

FRIEDRICH-LOEFFLER-INSTITUT

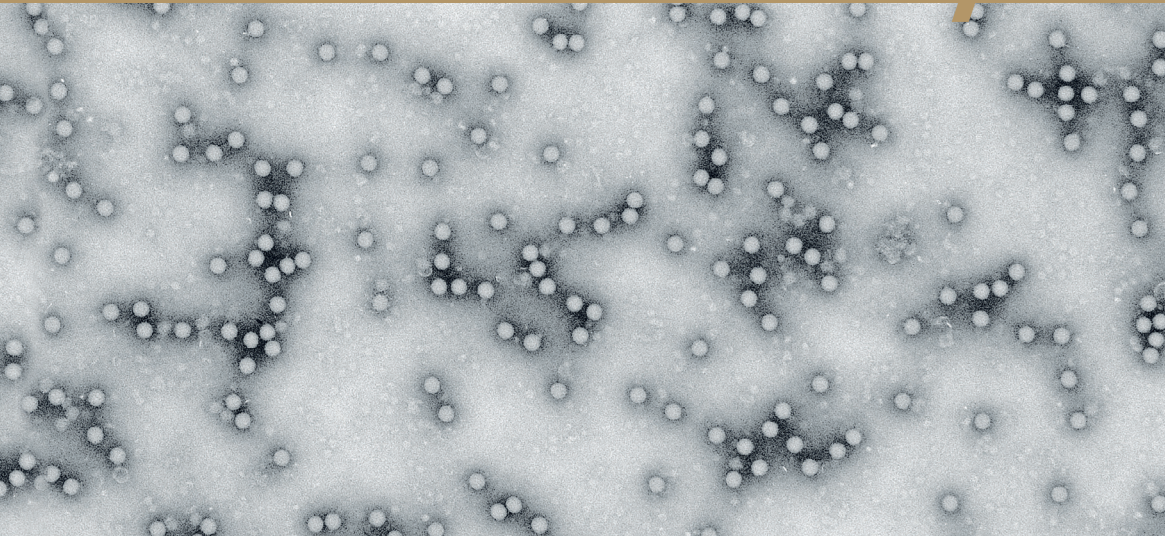
FLI

Bundesforschungsinstitut für Tiergesundheit  
Federal Research Institute for Animal Health



