MVI-1 | Chlamydia-infection mediated DNA damage and mechanisms of telomere maintenance

Host unit	Main supervisor	Co-supervisor
Institute of Microbiology and Virology (MVI) Explore the host institute Host–Pathogen Interactions group	Prof. Bhupesh Kumar Prusty View research profile Visit the research group	Dr Zaiga Nora-Krūkle View research profile

APPLICANT FREEDOM The proposed topic defines a broad research area rather than a predefined project. Applicants are encouraged to develop their own original research concepts, provided that these are scientifically aligned with the topic and feasible within the expertise, infrastructure, and resources available in the host environment.

Research context and rationale

Telomeric DNA and the shelterin complex are essential for chromosomal stability but remain vulnerable to persistent damage. Chlamydia trachomatis infection provides a model for investigating how an intracellular bacterial pathogen may alter host DNA-damage responses and telomere-maintenance mechanisms.

Indicative scientific scope

Projects should investigate mechanistic links between Chlamydia infection, telomeric damage and repair, considering host and bacterial factors. Potential research directions may include the role of the chlamydial nuclear effector NUE, host chaperones such as Hsp70 and telomerase-related repair. Applicants may address these or propose alternative, scientifically justified mechanisms that align with the overall thematic scope.

Examples of research questions

- How does Chlamydia infection alter telomere integrity, DNA-damage signalling or shelterin-associated processes?
- Which bacterial and host factors contribute to damage, persistence or repair?
- How do findings vary across cellular, organoid or other physiologically relevant infection models?
- Can mechanistic insights distinguish infection-specific effects from general cellular stress or senescence responses?

Possible approaches

- Biochemical and molecular assays for DNA damage, telomere biology and protein interactions.

- Molecular and biochemical reconstitution approaches to investigate interactions between bacterial effectors, host proteins, and telomeric components, where appropriate to the proposed mechanism.
- Advanced fluorescence or confocal microscopy and quantitative image analysis.
- Cellular infection models, with organoid-based validation where justified and available.
- Single-cell or other transcriptomic approaches where they directly address the research question.

METHODS NOTE The approaches above are indicative. Applicants should select and justify methods appropriate to their own questions rather than attempt to include every method listed.

Relevant host expertise and resources

Expertise: Host-pathogen interactions, Chlamydia biology, DNA-damage responses, telomere biology, molecular cell biology and infection-related chronic disease.

- Cell-culture and infection-model work must comply with the authorised biosafety scope of the KEY-RSU host facilities.
- 10x Genomics Chromium controllers, Agilent TapeStation, real-time PCR, nucleofection, fluorescence microscopy, BioTek Cytation C10 Confocal Imaging Reader, Seahorse XF Pro, capillary Western blotting and central flow-cytometry/confocal microscopy facilities.
- Modern Radioisotope labs.
- Bioinformatics and HPC support, subject to project-specific arrangements.

ACCESS CONDITION Access to the specialized resources listed above is subject to the conditions described in the separate MVI Host Profile and to project-specific arrangements.

Interdisciplinary and intersectoral opportunities

- Molecular microbiology, cell biology, genome stability, imaging, bioinformatics and translational infection biology.
- Potential links with clinical and biomedical expertise at RSU where scientifically appropriate.

Potential collaboration and secondment pathways

The host group's topic-specific scientific collaborations include Prof. Thomas Rudel's group at Julius-Maximilians-Universität Würzburg and Prof. Cindrilla Chumduri's group at Aarhus University. Prof. Chumduri is a proposed external mentor for this research area. Any project-specific involvement or placement is subject to agreement; scientific collaboration does not in itself imply formal KEY-RSU Associated Partner status.

- Aarhus University - proteomics/metabolomics, bioenergetics, sequencing, patient models and research training.
- University of Skövde - digital health, precision medicine and translational medicine.
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- SIA APPLY - applied AI, computer vision, predictive modelling and production-oriented digital-health development.

- Other Associated Partners may be relevant if the final project requires their documented expertise.

