Research Training Group
Virus detection, pathogenesis and intervention (GRK 2485)

NEWSLETTER

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Volume 3 - June 2022

We are proud to release the third annual VIPER newsletter three years after the official start of the Research Training Group in April 2019. Within this issue, we will recap the past three years of the first cohort of VIPER students, all their successes and challenges during their studies, which have been influenced, shaped and overshadowed by the current pandemic.

In addition, we would like to introduce our newly admitted second cohort of students who started their VIPER journey in April 2022.

COVID-19 – back and forth on the way back to normality

Let's look back together for a moment. Just a year ago, in the midst of the lockdown, the second official VIPER newsletter was published. A lot has happened since then. Read on to find out what new publications have been published and which VIPER students have successfully completed their PhDs.

It has been a year full of challenges. Practical face-to-face courses were impossible to conduct. Accordingly, each VIPER course, as well as our symposium, was planned in parallel as both an on-site event and an online event, which was obviously an additional challenge for the organizing committees. Therefore, we would like to explicitly thank everyone involved in the planning of these events for their patience and commitment in creating great, informative courses. We'd also like to thank our first cohort VIPER students, whom we officially said goodbye to this April, for their patience and flexibility during this challenging time. We would like to take this opportunity to wish them all the best and every success in their future careers. Furthermore, we are pleased to introduce you to the students of the second cohort in this newsletter. We look forward to the coming years with them and sincerely hope that their meetings, classes and courses can be held in presence again and that group activities will be possible more often as well.

Looking back at the academic year 2021/2022 - Process evaluation by KHN

As in previous years, students were asked to evaluate the program. In an online session with Dr. Nounla, they discussed their course of study, achievements, experiences, and obstacles. In general, the feedback was positive, although of course some critical issues were raised that need and should be improved in the coming years. Below is an example of a mind map of these sessions with the students' responses in magenta, cyan or green.

En-block schools

Master class (04.-08.10.2021)

The VIPER master class took place on October 4th to 8th and covered aspects regarding future career options, grant applications and industrial approaches to make results available (see schedule).

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Monday	Tuesday	Wednesday	Thursday	Friday
Moderation: Baumgärtner	Moderation: Steffen	Moderation: Ludlow	Moderation: Beineke	Moderation: Gerold / Rautenschlein
9:00 Gerit Sonntag: Funding possibilities by the DFG **10:00 Stefan Uhle** : "Patenting and Commercializing Scientific Inventions" - From your research to an invention to your patent and its commercialization	**10:30 Friedemann Weber:** How to write successful grant applications	**10:00 Veronika von Messling:** Career in academia and beyond **11:15 Britta Schürmann** Excellence connects – be part of a worldwide network	**9:30 Verena Haist:** Career in industry **11:00 Nina McGuinness**: EU-funding and participation strategies/ application process	**9:30 Florian Schmidt:** Over the mountains, across the pond and back – example of an academic career with practical hints **11:00 Alain de Bruin:** Future career options in academdia
14-16.00 Tom Rosol • Introduction to University Commerciali-zation • Intellectual Property and Due Diligence	**14-16.00 Tom Rosol** • Licensing of Technology • Startup Companies • The Elevator Pitch; Conflict of Interest & Commitment	**14:00 Dana Thal**: German Research Plattform for Zoonoses – how we support young One Health researchers		

The invited speakers of the VIPER master class:

Gerit Sonntag (German Research Foundation – DFG)
Stefan Uhle (MBM ScienceBridge GmbH)
Tom Rosol (Department of Biomedical Sciences, Heritage College of Osteopathic Medicine, Ohio University)
Friedemann Weber (Institute of Virology, Faculty of Veterinary Medicine, Justus Liebig University Giessen)
Veronika von Messling (Federal Ministry of Education and Research)
Britta Schürmann (Alexander von Humboldt Foundation)
Dana Thal (German Research Plattform for Zoonoses)
Verena Haist (Boehringer Ingelheim)
Nina McGuinness (EU Liaison Office Hannover/ Hildesheim)
Florian Schmidt (Institute of Innate Immunity, University of Bonn)
Alain de Bruin (Department of Biomolecular Health Sciences, Faculty of Veterinary Medicine, Utrecht University)

En-block schools

Students' opinions on the Master class

Interesting lectures and open speakers providing know-how and knowledge relevant for future researchers

It's a very useful lecture, we got lots of knowledge from it

Really nice speaker line-up in general. Approachable people with a lot of productive energy

Tom Rosol is an excellent speaker (and mentor I can imagine). I think we were very lucky to benefit from his knowledge. He really inspired me, and I think I might really contact him one day if I'd be thinking about commercialisation of a certain product.

VIPER symposium (07./08.02.2022)

The VIPER symposium was originally hopefully planned as a hybrid seminar but had to be changed back to an additional online-only session due to the increasing COVID-19 cases. It was held in February. We used the now well-established concept of the online conference for this purpose. As planned for the face-to-face symposium, a VIPER student and one of the consortium PIs shared the moderation of a session, while the other students presented their projects either in the form of a talk or a poster. We are proud to announce that about 400 participants from all over the world attended the two days of the symposium.

Our special thanks go to the organizing committee led by Prof. E. Steinmann and André Gömer. They have put together a very informative symposium with a great international response.

Timetable of the first day of the VIPER symposium

Monday, 07.02.2022		
09:30 - 09:45	Welcome by Dr. Dr. h. c. mult. Greif (President of the TiHo) and Prof. Baumgärtner (Speaker of VIPER)	
	Session 1, Emerging Viruses (Moderators: Steinmann, Gern)	
09:45 - 10:15	Paul Wichgers Schreur	A One Health approach for Rift Valley fever virus vaccine development
10:15 - 10:45	Sandra Diederich	Working with emerging viral pathogens under BSL4-conditions
11:00 - 11:30	Martin Beer	HPAIV H5 - an update on the avian pandemic
11:30- 12:00	**PhD students VIPER**	
	Franziska Kaiser	Characterization of selected viruses discovered in wildlife reservoirs
	Michael Wißing	HVR insertions during chronic hepatitis E infections – enhancer of viral replication?