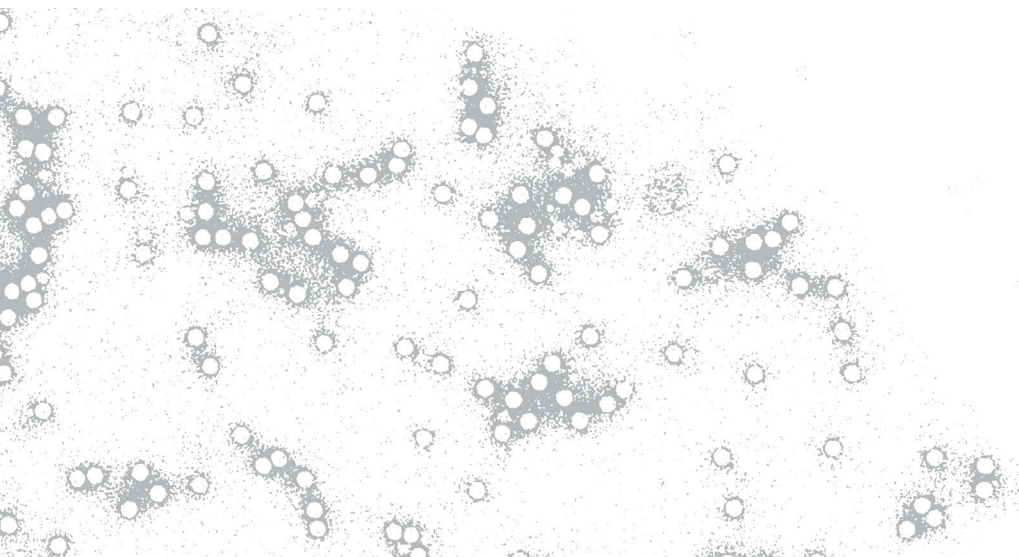
RESEARCH FOR ANIMAL HEALTH

1910–today



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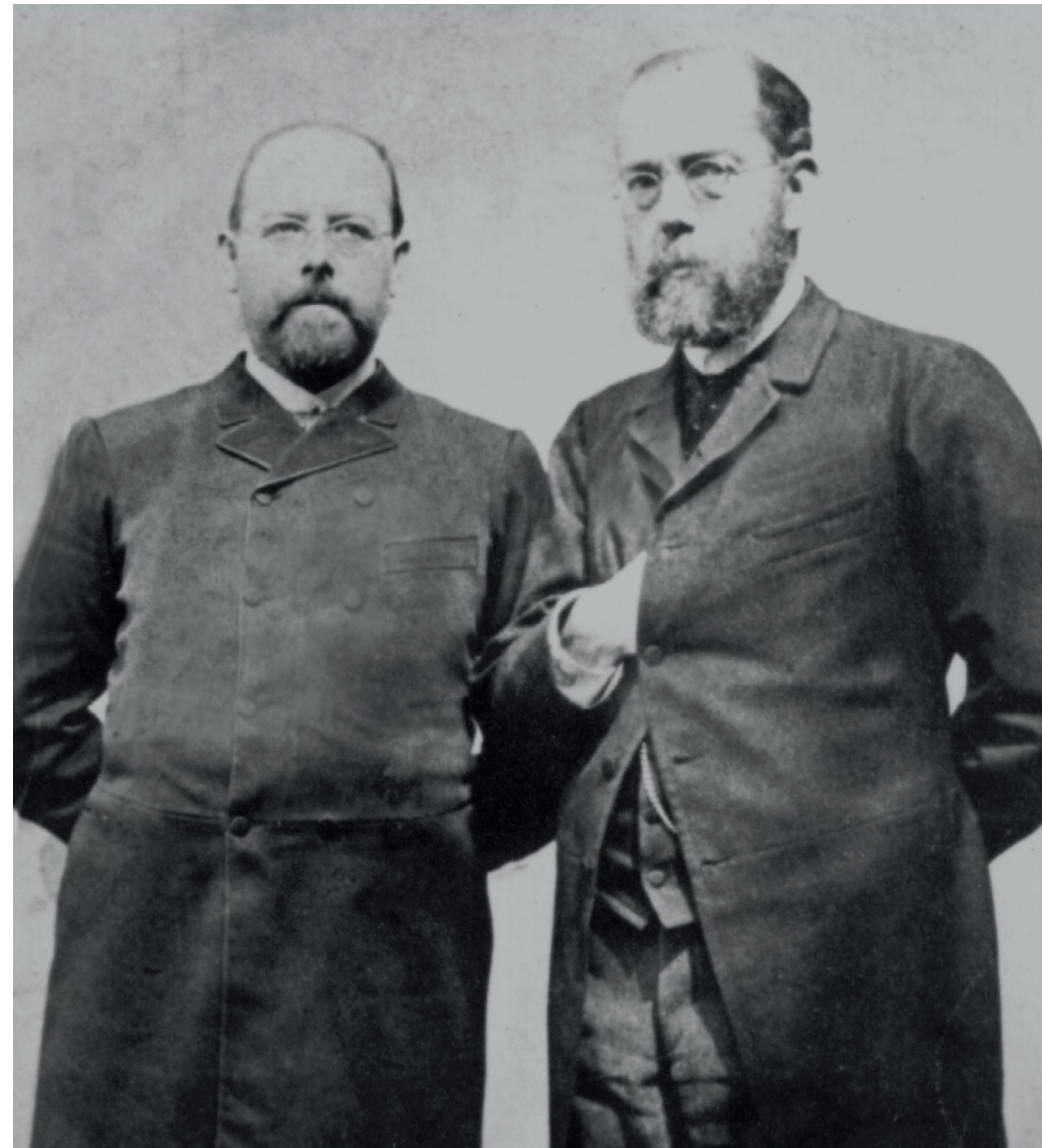


## Friedrich Loeffler – Physician, Researcher and Family Man

Friedrich August Johannes Loeffler, born on June 24, 1852 in Frankfurt/Oder, was a physician, hygienist, bacteriologist and the founder of the science of virology.

After studying medicine, Loeffler worked as a military physician before becoming principal assistant to Robert Koch at the Imperial Health Office in Berlin in 1879. He discovered the causative agents of various infectious diseases such as glanders and erysipelas. With the discovery of the causative agent of diphtheria in 1884, he laid the groundwork needed to develop effective remedies and protective vaccines. In 1888, Loeffler became Professor for Hygiene at the University of Greifswald. In 1897, he was commissioned by the state to do research into foot-and-mouth disease. Together with Paul Frosch, he identified the pathogen as an ultrafilterable, replication-competent particle, smaller than a bacterium. They concluded that a novel type of pathogen must exist: viruses. Loeffler and Frosch are therefore rightly regarded as the founders of virology. They opened the window on a nanoworld that still occupies and fascinates scientists today. In 1910, Loeffler founded the world's first virological research facility on the island of Riems, which he headed until his appointment as director of the future Robert Koch Institute in 1913.

