

To harness RNA  
in medical diagnostics,  
prevention and as  
anti-infectives

To develop innovative  
application techniques

## ABOUT

The Helmholtz Institute for RNA-based Infection Research (HIRI) is the first institution worldwide to combine ribonucleic acid (RNA) research with infection biology.

Based on novel findings from our strong basic research program, our long-term goal is to develop innovative therapeutic approaches to better diagnose and treat human infections.

HIRI is a joint venture of the Helmholtz Centre for Infection Research (HZI) in Braunschweig and the Julius Maximilian's University of Würzburg (JMU) and is located on the Würzburg Medical Campus.

## CONTACT

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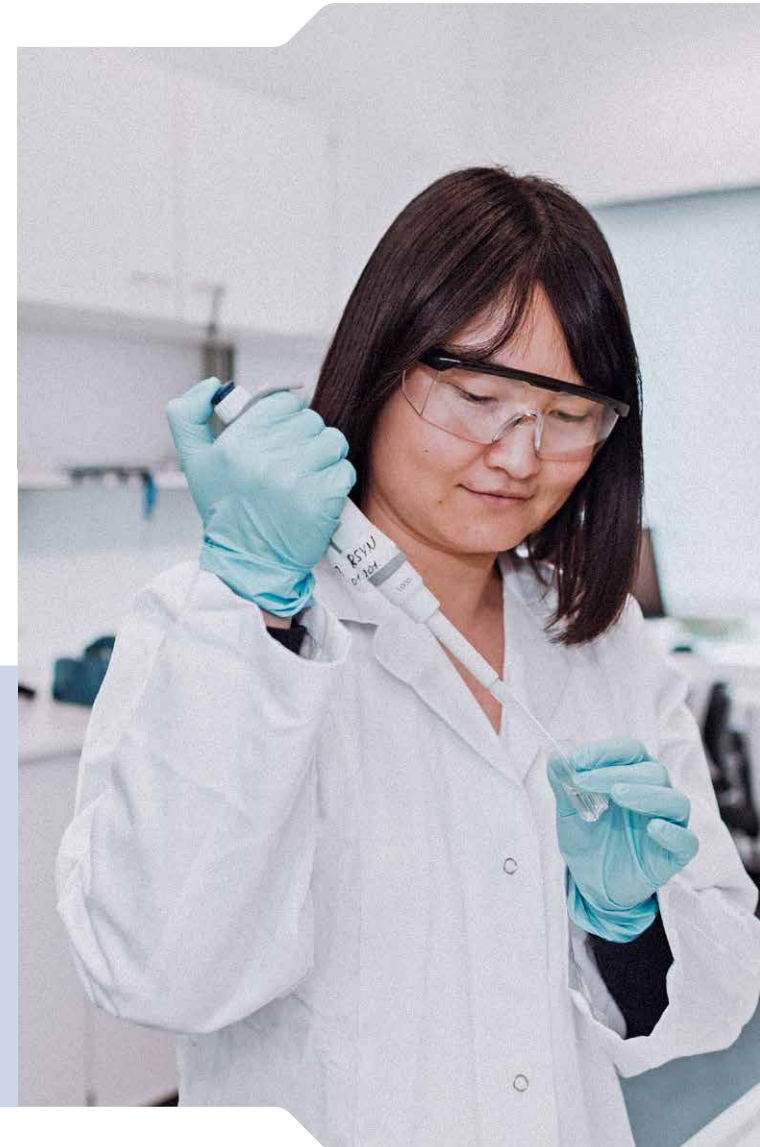
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**HIRI** **HELMHOLTZ**  
Institute for RNA-based Infection Research



## OUR MAJOR GOALS ARE:

To better understand  
infections at the  
single-cell level

To detect regulatory  
ribonucleic acids (RNA)  
in infection processes

To identify RNA-based  
mechanisms in  
viral infectivity  
and host defense

Institution of

**HZI** **HELMHOLTZ**  
Centre for Infection Research

In cooperation with

Julius-Maximilians-  
**UNIVERSITÄT**  
**WÜRZBURG**

**#RNAexcellence**

**RNA-BASED  
INFECTION RESEARCH  
MADE IN WÜRZBURG**



## RESEARCH GROUPS AT HIRI



**Prof  
Jörg Vogel**

RNA Biology of  
Bacterial Infections

The research group led by **Jörg Vogel** investigates the RNA world of microbes during infection and in the context of their natural habitat. Using high-resolution methods, they seek to understand when, how and why bacteria use RNA-based mechanisms to regulate their genes, and exploit this knowledge to develop RNA-based therapeutic approaches.



**Prof  
Chase Beisel**

RNA Synthetic Biology

**Chase Beisel's** group adopts synthetic biology approaches to investigate how CRISPR/Cas immune systems function and how they can be converted into different technologies. They interrogate the properties of the immune systems using cell-free transcription-translation systems as well as *E. coli* and non-model bacteria naturally harboring these systems.



**Dr Antoine-  
Emmanuel Saliba**

Single-Cell Analysis

The research group led by **Emmanuel Saliba** explores host-pathogen interactions in high resolution at the single-cell level. They develop and integrate single-cell genomics, imaging and computational approaches to decipher the microenvironments of individual pathogens and shed light on the heterogeneity of host responses and disease outcomes.



**Jun Prof  
Lars Barquist**

Integrative  
Informatics for  
Infection Biology

**Lars Barquist's** group works on the development of new statistical, bioinformatic, and visualization approaches. Their work applies tools such as machine learning and Bayesian statistics to provide insight into bacterial pathogens, with the ultimate aim of overcoming the current bottleneck in the interpretation of complex post-genomic data.

**Neva Caliskan's** group investigates the functions and dynamics of RNA molecules and their interplay with trans-acting factors involved in recoding events. They work with several viruses known to depend on recoding strategies for replication including corona and retroviruses, and develop methods to investigate RNA complexes and translation in unprecedented detail.

**Redmond Smyth's** group studies RNA-based mechanisms of RNA virus replication and evolution. Their work employs a combination of molecular virology, RNA biochemistry and mathematical modelling. They seek to identify essential RNA structures as new antiviral targets, and to understand how RNA structure regulates viral evolution.

**Alexander Westermann's** group maps the complex network of interactions between human gut microbes, the host and invading pathogens during infection processes. Their research seeks to identify and functionally characterize non-coding RNA molecules (ncRNA) and RNA-binding proteins in pathogens, the host and its microbiota.

**Mathias Munschauer's** group is charting a map of functionally important RNA-protein interactions for specific RNA types, ranging from host or pathogen encoded long non-coding RNAs (lncRNAs) to viral RNA genomes. Their work combines a cutting-edge suite of technologies from the fields of biochemistry, genomics, molecular biology and computational biology.



**Jun Prof  
Neva Caliskan**

Recoding  
Mechanisms  
in Infections



**Jun Prof  
Redmond Smyth**

Genome Architecture  
and Evolution of  
RNA Viruses



**Jun Prof  
Alexander Westermann**

Host-Pathogen-  
Microbiota Interactions



**Jun Prof  
Mathias Munschauer**

LncRNA and  
Infection Biology