Monday, 07.02.2022		
	Session 2, COVID-19 (Moderators: Kalinke, de le Roi)	
12:30 - 13:00	Bart Haagmans	Clinical and experimental insights into SARS-CoV-2 pathogenesis
13:00 - 13:30	Volker Thiel	SARS-CoV-2: from gene to function
13:30 – 14:00	Stephanie Bertram	Sex differences in SARS-CoV-2 pathogenesis
14:00 – 14:15	Coffee break	
14:15 – 14:45	Albert Osterhaus	Pandemic preparedness: virus discovery versus surveillance.
14:45 – 15:15	Asisa Volz	Immunogenicity and efficacy of the COVID-19 candidate vector vaccine MVA SARS 2 S in preclinical vaccination
15:15 – 15:45	**PhD Students**	
	Tom Schreiner	Loss and regeneration of motile cilia in the trachea of Syrian golden hamsters after SARS-CoV-2 infection
	Georg Beythien	Decreased SARS-CoV-2 Omicron variant pathogenicity compared to other SARS-Cov-2 strains in Syrian golden hamsters
15:45 – 16:30	**Poster Session I (Moderator: Beineke)**	

VIPER symposium (07./08.02.2022)

Timetable of the second day of the VIPER symposium

Tuesday, 08.02.2022		
	Session 3, Viruses with Pandemic Potential (Moderators: Steffen, Gömer)	
08:30 - 09:00	Felix Drexler	Emerging viruses from animal reservoirs
09:00 - 9:30	André Gömer	Hepacivirus intra-host diversity
9:30 - 10:00	Gülsah Gabriel	Influenza pandemics and lessons to be learned

Tuesday, 08.02.2022		
	Session 4, Animal Pathogens (Moderators: Becher, Herbst)	
10:15 - 11:00	**PhD Students VIPER**	
	Franziska Geiselhardt	Investigation of host and viral determinants of canine distemper virus interspecies transmission
	Olivia Gern	Sensing of zoonotic RNA viruses by brain resident cells
11:00 - 11:30	Sandra Blome	The second pandemic: Myths and facts about African swine fever
11:30 - 12:00	Sandra Junglen	New Sandfly-borne phleboviruses circulating in East Africa
12:00 - 12:45	**Poster Session II (Moderator: Ludlow)**	
12:45 - 13:00	Closing remarks	

Students' poster at the VIPER symposium

Breitfeld et al.:
Co-circulation of diverse bovine hepacivirus (BovHepV) strains in Bulgarian cattle

Schön et al.:
A cross-species comparative approach to screen C-type lectin receptor / Rift Valley fever virus interactions

Beicht et al.:
An Influenza A Virus-based Vaccine Candidate Expressing Tick-borne Encephalitis Virus Non-structural Protein 1 (TBEV NS1)

Jesse et al.:
Molecular characterization of avian metapneumovirus subtype C detected in wild mallards in The Netherlands

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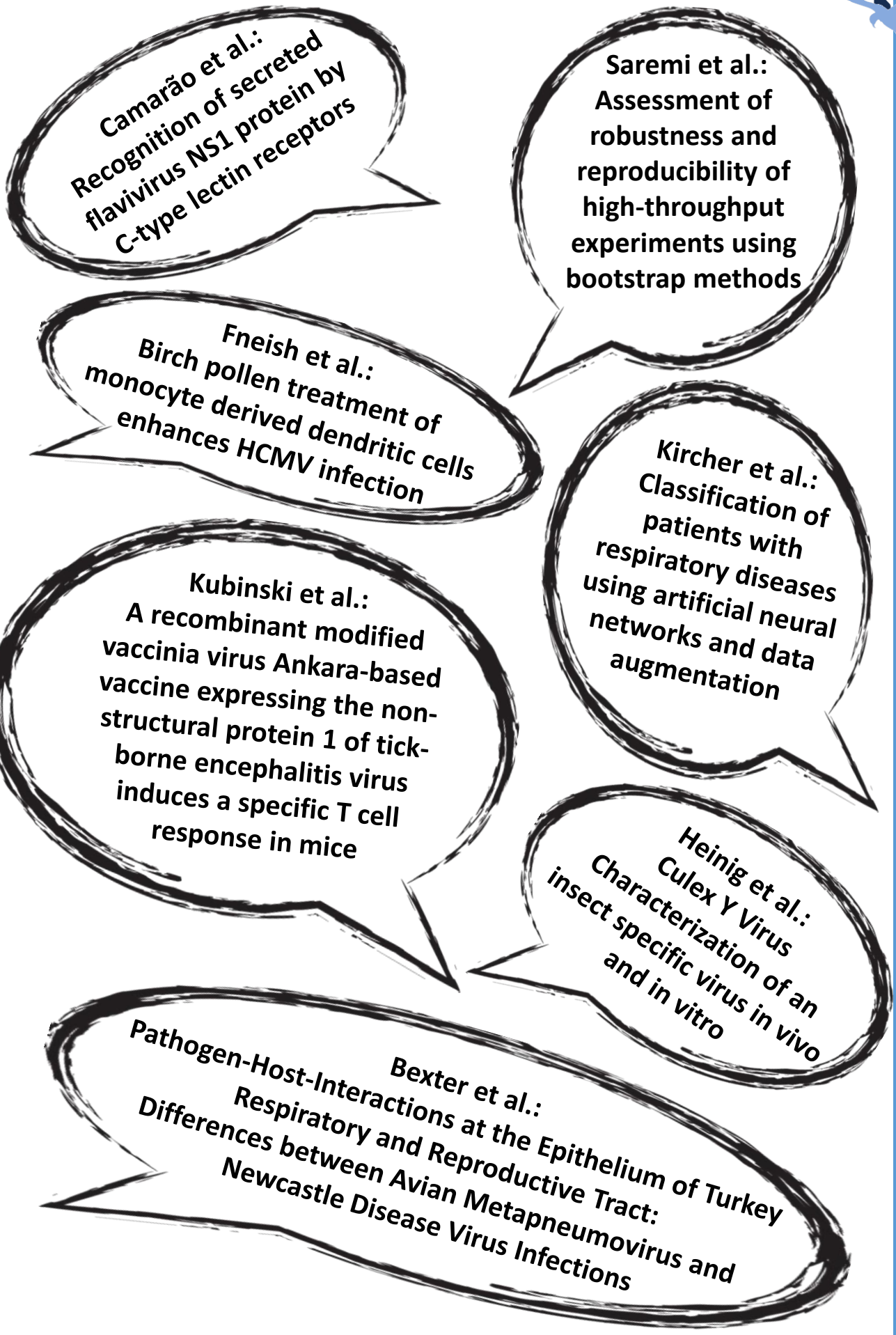
VIPER symposium (07./08.02.2022)

Students' poster at the VIPER symposium



VIPER symposium (07./08.02.2022)

Students' poster at the VIPER symposium

Congress reports

65th annual meeting of the DVG-group of veterinary pathology (Madeleine de le Roi)

Once a year veterinary pathologists from all over Germany and even abroad come together for the annual conference on pathology of the German Veterinary Society (DVG). Beside histological slide seminars with special emphasis on specific organ systems and lectures from well-recognized pathologists, the congress offers all participants, including doctoral candidates as well as PhD students, the possibility to present interesting and relevant topics to the plenum. The range of contributions includes case reports about rare findings in animals as well as preliminary results of own research work covering a great variety of subjects with regard to diagnostic and/or experimental pathology.