Loeffler worked in Greifswald for more than 25 years. He was active in the city assembly, modernized disease control and hygiene, and brought about the construction of the Greifswald sewage system. In 1913, the city granted him honorary citizenship.



■ Friedrich Loeffler (left) with Robert Koch, around 1885  
(Source: Robert Koch Institute)





■ From left to right: Friedrich Loeffler's youngest son Ernst, the second oldest daughter Elsbeth with her son Horst, in the center Friedrich Loeffler, next to him his youngest daughter Marie-Luise (holding hands with Elsbeth's daughter Hildegard, the future H. Gaedt), next to her Friedrich Loeffler's eldest daughter Margarethe with her children Eberhard and Irmgard, right behind her Friedrich Scholz (Elsbeth's husband), to her left Alwin de Barde (Margarethe's husband). The other two gentlemen in the back are unknown. The photograph was taken around 1910. (Source: Gaedt family)

However, Loeffler was not only an ambitious researcher and committed citizen, but also a distinct family man. „Father Loeffler“, as he was called, and his wife Anna-Otilie had three daughters and two sons. Family pictures and documents tell of a domestic atmosphere that was characterized by cordiality, humour and mutual esteem.

His youngest son, Ernst Loeffler, is known to have worked as a physician. The other son, Friedrich Karl Georg Loeffler, was an orthopaedist and surgeon in Halle and at the Berlin Charité. Daughter Marie-Luise worked as a nurse, also at the Berlin Charité. Out of personal interest, Loeffler also did research into cancer, as his wife fell seriously ill and succumbed to the disease at the age of 45. Loeffler died in Berlin on April 9, 1915, aged 62. He is buried at the „Old Cemetery“ in Greifswald.



■ Friedrich Loeffler in his Greifswald laboratory around 1906. He was a pioneer in the field of virology. The paradigm shift from the already small bacteria to the even smaller viruses was a scientific tour de force. (Source: Anna Hertwig)



## The long way to Riems – How Loeffler came to the island (1897 to 1910)

On October 10, 1910 Loeffler began his work on the island of Riems. What seems inseparable today – Riems and animal disease research – only came to be after overcoming some difficulties.



■ *The island of Riems around 1916. According to contemporary reports it appears „as a centre of small radius having a web of connections all throughout the surrounding area“. E.g., butter produced on the island was transported to Wieck by sailboat. Peat used as fuel was pulled to the mainland across the channel by horses. Fishing and hunting served as sources of food and income.*

In 1897, Loeffler, working as a professor at the Institute of Hygiene in Greifswald, was commissioned to do research into foot-and-mouth disease – one of the most threatening virus diseases of farm animals worldwide. At the Institute for Infectious Diseases in Berlin, today's Robert Koch Institute, Loeffler and Paul Frosch performed the decisive



■ The farm house of the Möller family around 1919

experiments that led to the discovery of the dangerous pathogen in 1898. Loeffler continued his research in Greifswald under simple conditions until an increasing number of outbreaks to his experiments led to a research ban.

As a consequence, he moved to the island of Riems to continue his work. The isolated, but easily accessible island had seven inhabitants and belonged to the farmer Otto Möller. A lease and service agreement was concluded with Möller, which included a pig as payment-in-kind.



In 1909, the ground-breaking ceremony was held for the animal houses, rooms for slaughtering and incinerating carcasses, and for the office and laboratory building, today's Loeffler-Haus. However, Loeffler had only been granted half the money he had applied for and communication with the authorities was extremely difficult. Even his application for an automobile was rejected, as the district president of Stralsund could

*"not recognize an urgent need for the purchase of an automobile at state expense, because the distance of approximately 13 km between Greifswald and Gristow can be covered comfortably by horse and wagon in 1 hour and 10 minutes."*

The relationship with the inhabitants along the Baltic coast in the vicinity of the island was not easy either. The Gristow parish church council blocked a path leading past the parsonage, so that only the long detour via Kalkvitz remained. The Kalkvitz fishermen, on the other hand, refused to provide land for fencing in the landing site. After successful mediation by the departmental veterinarian, a lease could be agreed. This was done by handshake and without a written contract,

*"due to the great inertia of these simple fishermen and their strong mistrust of everything written."*

In spite of the initial difficulties, Loeffler and his successors were able to establish an institute of international reputation, which receives recognition (even) from the locals.