SECONDMENT STATUS Participation in a mandatory secondment of 6–12 weeks forms part of KEY-RSU. The final host, duration, objectives and outputs will be agreed for the selected fellow and aligned with the approved KEY-RSU rules and Career Development Plan. The researcher remains employed by RSU throughout the secondment. Additional host organisations may be considered, subject to confirmation of their suitability, compliance with KEY-RSU requirements and any necessary approvals.

Research training and career development

The research environment offers opportunities to develop an interdisciplinary profile across infection biology, RNA biology, molecular and cellular methods, and computational analysis, according to the selected project. Training and mentoring may include project planning, research data management, Open Science, scientific writing, and communication. Opportunities to contribute to guest lectures, practical laboratory sessions and the mentoring of bachelor's and master's students will be tailored to the researcher's expertise and institutional arrangements. Individual priorities and activities will be agreed through the Career Development Plan.

Applicant background

Relevant background: Applicants should hold a doctoral degree in a relevant field and demonstrate the ability to develop and conduct independent research. Assessment will consider the quality, originality, and relevance of the applicant's research contributions, as well as evidence of scientific leadership, collaboration, mentoring, and contributions to the research community. Experience in supervising, co-supervising, or mentoring early-career researchers and students will be considered an asset.
Methodological expertise will be evaluated in the context of the proposed research and the applicant's overall competencies, recognising that excellent candidates may acquire additional skills during the fellowship.
No additional position-specific eligibility requirement should be inferred from this profile unless it is explicitly included in the approved Full Call Text.

Competences that may strengthen the proposal

The following experience may strengthen a proposal but is not an automatic eligibility requirement:

- molecular or cellular infection models;
- host–pathogen interaction research;
- DNA-damage responses, telomere biology or genome stability;
- fluorescence or confocal microscopy and quantitative image analysis;
- biochemical, molecular or protein-interaction assays;
- transcriptomic or bioinformatic analysis relevant to the proposed research.

Applicants are not expected to cover every area listed. The appropriate combination of competences will depend on the candidate's own research questions and methodological strategy.

Feasibility boundaries

- The proposed project must be scientifically ambitious while remaining feasible within the available timeframe, resources, infrastructure, and expertise of the host environment.
- Applicants should clearly distinguish essential research activities from optional validation, extension, or exploratory studies, and describe credible alternative approaches for critical project components.
- Access to specialised infrastructure, including sequencing, imaging, biobank, clinical, animal, computational, and other research resources, is subject to project-specific requirements, approvals, availability, and institutional procedures.
- Research involving external biological materials, patient samples, datasets, organoids, specialised facilities, or third-party resources depends on established collaborations, resource availability, ethical and regulatory approvals, and the necessary material or data transfer agreements.
- Proposals should identify key scientific, technical, operational, and regulatory risks, together with appropriate mitigation strategies and contingency plans.
- The project should demonstrate a realistic implementation pathway, including appropriate milestones, deliverables, and resource allocation.
- Applicants are expected to demonstrate how the proposed research can be effectively implemented within the capabilities of the host institution while making appropriate use of complementary collaborations and external expertise where justified.

Ethics, data and responsible research

- All research activities must be conducted in accordance with applicable ethical, legal, biosafety, and regulatory requirements.
- Biosafety assessments and pathogen-specific risk evaluations must be completed and approved before commencing experimental work.
- The use of human-derived samples, data, or model systems requires appropriate ethical approval, documented provenance, informed consent where applicable, and the necessary material or data transfer agreements.
- Research data must be managed in line with FAIR principles and institutional policies, with data management plans addressing the generation, storage, sharing, protection, and long-term stewardship of research data, including sequencing, imaging, clinical, and other sensitive datasets.
- Applicants are expected to promote responsible research practices, including research integrity, reproducibility, transparency, and appropriate management of ethical, societal, and environmental considerations throughout the project lifecycle.

Expected contribution

The research is expected to advance mechanistic understanding of pathogen-induced genome instability and telomere repair, with potential relevance to infection biology and longer-term cellular consequences.