In this context, I was given the opportunity to present a case of meningo-encephalitis in seals caused by an avian influenza A virus infection. Several epidemic outbreaks of different sub-types of avian influenza virus (AIV), resulting in mass mortalities of harbor seals, have already been described in the past. In these cases, the virus infected predominantly the respiratory tract. This study describes a previously rarely observed infection of the central nervous system (CNS) with highly pathogenic AIV (HPAIV) of subtype H5N8 in harbor seals.

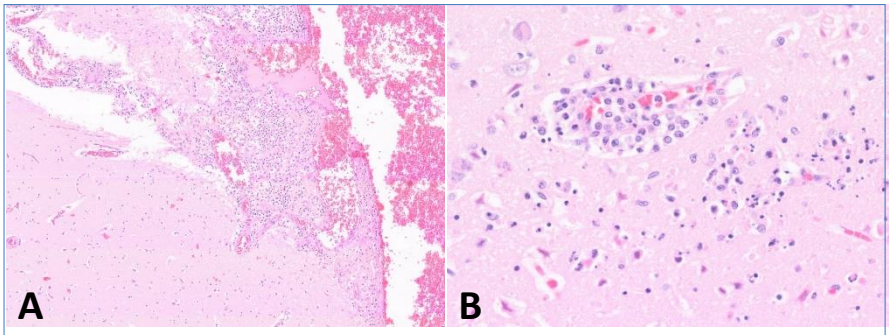


Figure 1. Histopathological lesions of animals 1 comprised mild to moderate, focally extenisve, lymphohistiocytic, partially neutrophilic meningoencephalitis (A, asterisk, 4x) with focal hemorrhage and a moderate, multifocal, lymphohistiocytic vasculitis (B, 40x). Hematoxylin and eosin stain

Two harbor seals (*Phoca vitulina*) were found dead on the German North Sea coast (Meldorf, Sylt). CNS tissue samples of both animals were examined histopathologically and immunohistochemically. In addition, molecular virological examination [real-time (RT)-PCR, Sanger and next generation sequencing (NGS)] was performed for identification of the subtype.

Animal 1 showed a mild to moderate, focally extensive, lymphohistiocytic and neutrophilic meningoencephalitis (Fig. 1A, asterisk) with focal hemorrhage, a moderate, multifocal, lymphohistiocytic vasculitis (Fig. 1B), and degeneration of glial cells and neurons within cerebrum and cerebellum. Histopathological lesions of animal 2 (found in Sylt) comprised a moderate, multifocal, lymphohistiocytic meningoencephalitis in cerebrum and cerebellum. RT-PCR, Sanger sequencing and NGS were used to identify the highly pathogenic subtype H5N8 of AIV.

By performing immunohistochemistry, AIV antigen could be detected in brain tissue of both animals. Immunopositive reaction was identified in nuclei of neurons as well as in glial cells (Fig. 2, AIV).

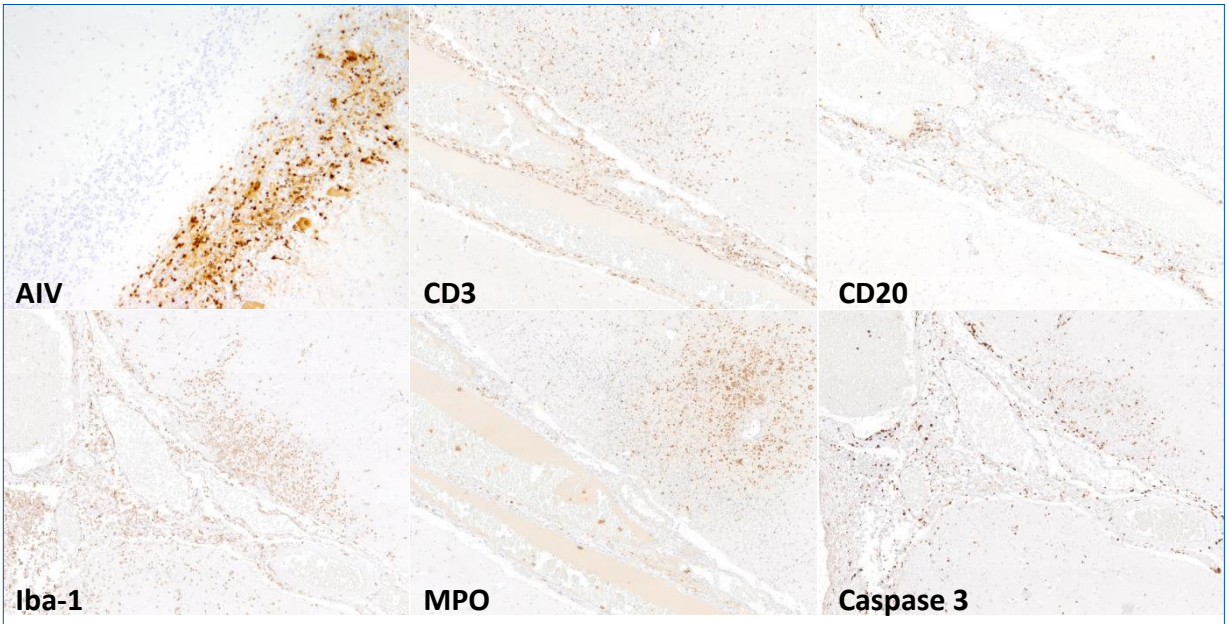


Figure 2. Viral antigen was detected multifocally within cells of the granular layer of animal 1 (AIV, 10x). Phenotypical characterisation of inflammatory cells in animal 1 revealed mild to moderate amounts of T cells within meninges but also perivascularly within the parenchyma (CD3, 8x). In addition, meninges displayed mild to moderate amounts of B cells (CD20, 8x) and macrophages (Iba-1, 8x). The use of an antibody directed against MPO demonstrated mild amounts of macrophages and few neutrophils within the cerebrum (MPO, 8x). Degenerated glial cells and neurons of cerebrum were visualized by using an antibody directed against caspase 3 (Caspase 3, 8x).