■ The Loeffler-Haus around 1914



## From the beginning of research to the post-war period (1910 to April 1948)



■ The Riems hyperimmune serum  
(Source: Institute for Virology and Immunology, Mittelhäusern, Switzerland)



■ Veterinarian and virologist Otto Waldmann, President of the Friedrich-Loeffler-Institut from 1920 to 1948

Research began in 1910. Initially it aimed at the production of a protective serum for cattle against foot-and-mouth disease (FMD). One year later, Loeffler reported the successful production of the first 75 litres, sufficient for about 900 head of cattle. The annual production initially only amounted to 300 litres of immune serum.

However, successful vaccination during the epidemic between 1910 and 1912 confirmed the value of such efforts and gave reason to purchase the island as a permanent production and research site.

After Loeffler had been appointed head of the Institute for Infectious Diseases, today's Robert Koch Institute, in Berlin in 1913 and the scientific staff had been drafted into military service, production was discontinued during the course of the First World War. The shutdown ended in May 1919 with the arrival of Otto Waldmann as Assistant District Veterinarian. In 1920 he became director of the „Staatliche Forschungsanstalt Riems“.

Shortly afterwards, Waldmann and his assistant Julius Pape succeeded in experimentally infecting guinea pigs with the FMD pathogen. The focus of his research was now on a cost-effective and financially viable method of serum production.

After the construction of new laboratories and large animal houses from 1925 to 1930, between 80,000 and 100,000 litres of the new Riems hyperimmune serum were produced. In 1932, the virus was cultivated on cell cultures, and in 1938 the first active vaccine for protective immunization was produced.

Additionally, research was done on other viral diseases, such as classical swine fever, infectious equine anaemia, enzootic pneumonia, fowl plague, and infectious bronchitis of cattle.



■ *The slaughterhouse on the institute premises*

During the Second World War and in the following years, FMD remained the primary focus of the institute. Use of the latest technologies such as ultracentrifuges and electron microscopes, and interdisciplinary cooperation, for example with human medicine, brought advances in basic research.

In early July 1945, the institute's furnishings and equipment were completely dismantled as reparations by the Soviet occupying power. Threatened by the risk of foot-and-mouth disease epidemics, work was resumed at the end of 1945 in two makeshift laboratories. Here the production of vaccines against swine erysipelas and the cultivation of FMD virus in incubated chicken eggs were achieved. However, research and production stagnated when Waldmann left Riems for Argentina with a group of scientists in April 1948 due to difficult working conditions and political conflicts.



■ *Until 1926, people, animals and material could only be transported to the island by boat. In the following years, a two-line cable car was installed. It was not until 1970 that a causeway was built. A checkpoint was located in Riemserort.*



## Research continues – in East and West Germany (November 1948 to 1991)



■ Veterinarian and virologist Heinz Röhrer, President of the Friedrich-Loeffler-Institut from 1948 to 1970



■ Beginning in 1942, veterinarian and virologist Erich Traub was head of laboratory at the „Reichsforschungsanstalt Insel Riems“, and from 1955 to 1959 he was President of the Federal Research Centre for Virus Diseases of Animals in Tübingen

Beginning in November 1948, Heinz Röhrer headed the institute. Basic research was intensified and mass production of various vaccines was initiated. In 1950, the GDR was the first country worldwide to introduce mass vaccination of cattle against foot-and-mouth disease (FMD).

In 1951, Röhrer and his colleagues were awarded the GDR National Prize of the highest class for „decisive improvements in the production processes for vaccines against foot-and-mouth disease (...)“. Among the scientists who were awarded the prize as a collective were – in addition to Heinz Röhrer – Gottfried Pyl, Hubert Möhlmann, Herbert Bindrich, Kurt Dedié and Kurt Potel. Cultivation of the virus on cell culture basis was brought up to production level in the 1960s, and ultimately the entire vaccine requirement was covered by cell culture vaccines. Another focus was the control of classical swine fever.

After the division of Germany, the former Reichsforschungsanstalt was renamed „Forschungsanstalt für Tierseuchen Insel Riems“. Its expertise was no longer available to the Federal Republic of Germany. Thus, in 1952, it was decided to establish the „Federal Research Centre for Virus Diseases of Animals“ in Tübingen. Erich Traub, who came from the island of Riems and had been active in the USA before and after the war, was commissioned to set up and head the institute. In addition to FMD research, work also included the diagnosis and epidemiology of the other virus-related animal diseases.

