärtner, P. Kremsner, R. Fendel, M. M. Addo, S. Becker, G. Sutter and A. Volz. *The Journal of Clinical Investigation* (2022) <https://www.jci.org/articles/view/159895>
- **Evidence for a novel gammaherpesvirus as the putative agent of malignant catarrhal fever disease in roan antelopes (*Hippotragus equinus*).** *F. K. Kaiser, M. de le Roi, M. Mirolo, S. T. Jesse, C. Puff, J. Bohner, M. Ludlow, W. Baumgärtner, A. Osterhaus.* *Viruses* (2023) <https://www.mdpi.com/1999-4915/15/3/649>
- **Detection and Characterization of Alongshan Virus in Ticks and Tick Saliva from Lower Saxony, Germany with Serological Evidence for Viral Transmission to Game and Domestic Animals.** C.L. Ebert, *L. Söder, M. Kubinski, J. Glanz, E. Gregersen, K. Dümmer, D. Grund, A.-S. Wöhler, L. Könenkamp, K. Liebig, S. Knoll, F. Hellhammer, A.-K. Topp, P. Becher, A. Springer, C. Strube, U. Nagel-Kohl, M. Nordhoff, I. Steffen, B. U. Bauer, M. Ganter, K. Feige, S. C. Becker, M. Boelke.* *Microorganisms* (2023) <https://www.mdpi.com/2076-2607/11/3/543>
- **Infection Studies with Airway Organoids from *Carollia perspicillata* Indicate That the Respiratory Epithelium Is Not a Barrier for Interspecies Transmission of Influenza Viruses.** A. Su, *M. Yan, S. Pavasutthipaisit, K. D. Wicke, G. A. Grassl, A. Beineke, F. Felmy, S. Schmidt, K.-H. Esser, P. Becher, G. Herrler.* *Microbiology spectrum* (2023) <https://journals.asm.org/doi/epub/10.1128/spectrum.03098-22>
- **Recombinant Modified Vaccinia Virus Ankara Expressing a Glycosylation Mutant of Dengue Virus NS1 Induces Specific Antibody and T-Cell Responses in Mice.** *L. Wilken, S. Stelz, A. Agac, G. Sutter, C. K. Prajeeth and G. F. Rimmelzwaan.* *Vaccines* (2023) <https://www.mdpi.com/2076-393X/11/4/714>
- **Transient Blockade of Type I Interferon Signalling Promotes Replication of Dengue Virus Strain D2Y98P in Adult Wild-Type Mice.** *L. Wilken, S. Stelz, C. K. Prajeeth and G. F. Rimmelzwaan.* *Viruses* (2023) <https://www.mdpi.com/1999-4915/15/4/814>



GRK 2485

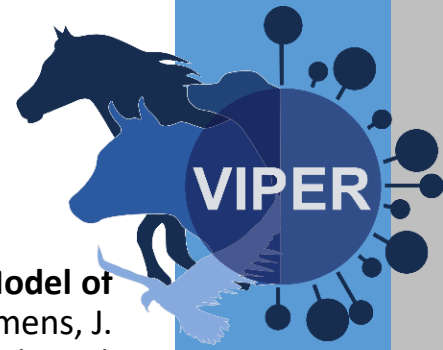
Recent VIPER publications (continued)

Contributing VIPER students highlighted in *italics*

- **Canine Distemper Virus Alters Defense Responses in an Ex Vivo Model of Pulmonary Infection.** *E. Chludzinski*, M. Ciurkiewicz, M. Stoff, J. Klemens, J. Krüger, D.-L. Shin, G. Herrler and A. Beineke. *Viruses* (2023) <https://www.mdpi.com/1999-4915/15/4/834>
- **In Vitro Investigation of the Interaction of Avian Metapneumovirus and Newcastle Disease Virus with Turkey Respiratory and Reproductive Tissue.** *F. Bexter*, N. Rüger, H. Sid, A. Herbst, G. Gabriel, A. Osterhaus and S. Rautenschlein. *Viruses* (2023) <https://www.mdpi.com/1999-4915/15/4/907>
- **A recombinant modified vaccinia virus Ankara expressing prME of tick-borne encephalitis virus (TBEV) affords mice full protection against TBEV infection.** *M. Kubinski*, *J. Beicht*, I. Zdora, J. Biermann, C. Puff, T. Gerlach, W. Baumgärtner, A. D. M. E. Osterhaus, G. Sutter, C. K. Prajeeth and G. F. Rimmelzwaan. *Frontiers in Immunology* (2023) <https://www.frontiersin.org/articles/10.3389/fimmu.2023.1182963/full>
- **First Report of Skunk Amdoparvovirus (Species *Carnivore amdoparvovirus 4*) in Europe in a Captive Striped Skunk (*Mephitis mephitis*).** *F. K. Kaiser*, *M. de le Roi*, W. K. Jo, I. Gerhauser, V. Molnár, A. D. M. E. Osterhaus, W. Baumgärtner and M. Ludlow. *Viruses* (2023) <https://www.mdpi.com/1999-4915/15/5/1087>
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GRK 2485



Outlook and announcements

After this successful and eventful fourth year for VIPER and the exciting first year for the second cohort students, there are many great events coming up in the future.

In June, VIPER will be represented with a booth at the summer party of the University of Veterinary Medicine Hannover. In addition to lots of information about the Research Training Group, guests can test their knowledge about various viruses in funny games.

In addition, the one-week junior class will be held in September. With an enhanced approach for more interactivity, students will dive deeper into virology in lectures by renowned virologists and interactive hands-on courses supervised by VIPER PIs.

Of course, the individual training courses for students continue to take place and visits to congresses for scientific exchange will also be further supported and encouraged.

Now, we are excited and very much looking forward to continuing the success story of our Research Training Group VIPER for another 4.5 years.

For further information about VIPER, please visit our website: www.rtg-viper.com

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GRK 2485