The investigation for canine distemper virus showed no immunoreactivity. Using an anti-CD3 antibody, low to moderate amounts of T cells were detected in the meninges and perivascularly in the parenchyma in both animals (Fig. 2, CD3). Multifocally, small amounts of B cells were identified in both seals by the application of an anti-CD20 antibody (Fig. 2, CD20). In addition, single Pax5-positive B cells were detected in the meninges of animal 1.

By using an anti-Iba-1 antibody, mild to moderate amounts of macrophages were tagged in the meninges and in glial nodules in the parenchyma of animal 1 (Fig. 2, Iba-1) and to a lesser extent in animal 2. In addition, animal 1 showed mild amounts of CD204-positive macrophages, mainly within the meninges. Furthermore, few macrophages as well as single neutrophils were detected by the use of an anti-myeloperoxidase (MPO) antibody (Fig. 2, MPO). Activated caspase 3-positive cells, an indicator of apoptosis, were observed in low to moderate amounts in the meninges as well as in the parenchyma of both animals (Fig. 2, caspase 3).

In summary, the examination of both seals revealed lymphohistiocytic, partly neutrophilic meningoencephalitis and vasculitis as well as degeneration of glial cells and neurons caused by an infection with AIV of subtype H5N8. The present findings describe unusual neuropathological alterations of the CNS of harbor seals induced by an infection with HPAIV of subtype H5N8.

The results of this investigation have been published recently in Emerging Microbes & Infections.
(https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8890524/)

Further activities – social interactions

Reaching for the stars – a night out

Fortunately, due to the relaxed restrictions by the government, we were able to meet with the students of the first cohort for a leisurely round of neon golf. Face to face again, the students in the group were highly motivated to beat each other in the game, good advice on technique or the perfect tee angle from teammates included ;-)

After we reached the stars, students had time to discuss their experiences during the pandemic as well as current problems within their scientific projects.

Further activities – VIPER goes Hollywood (Pt. 2)

Last fall, VIPER started producing the second official short film about the Research Training group, the scientific work and students´ experiences to showcase our program. The production was supported by many talented actresses and actors. The film is available on the VIPER homepage and on the TiHo youtube channel.
https://www.youtube.com/watch?v=Ceq_6g0QiP0

Students' experiences

Participating in the shooting of the VIPER film was an interesting occasion to communicate with fellow students and join an insightful exchange into one another's perspective on PhD subjects as well as executed laboratory techniques. The outcome provides a summarizing image of the work and tasks of the VIPER research group, combined with a portrait of a handful of participating students and PIs.

Further activities – VIPER goes Hollywood (Pt. 2)

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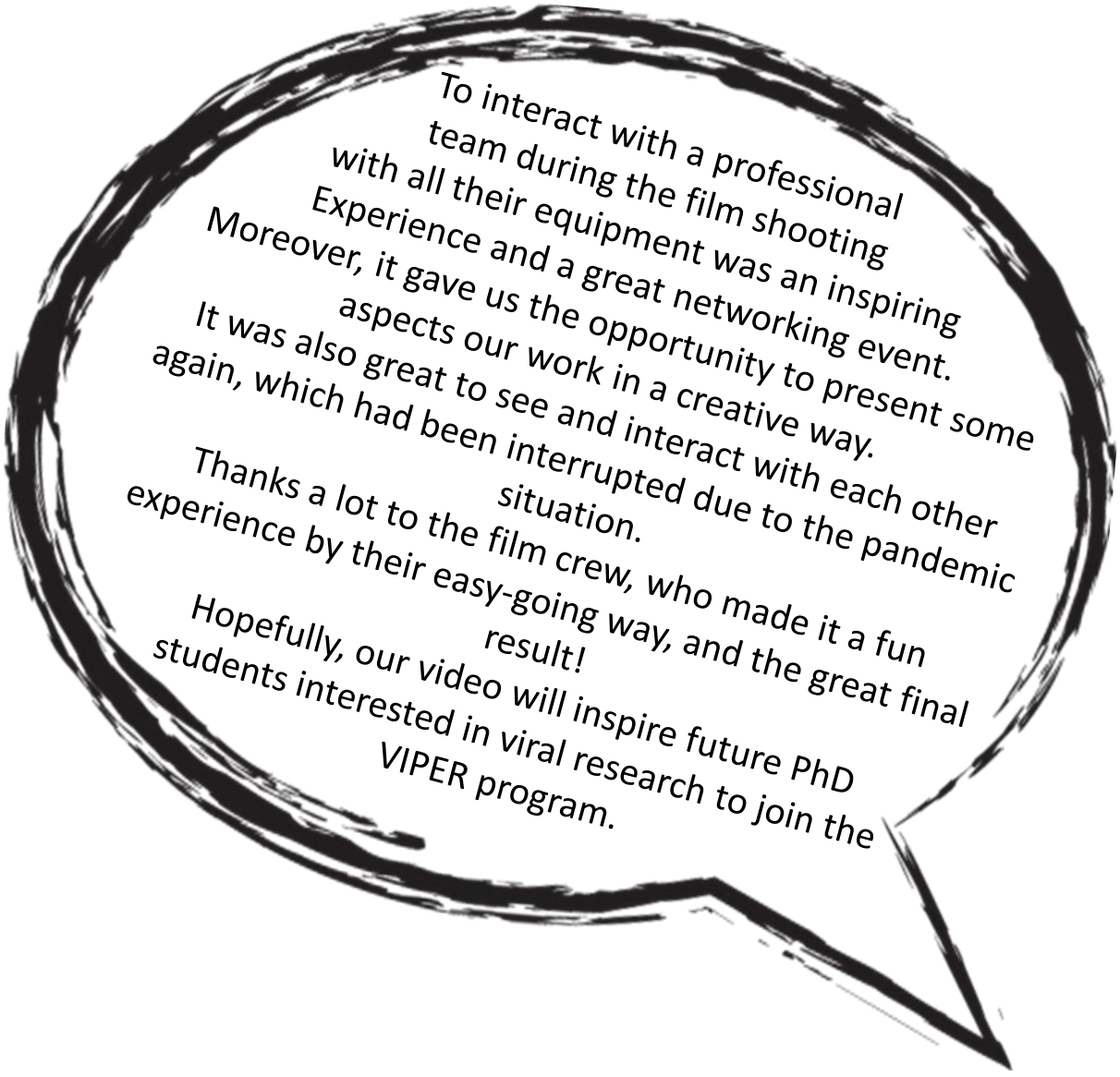
Students' experiences