In Tübingen, successes were achieved in the development of an FMD vaccine which was also suitable for use in pigs, and in elucidating the structure of the FMD virus and the structures responsible for immune response. Further accomplishments were achieved in research on the epidemiology and diagnosis of enzootic bovine leukosis and in the development of a live vaccine against rabies. With this vaccine, fox rabies could be eradicated in Germany and beyond.

The successful development of crystal violet vaccine in 1956 enabled the preventive immunization of pig holdings against classical swine fever. The scientific focus was now extended to virus diseases of other farm animals.

After Röhrer's retirement in 1970, the institute's focus was moved towards production. As a result of the outbreak of foot-and-mouth disease in 1982 which was traced back to the institute, an „investment plan FMD complex" with a volume of approximately 250 million GDR marks was decided. This included the establishment of a specialist institute for epidemiology. The „Bezirksinstitut für Veterinärwesen" in Wusterhausen/Dosse, Brandenburg, founded in 1962 as a district animal clinic was found suitable for this purpose. In 1985, the Wusterhausen facility finally took up its work as the „Staatliches Institut für Epizootiologie und Tierseuchenbekämpfung" (State Institute for Epizootiology and Animal Disease Control).



■ As part of the „investment plan FMD complex", a high-containment animal went into operation in 1991. Infection studies on animal diseases were carried out here until 2016. The building was torn down in 2019.



## The Friedrich-Loeffler-Institut becomes the Federal Research Institute for Animal Health (1992 to 2008)



■ *Biologist and virologist Thomas C. Mettenleiter,  
President of the Friedrich-Loeffler-Institut since 1996*

With the reestablishment of the institute on the island of Riems as part of the Federal Research Centre for Virus Diseases of Animals (BFAV) in 1992, new specialist divisions for molecular virology, infectology and virus diagnosis were created.

Production was privatized and basic research returned to centre stage. The Wusterhausen site continued its epidemiological work under the roof of the BFAV. Thomas C. Mettenleiter has been President of the Centre since 1996.

Until 1993, he worked at the Institute for Vaccines of the BFAV in Tübingen and from 1994 to 2019 he headed the Institute of Molecular Virology and Cell Biology on the island of Riems. Since 1997, the island of Riems has been the headquarters of the institute, which in 2004 was again named after its founder with the addition „Federal Research Institute for Animal Health“. It is affiliated to the Federal Ministry of Food and Agriculture (BMEL) as an independent higher federal authority.

With the reorganisation of consumer protection in the wake of the BSE crisis, the Jena site was incorporated in 2002. The Institute for Bacterial Animal Disease Research of the German Academy of Agricultural Sciences had been founded there already in 1954.

The other three locations of the Friedrich-Loeffler-Institut (FLI) also look back on an eventful history. Since 1896, horses had been trained for military service on the estate of the Mariensee Monastery. After 1946, animal breeding became the focus of research. In 1974, the institute was incorporated into the Federal Agricultural Research Centre as Institute for Animal Breeding and Animal Behaviour.

The institute in Celle was founded in 1938 as „Reich Institute for Silk Farming“. From 1942 on, the institute did small animal research. After being renamed repeatedly, it was refounded in 2002 as Institute of Animal Welfare and Animal Husbandry. The Institute of Animal Nutrition in Braunschweig was established in 1948 as one of the first institutes of the new Federal Agricultural Research Centre and became part of departmental research in 1966.

Reorganisation of departmental research within the Federal Ministry, finally led to the incorporation of the Institutes of Farm Animal Genetics in Mariensee, of Animal Welfare and Animal Husbandry in Celle, and of Animal Nutrition in Braunschweig into the FLI in 2008.

At the end of 2011, the Tübingen site was closed as part of the research concept of the Federal Ministry. The Institute of Immunology which had last been located there continues its work on the island of Riems.

At the end of 2013, the Wusterhausen site was also given up. The Institute of Epidemiology moved to the island of Riems as well.