Farewell to our first cohort and welcome of our second cohort of PhD students

On April 4, after a long time, we were finally able to organize a face-to-face meeting to say goodbye to the last and welcome the second cohort. This joint meeting was also primarily intended to stimulate exchange between the two cohorts.
After a short welcome by the President of the TiHo Dr. Dr. h. c. mult. Greif and introductory Words by the speaker of the Research Training Group VIPER Prof. Baumgärtner, Prof. Valentin-Weigand introduced the Hannover Graduate School (HGNI) in his function as its director.

Afterwards the concept of VIPER and the division into the three VIPER Pillars was outlined:
Pillar I - Virus discovery, host range and transmission (presented by Prof. Osterhaus)
Pillar II - Virus-host interactions and pathogenesis (presented by Prof. Becher)
Pillar III - Immune interference and intervention strategies (presented by Prof. Kalinke).

Farewell to our first cohort and welcome of our second cohort of PhD students

After a coffee break, which was used for a lively exchange of ideas, the two newly appointed PIs of the Research Training Group, Prof. Gisa Gerold and Prof. Asisa Volz, gave the VIPER students an insight into their research. Both keynote lectures, entitled “Identification of CD81 as re-emerging alphavirus replication factor” and "Immunogenicity and efficacy of the COVID-19 candidate vector vaccine MVA SARS 2 S in preclinical vaccination" gave fascinating insights into virus research and especially intervention strategies against viral diseases. This gave the students another impression of what the VIPER Research Training Group is all about.

After the lectures, with one eye crying and one eye laughing, it was time to say goodbye to the first cohort and the new VIPER students were welcomed.

After the official part of the meeting, everyone had the opportunity to talk to each other over finger food and soft drinks and, after the long period of online meetings, to finally meet live again.

Schedule of Kick-off/Farewell

14:00	Welcome address by the president of the University of Veterinary Medicine Hannover Dr. Dr. h. c. mult. G. Greif
14:15	Introduction of VIPER by the speaker of the Research Training Group Prof. Dr. W. Baumgärtner
14:45	Introduction of the HGNI by the Director of the HGNI Prof. Dr. P. Valentin-Weigand
15:15	Introduction of the three VIPER pillars by VIPER PIs
15:45	Coffee break
16:00	Key note lecture by Prof. Dr. G. Gerold and Prof. Dr. A. Volz
16:30	Introduction of new students and good-bye to the first cohort
17:00	Informal get-together with finger food at the Foyer of the Department of Pathology

Achievements:

Congratulation to our new VIPER PhDs:

Until March 31st, 7 VIPER students finished and defended their thesis successfully. We wish you success and good luck for your future career.

- **Sarah Schwarz:**

  "Neuronal cultures from dorsal root ganglia of adult dogs represent a promising in vitro model to investigate infectious and non-infectious influences"

- **Frederic Gusmag:**

  "Influence of genetic adaptation to vector populations on arbovirus emergence and spread"

- **Alina Schadenhofer:**

  "Respiratory syncytial virus reverse genetics for identification of molecular determinants of strain specific phenotypic changes"

- **Veronika Breitkopf:**

  "Host cell responses and protein-protein interactions in tick-borne encephalitis virus infection "

- **Franziska Geiselhardt:**

  "Identification of host and viral determinants of canine distemper virus interspecies transmission"

- **Sonja T. Jesse:**

  "Identification and characterization of selected emerging and re-emerging avian and mammalian viruses"

- **Babak Saremi:**

  "Assessment of robustness in computational analysis of high-throughput sequencing experiments using bootstrap samples from FASTQ files"

VIPER student´s profiles – second cohort

Georg Beythien

"Comparative analysis of canine distemper virus cell tropism, replication and translation in canine 2D and 3D neuronal ex vivo culture systems as well as detection of new viruses ."

Department of Pathology, TiHo

Supervisors: Prof. Wolfgang Baumgärtner

Bianca Kühl

"Investigation of potential viral etiology and associated pathogenesis in disease syndromes of unknown cause in wildlife and marine mammals."

Department of Pathology, TiHo

Supervisors: Prof. Andreas Beineke, Prof. Ursula Siebert

Josefin Säurich

"Automated unsupervised clustering of viral meta-genomes derived from sequence read archives."

Institute for Animal Breeding and Genetics, TiHo

Supervisors: Prof. Klaus Jung

Sandra Runft

"Biodistribution and reactogenicity of SARS-CoV-2 antigens delivered by MVA candidate vector vaccines against COVID-19."

Department of Pathology, TiHo

Supervisor: Prof. Wolfgang Baumgärtner, Prof. Gerd Sutter

Laura Heydemann

"Long term consequences of SARS-CoV-2 infection in the lung and the CNS in the golden Syrian hamster model."

Department of Pathology, TiHo

Supervisors: Prof. Wolfgang Baumgärtner

VIPER student´s profiles – second cohort

Tom Schreiner

"Morphologic examination of ciliated epithelia in upper respiratory tract with special consideration of olfactory epithelium after SARS-CoV-2 infection."

Department of Pathology, TiHo

Supervisors: Prof. Wolfgang Baumgärtner

Anna Reiß

"Investigation of pathogenesis, virulence and immunoreaction following infection with a genetically modified OVA-Theilervirus in a murine model of multiple sclerosis."

Department of Pathology, TiHo

Supervisors: Prof. Wolfgang Baumgärtner

Lars Söder

"Characterization of recently identified novel viruses from wild boar and other wild animal species."

Institute of Virology, Tiho

Supervisor: Prof. Paul Becher

Malte Pitters

"Overcoming the airway epithelium barrier in the early phase of bovine viral diarrhea virus (BVDV) infection."

Institute of Virology, Tiho

Supervisor: Prof. Paul Becher

David Zöller

"The role of Card-9 regulated pathways in orthobunyavirus infections."