- Since 2004, the institute has again used its traditional name Friedrich-Loeffler-Institut with the addition "Federal Research Institute for Animal Health"



- The former and current locations of the Friedrich-Loeffler-Institut

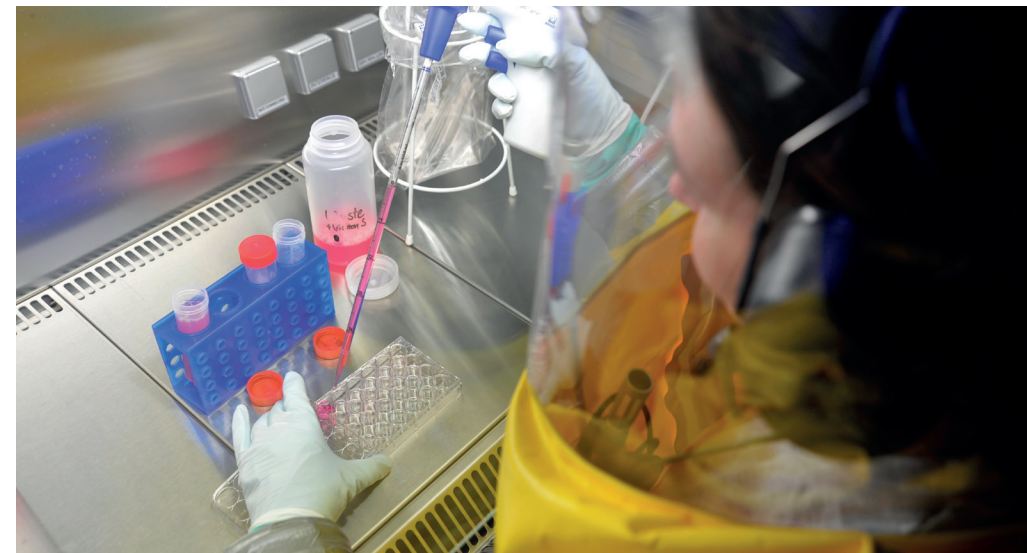


## The Friedrich-Loeffler-Institut today – part of a worldwide network for One Health

The Friedrich-Loeffler-Institut (FLI) performed research on animal health for more than 100 years and is the oldest virus research institute worldwide. At its headquarters on the island of Riems near Greifswald, research mainly focusses on the prevention, diagnosis, and control of viral infections, especially in food-producing animals. In Jena, basic and applied research on bacterial diseases are performed. The institutes in Lower Saxony are dedicated to classical livestock sciences. Questions related to animal friendly housing systems and responsible handling of farm animals are becoming increasingly important. In all areas of animal health, the FLI has an advisory function towards decision-makers on a national and international level. In addition, it houses national reference laboratories for all notifiable and several reportable infectious animal diseases.



■ *View of the laboratory and experimental animal facility complex on the island of Riems*



■ *In the laboratory of biosafety level 4, all work is carried out in a full protective suit*

At FLI, 850 staff members work to ensure the health and well-being of food-producing animals. Animal health research is also research for the protection of humans from infections that can be transmitted between animals and humans. Formerly exotic pathogens are rapidly gaining importance due to climate change and globalisation. Some of these highly dangerous pathogens can only be investigated in special high-containment laboratories. With its laboratory and animal house complex completed in 2013, representing an investment volume of approx. 380 million €, the FLI on the island of Riems has an infrastructure unique in the world. 89 laboratories and 163 animal house compartments have been built here on around 80,000 m<sup>2</sup>. The new high-containment laboratory of the highest biosafety level 4 offers the possibility to investigate highly dangerous pathogens such as the Ebola or the Crimean-Congo haemorrhagic fever virus directly in the host animal without leaving the shores of Europe.





■ A comprehensive construction project is also being realized at the Jena site

As Federal Research Institute for Animal Health, the FLI bears a responsibility that transcends borders and disciplines. With more than 150 international projects and cooperation in 85 countries, it is part of a worldwide network.



■ The FLI sites Braunschweig, Celle and Mariensee each have an experimental station



■ Over the next few years, the three institutes in Lower Saxony will be consolidated in a new animal experimental centre at the Mecklenhorst/Mariensee site

In addition to cooperation with universities and research institutions, FLI is involved in projects of international organisations such as the World Organisation for Animal Health (OIE), the European Food Safety Authority (EFSA), the World Health Organization (WHO), and the Food and Agriculture Organization (FAO) and participates in various committees. A detailed exchange is ongoing between natural science, human and veterinary medicine and environmental sciences as part of the „One Health concept“, the interdependence of humans, animals, and the environment.

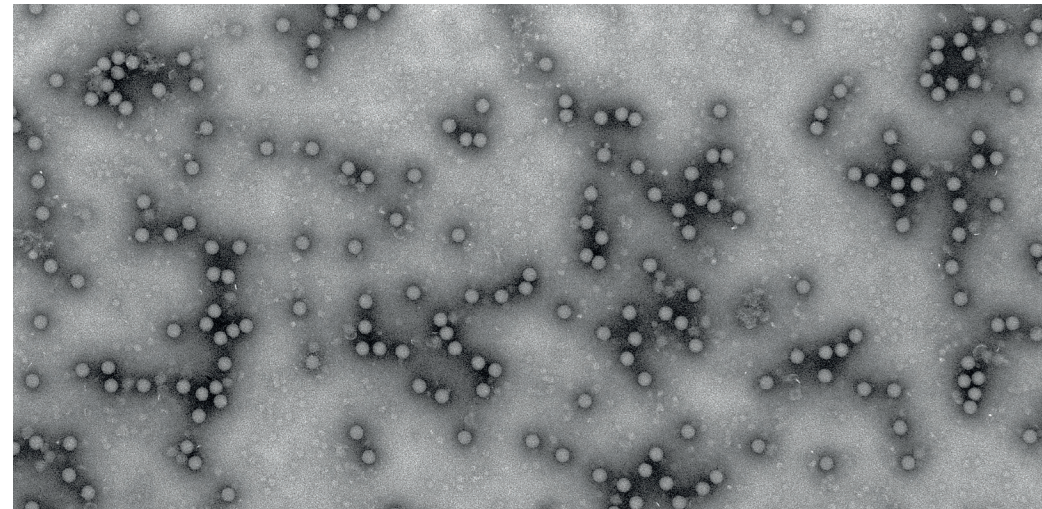


## What happened to Foot-and-Mouth Disease?

Over the last few years, foot-and-mouth disease (FMD) has been eradicated in many countries, particularly in Europe and North America. Due to the successful control of FMD in Germany, the disease has lost its terror in public perception. Is this a reason to reduce preventive measures? Not at all, if we look at setbacks such as the catastrophic 2001 epidemic in the United Kingdom, during which several million animals were killed. Only a few hours away by plane, e.g. in North Africa, Turkey, and the Middle East, the disease is still part of everyday life.

On all continents, there are now countries or regions that are considered free from the disease. South America has probably made the most significant progress in recent years. The fragility of this situation becomes evident as soon as, for example in the wake of political crises or armed conflicts in a region, animal health protection measures collapse. Successes achieved over decades can be reversed in a short time, as shown by the outbreaks reported in Colombia at the Venezuelan border in 2017 and 2018.

The eradication of the disease in America and the European Union proves that groups of cooperating states are able to achieve lasting success, whereas single countries often struggle. Therefore, international organisations are working towards regional networking of affected and imperiled countries. In Europe, the European Commission for the Control of Foot-and-Mouth Disease (EuFMD) fulfils this function. The rapid detection of outbreaks, the culling of infected or suspected animals, animal movement and trade restrictions, but also effective