Working Group Becker – RIZ and Institute for Parasitology, Tiho

Supervisors: Prof. Stefanie Becker

VIPER student´s profiles – second cohort

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Susann Dornbusch

“The role of Anti-RVFV immunity in Germline infection and behavior modulation in insects.”

Working Group Becker – RIZ and Institute for Parasitology, Tiho

Supervisors: Prof. Stefanie Becker

Pauline Pöpperl

“Identification of intracellular host range restriction factors of canine distemper virus .”

Department of Pathology and Working Group Osterhaus – RIZ, Tiho

Supervisors: Prof. Andreas Beineke, Dr. Martin Ludlow

Muhammad Ameen

“Investigations upon the role of C-type lectin receptors in the pathogenesis of Theiler's murine encephalomyelitis virus-induced hippocampal damage.”

Department of Pathology and Working Group Osterhaus – RIZ, Tiho

Supervisors: Prof. Andreas Beineke, Dr. Martin Ludlow

Mara Duven

“The role of tetraspanins in cross-species transmission of re-emerging alphaviruses.”

Institute for Biochemistry, Tiho

Supervisors: Prof. Gisa Gerold

Belén Carriqui

“Host factor interactions during early steps of hepatitis C virus cell entry and their interindividual modulation by genetic and pharmacological perturbations alphaviruses.”

Institute for Biochemistry, Tiho

Supervisors: Prof. Gisa Gerold

VIPER student´s profiles – second cohort

Franz Leonhard Böge

“Prediction of miRNAs involved during viral infections using gene-set tests on expression data of mRNA targets.”

Institute for Animal Breeding and Genetics, TiHo

Supervisors: Prof. Klaus Jung

Felix Schweitzer

“Tick-borne encephalitis neuro-pathogenesis

Working Group Osterhaus - RIZ, Tiho

Supervisors: Prof. Albert Osterhaus

Sophie Kolbe

“In vitro systems to study antibody escape and antiviral resistance mechanisms during RSV and SARS-CoV-2 infections.”

Working Group Osterhaus - RIZ, Tiho

Supervisors: Prof. Albert Osterhaus, Dr. Martin Ludlow

Nunzio Sarnino

“Investigations of virulence factors and host-pathogen-interaction of newly emerging Avian Influenza viruses in chickens .”

Clinic for Poultry, TiHo

Supervisors: Prof. Silke Rautenschlein

Lea Blank

“Modulation of cellular stress responses in RNA virus infections.”

Institute of Physiological Chemistry and Working Group Steffen - RIZ, Tiho

Supervisors: Dr. Imke Steffen

VIPER student´s profiles – second cohort

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Aparna Shandheep

“RNA-based in vivo expression of monoclonal antibodies.”

TWINCORE

Supervisor: Prof. Ulrich Kalinke

Sonja Ohrnberger

“MVA-based therapeutic approaches against equine hepacivirus infections in horses.”

Institute for Virology and RIZ, TiHo

Supervisor: Prof. Asisa Volz

Sana Adam

“Coronavirus infections of the reproductive tract in mammals and birds: interplay of hormones and innate immunity.”

Clinic for Poultry, TiHo and Heinrich-Pette Institute Hamburg

Supervisors: Prof. Silke Rautenschlein

“Assessment of antibody-dependent enhancement (ADE) by SARS-CoV-2 specific monoclonal antibodies.”

TWINCORE

Supervisor: Prof. Ulrich Kalinke

“Exploitation of the TiHo SARS-CoV-2-hamster model under BSL-3 conditions for testing of novel intervention strategies for COVID-19.”

Working Group Osterhaus – RIZ, Tiho

Supervisors: Prof. Albert Osterhaus

VIPER student´s profiles – second cohort

“Immunity to CNS infection caused by Rift Valley Fever Virus (RVFV).”

Working Group Rimmelzwaan – RIZ, TiHo

Supervisors: Prof. Guus Rimmelzwaan

“Towards a better understanding of cell-mediated immunity to Respiratory Syncytial Virus (RSV).”

Working Group Rimmelzwaan – RIZ, TiHo

Supervisors: Prof. Guus Rimmelzwaan

“Propagation of hepatitis E virus in human neuronal cells as infection model system for extrahepatic manifestations.”

Institute of Virology, Tiho and Molecular & Medical Virology, Ruhr-University Bochum

Supervisors: Prof. Paul Becher, Prof. Eike Steinmann

“Evaluation of innovative MVA-WNV candidate vaccines to overcome immunosenescence in old mice.”

Institute for Virology and RIZ, TiHo

Supervisor: Prof. Asisa Volz

“Virus discovery and characterization platform.”

Working Group Osterhaus – RIZ, Tiho

Supervisors: Prof. Albert Osterhaus, Prof. Ursula Siebert

“Host restriction factors in hepatitis E virus replication.”

Institute of Virology, Tiho and Molecular & Medical Virology, Ruhr-University Bochum

Supervisors: Prof. Paul Becher, Prof. Eike Steinmann

Introduction of two new PIs

During the pandemic, two new VIPER PIs could be recruited for the consortium. Prof. Dr. Gisa Gerold and Prof. Dr. Asisa Volz are highly motivated to share their experience in the field of virus research with our students. Unfortunately, we had to say goodbye to Christine Bächlein, PhD, who is moving on to new challenges at another job. We are grateful that she actively shared her experience in virology with the students of the first cohort in various courses and classes.

Prof. Dr. Asisa Volz
Institute for Virology and Research Center for Emerging Infections and Zoonoses, TiHo

Prof. Dr. Gisa Gerold
Research Group Molecular and Clinical Infection Biology, Institute for Biochemistry and Research Center for Emerging Infections and Zoonoses, TiHo

Recent VIPER publications

Contributing VIPER students highlighted in *italics*

Rift Valley fever virus detection in susceptible hosts with special emphasis in insects. K. M. Gregor, L. M. Michaely, B. Gutjahr, M. Rissmann, M. Keller, S. Dornbusch, F. Naccache, *K. Schön*, S. Jansen, A. Heitmann, R. König, B. Brennan, R. M. Elliott, S. Becker, M. Eiden, I. Spitzbarth, W. Baumgärtner, C. Puff, R. Ulrich & M. H. Groschup. Scientific Reports (2021). https://www.nature.com/articles/s41598-021-89226-z

A resampling strategy for studying robustness in virus detection pipelines. Kohls, M., *Saremi, B.*, Muchsin, I., Fischer, N., Becher, P., & Jung, K. Computational Biology and Chemistry (2021). https://www.sciencedirect.com/science/article/abs/pii/S1476927121001225

Clinical Course of Infection and Cross-Species Detection of Equine Parvovirus-Hepatitis. B. Reinecke, M. Klöhn, Y. Brüggemann, V. Kinast, D. Todt, A. Stang, M. Badenhorst, K. Koeppel, A. Guthrie, U. Groner, C. Puff, *M. de le Roi*, W. Baumgärtner, J.-M. V. Cavalleri & E. Steinmann. Viruses (2021). https://www.mdpi.com/1999-4915/13/8/1454

Comparison of merging strategies for builidng machine learning models on multiple independent gene expression data sets. J. Krepel, *M. Kircher*, M. Kohls and K. Jung. Statistical Analysis and Data Mining (2021). https://onlinelibrary.wiley.com/doi/full/10.1002/sam.11549

Mammals Preferred: Reassortment of Batai and Bunyamwera orthobunyavirus Occurs in Mammalian but Not Insect Cells. A. Heitmann, *F. Gusmag*, M. G. Rathjens, M. Maurer, K. Frankze, S. Schicht, S. Jansen, J. Schmidt-Chanasit, K. Jung and S. C. Becker. Viruses (2021). https://www.mdpi.com/1999-4915/13/9/1702

Sequential MAVS and MyD88/TRIF signaling triggers anti-viral responses of tick-borne encephalitis virus-infected murine astrocytes. L. Ghita, *V. Breitkopf*. F. Mulenge, A. Pavlou, *O. L. Gern*, V. Durán, C. K. Prajeeth, M. Kohls, K. Jung, M. Stangel, I. Steffen, U. Kalinke. Journal of Neuroscience Research (2021). https://onlinelibrary.wiley.com/doi/10.1002/jnr.24923

Swinepox Virus Strains Isolated from Domestic Pigs and Wild Boar in Germany Display Altered Coding Capacity in the Terminal Genome Region Encoding for Species-Specific Genes. *F. K. Kaiser*, A. Wiedemann, B. Kühl, L. Menke, A. Beineke, W. Baumgärtner, P. Wohlsein, K. Rigbers, P. Becher, M. Peters, A. D. M. E. Osterhaus & Martin Ludlow. Viruses (2021). https://www.mdpi.com/1999-4915/13/10/2038

Toll-like Receptors in Viral Encephalitis. *O. L. Gern*, F. Mulenge, A. Pavlou, L. Ghita, I. Steffen, M. Stangel and U. Kalinke. Viruses (2021). https://www.mdpi.com/1999-4915/13/10/2065

New Insights into the Host–Pathogen Interaction of Mycoplasma gallisepticum and Avian Metapneumovirus in Tracheal Organ Cultures of Chicken. N. Rüger, H. Sid, J. Meens, M. P. Szostak, W. Baumgärtner, *F. Bexter* and S. Rautenschlein. Microorganisms (2021). https://www.mdpi.com/2076-2607/9/11/2407

Recent VIPER publications (continued)

Detection of Systemic Canine Kobuvirus Infection in Peripheral Tissues and the Central Nervous System of a Fox Infected with Canine Distemper Virus. *F. K. Kaiser*, L. van Dyck, W. K. Jo, *T. Schreiner*, V. M. Pfankuche, P. Wohlsein, I. Baumann, M. Peters, W. Baumgärtner, A. D. M. E. Osterhaus and Martin Ludlow. Microorganisms (2021). https://www.mdpi.com/2076-2607/9/12/2521

Analysis of avian Usutu virus infections in Germany from 2011 to 2018 with focus on dsRNA detection to demonstrate viral infections. T. Störk, *M. de le Roi*, A.-K. Haverkamp, *S. T. Jesse*, M. Peters, C. Fast, K. M. Gregor, L. Könenkamp, I. Steffen, M. Ludlow, A. Beineke, F. Hansmann, P. Wohlsein, A. D. M. E. Osterhaus and W. Baumgärtner. Scientific reports (2021). https://www.nature.com/articles/s41598-021-03638-5

Ferrets are valuable models for SARS-CoV-2 research. M. Ciurkiewicz, F. Armando, *T. Schreiner*, N. de Buhr V. Pilchová, V. Krupp-Buzimikic, G. Gabriel, M. von Köckritz-Blickwede, W. Baumgärtner, C. Schulz and I. Gerhauser. Veterinary Pathology (2022). https://journals.sagepub.com/doi/10.1177/03009858211071012

Neurotoxic potential of reactive astrocytes in canine distemper demyelinating leukoencephalitis. J. Klemens, M. Ciurkiewicz, *E. Chludzinski*, M. Iseringhausen, D. Klotz, V. M. Pfankuche, R. Ulrich, V. Herder, C. Puff, W. Baumgärtner and A. Beineke. Scientific Reports (2019). https://www.nature.com/articles/s41598-019-48146-9

Intra-host analysis of hepaciviral glycoprotein evolution reveals signatures associated with viral persistence and clearance. *A. Gömer*, R. J. P. Brown, S. Pfaender, K. Deterding, G. Reuter, R. Orton, S. Seitz, C.-T. Bock, J. M. V. Cavalleri, T. Pietschmann, H. Wedemeyer, E. Steinmann and D. Todt. Virus Evolution (2022). https://academic.oup.com/ve/article/8/1/veac007/6520266

Infections with highly pathogenic avian influenza A virus (HPAIV) H5N8 in harbor seals at the German North Sea coast, 2021. A. Postel, J. King, *F. K. Kaiser*, J. Kennedy, M. S. Lombardo, W. Reineking, *M. de le Roi*, T. Harder, A. Pohlmann, T. Gerlach, G. Rimmelzwaan, S. Rohner, L. C. Striewe, S. Gross, L. A. Schick, J. C. Klink, K. Kramer, A. D. M. E. Osterhaus, M. Beer, W. Baumgärtner, U. Siebert and P. Becher. Emerging Microbes & Infections (2022). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8890524/

Vector and Host C-Type Lectin Receptor (CLR)–Fc Fusion Proteins as a Cross-Species Comparative Approach to Screen for CLR–Rift Valley Fever Virus Interactions. *K. Schön*, D. L. Lindenwald, J. T. Monteiro, J. Glanz, K. Jung, S. C. Becker and B. Lepenies. International Journal of Molecular Sciences (2022). https://www.mdpi.com/1422-0067/23/6/3243