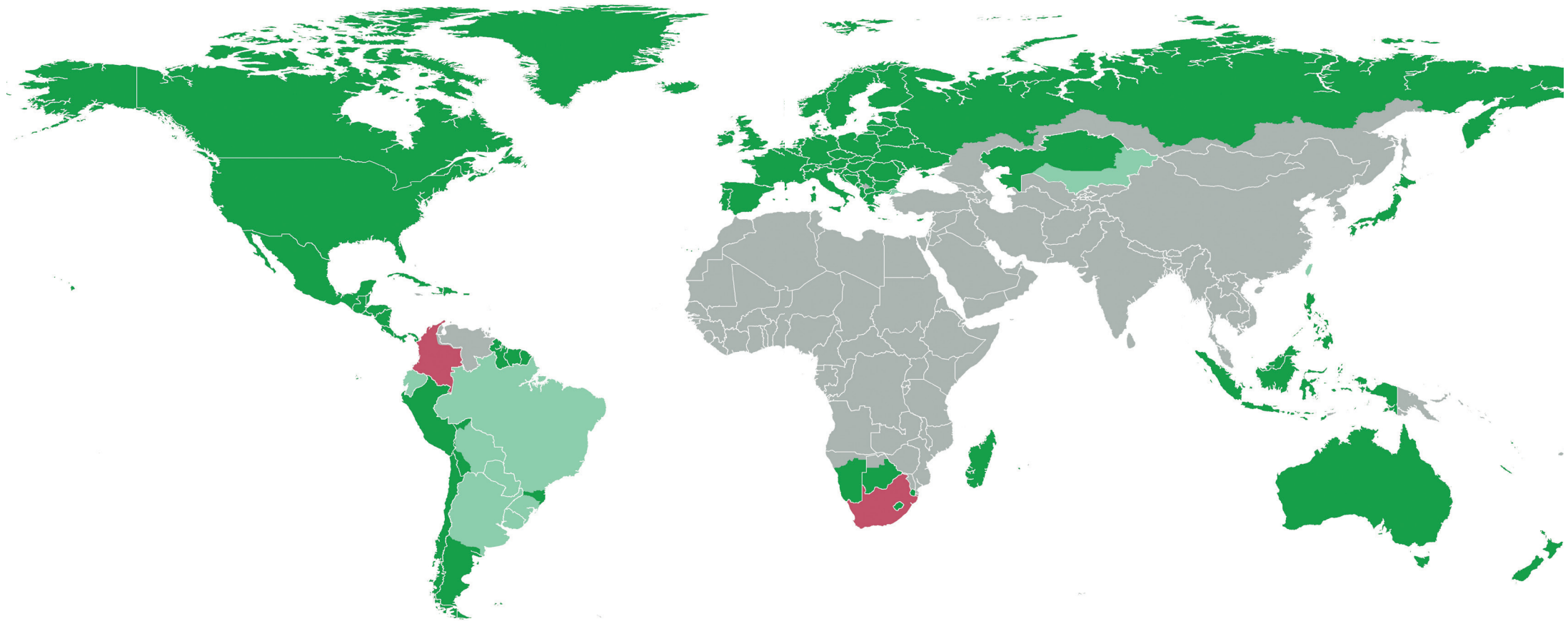


■ *Foot-and-mouth disease is a highly contagious virus disease of even-toed ungulates. The most susceptible animals are cattle, sheep, goats, buffaloes and pigs.*


measures to prevent an introduction of the disease remain important elements for preventing major epidemics. In particular as a result of globalisation, FMD remains one of the greatest threats to animal health.


Today, the Friedrich-Loeffler-Institut still performs research for the development of vaccines against the various serotypes of the FMD virus. One goal is to reliably differentiate vaccinated from infected animals and to develop vaccines that prevent not only disease, but also infection with the virus. Scientists from different disciplines are working together to find out under which conditions application of a vaccine makes sense and which are the most promising strategies.

## Official FMD status of the member countries of the World Organisation for Animal Health (OIE)



*last updated 2019*

 *Members and zones recognised as free from FMD (without vaccination)*

 *Members and zones recognised as free from FMD (with vaccination)*

 *Suspension of FMD free status*

 *Countries and zones without an OIE official status for FMD*



## "Cradle of virus research" – the exhibition in the Loeffler-Haus

At first glance it looks like a beautifully renovated single-family home from the last century, at second glance it turns out to be the "cradle of virus research": the Loeffler-Haus on the island of Riems. It was here that the research work of today's Friedrich-Loeffler-Institut began over 100 years ago.

The Loeffler-Haus was one of the first buildings built for research. The laboratory rooms were on the ground floor, with living quarters above. Loeffler's assistant Carl Schipp did research into foot-and-mouth disease here. Loeffler himself, who taught as professor for hygiene at the University of Greifswald, visited the institute regularly to discuss the research work and other tasks.



■ The Loeffler-Haus today



■ Selected exhibits tell the story of the institute; from the pioneering work to the ups and downs of the long development from a research institute for foot-and-mouth disease to the Federal Research Institute for Animal Health

In his letter to the Minister of Agriculture, Domains and Forests he wrote:

*"Your Excellency I obediently report that immediately after the arrival of a fresh lymph sample from Witkowo on Monday, October 10 I began work on the island of Riems."*

With this letter he documented the official founding date of the institute which would later be named after him.

There can be no more suitable place for a small, but comprehensive documentation of the institute's history. It is a stroke of luck that this historical building has survived all turmoil and is now in the care of the institute again. The exhibition was inaugurated at the occasion of the 100th anniversary on October 10, 2010.

Friedrich Loeffler's grandson, Peter Georg Loeffler, provided numerous objects, photographs and documents of his grandfather and thus gave the impetus for the exhibition in the Loeffler-Haus. His grandfather's research work is also honoured once a year with a public lecture given by a renowned scientist as the so-called „Loeffler Lecture“.



■ From right to left: Peter Georg Loeffler during the Loeffler Lecture 2016 with the virologist Geoffrey L. Smith, the current President of the Institute Thomas C. Mettenleiter, and the former Director of the Alfred Krupp Kolleg Bärbel Friedrich



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**Friedrich-Loeffler-Institut**  
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**1910 — today**