Augmentation of Transcriptomic Data for Improved Classification of Patients with Respiratory Diseases of Viral Origin. *M. Kircher*, *E. Chludzinski*, J. Krepel, *B. Saremi*, A. Beineke and K. Jung. International Journal of Molecular Sciences (2022). https://www.mdpi.com/1422-0067/23/5/2481

Recent VIPER publications (continued)

Investigations on SARS-CoV-2 Susceptibility of Domestic and Wild Animals Using Primary Cell Culture Models Derived from the Upper and Lower Respiratory Tract. I. Färber, J. Krüger, C. Rocha, F. Armando, M. von Köckritz-Blickwede, S. Pöhlmann, A. Braun, W. Baumgärtner, *S. Runft* and N. Krüger. Viruses (2022). https://www.mdpi.com/1999-4915/14/4/828

Microgliosis and neuronal proteinopathy in brain persist beyond viral clearance in SARS-CoV-2 hamster model. C. Käufer, C. S. Schreiber, A.-S. Hartke, I. Denden, S. Stanelle-Bertram, S. Beck, N. Mounogou Kouassi, *G. Beythien*, K. Becker, *T. Schreiner*, B. Schaumburg, A. Beineke, W. Baumgärtner, G. Gabriel and F. Richter. eBioMedicine (2022). https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(22)00183-9/fulltext

An ACE2-blocking antibody confers broad neutralization and protection against Omicron and other SARS-CoV-2 variants of concern. W. Du, D. L. Hurdiss, D. Drabek, A. Z. Mykytyn, *F. K. Kaiser*, M. González-Hernández, D. Muñoz-Santos, M. M. Lamers, R. van Haperen W. Li, I. Drulyte, C. Wang, I. Sola, F. Armando, *G. Beythien*, M. Ciurkiewicz, W. Baumgärtner, K. Guilfoyle, T. Smits, J. van der Lee, F. J.M. van Kuppeveld, G. van Amerongen, B. L. Haagmans, L. Enjuanes, A. D. M. E. Osterhaus, F. Grosveld and B.-J. Bosch. Science Immunology (2022) https://www.science.org/doi/10.1126/sciimmunol.abp9312

Development and Validation of a Pan-Genotypic Real-Time Quantitative Reverse Transcription-PCR Assay To Detect Canine Distemper Virus and Phocine Distemper Virus in Domestic Animals and Wildlife. *F. Geiselhardt*, M. Peters, W. K. Jo, *A. Schadenhofer*, C. Puff, W. Baumgärtner, A. Kydyrmanov, T. Kuiken, C. Piewbang, S. Techangamsuwan, A. D. M. E. Osterhaus, A. Beineke, M. Ludlow. Journal of Clinical Microbiology (2022) https://journals.asm.org/doi/10.1128/jcm.02505-21

SARS-CoV-2 Infection Dysregulates Cilia and Basal Cell Homeostasis in the Respiratory Epithelium of Hamsters. *T. Schreiner*, L. Allnoch, *G. Beythien*, K. Marek, K. Becker, D. Schaudien, S. Stanelle-Bertram, B. Schaumburg, N. Mounogou Kouassi, S. Beck, M. Zickler, G. Gabriel, W. Baumgärtner, F. Armando and M. Ciurkiewicz. International Journal of Molecular Sciences (2022) https://www.mdpi.com/1422-0067/23/9/5124#

Molecular characterization of a bovine adenovirus type 7 (Bovine Atadenovirus F) strain isolated from a systemically infected calf in Germany. *S. T. Jesse*, M. Ciurkiewicz, U. Siesenop, I. Spitzbarth, A. D. M. E. Osterhaus, W. Baumgärtner and M. Ludlow. Virology Journal (2022) https://virologyj.biomedcentral.com/articles/10.1186/s12985-022-01817-y

Recent VIPER publications (continued)

Investigations on SARS-CoV-2 Susceptibility of Domestic and Wild Animals Using Primary Cell Culture Models Derived from the Upper and Lower Respiratory Tract. I. Färber, J. Krüger, C. Rocha, F. Armando, M. von Köckritz-Blickwede, S. Pöhlmann, A. Braun, W. Baumgärtner, *S. Runft* and N. Krüger. Viruses (2022). https://www.mdpi.com/1999-4915/14/4/828

S**ARS-CoV-2 Omicron variant causes mild pathology in the upper and lower respiratory tract of hamsters.** F. Armando, *G. Beythien*, *F. K. Kaiser*, L. Allnoch, *L. Heydemann*, M. Rosiak, S. Becker, M. Gonzalez-Hernandez, M. M. Lamers, B. L. Haagmans, K. Guilfoyle, G. van Amerongen, M. Ciurkiewicz, A. D.M.E. Osterhaus and W. Baumgärtner. Nature Communications (2022) https://www.nature.com/articles/s41467-022-31200-y

An Equine Model for Vaccination against a Hepacivirus: Insights into Host Responses to E2 Recombinant Protein Vaccination and Subsequent Equine Hepacivirus Inoculation. M. Badenhorst, A. Saalmüller, J. M. Daly, R. Ertl, M. Stadlerm C. Puff, M. de le Roi, W. Baumgärtner, M. Engelmann, S. Brandner, H. K. Junge, B. Pratscher, A. Volz, B. Saunier, T. Krey, J. Wittmann, S. Heelemann, J. Delarocque, B. Wagner, D. Todt , E. Steinmann and J.-M. V. Cavalleri. Viruses (2022)
https://www.mdpi.com/1999-4915/14/7/1401

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Outlook and announcements

VIPER still tries to offer its students the best possible continuing education opportunities. After this long period of online-only courses, the first face-to-face meetings can now actually take place again. How far this will continue to be possible or whether another corona wave will banish us back into the virtual world is not yet foreseeable. Until then, we are happy about every meeting and every presentation that can be held in presence. Students will continue to have the opportunity to present their progress and accomplishments to the VIPER community at the quarterly VIPER network meetings with all members of the graduate program. In addition, we have already succeeded in recruiting experts from the fields of virology, biomedicine, and immunology for the upcoming freshman class in September 2022. It remains to be seen whether and in which framework social events with informal get-together of the students can be realized. However, VIPER will provide them with every possible opportunity to share their experiences, challenges, and successes during their first year. We keep our fingers crossed that the pandemic will slow down and at least some planned activities can be realized. Nevertheless, these times remain challenging, and flexibility is still required from all of us.

Until then and beyond, **stay healthy!**

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