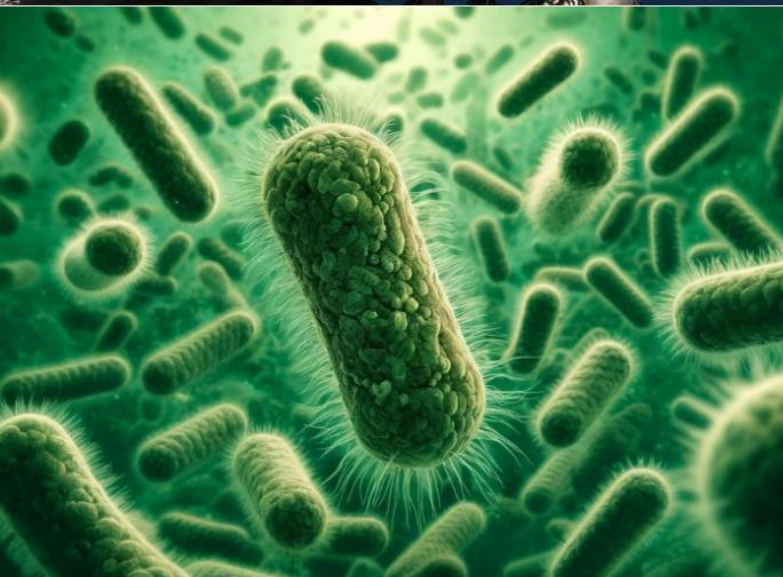




TROMSØ
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2024 Annual Report



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CANS – Centre for New Antibacterial Strategies

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Cover photo: Jan Fredrik Frantzen/UiT

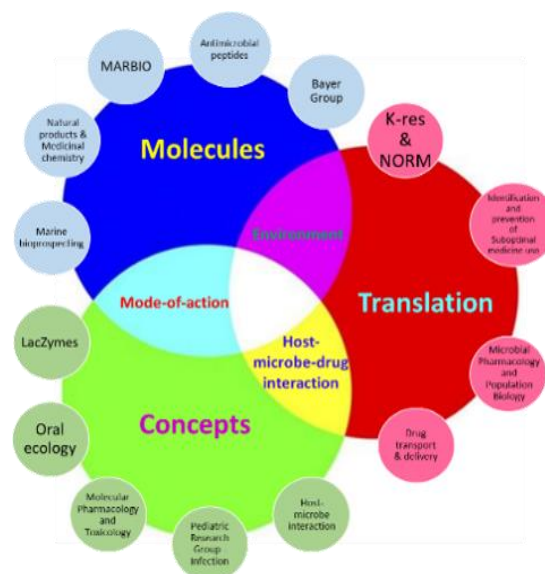
CANS is hosted by the Department of Medical Biology and the Faculty of Health Sciences at UiT The Arctic University of Norway

About CANS

The Centre for New Antibacterial Strategies (CANS) is an interdisciplinary centre at UiT The Arctic University of Norway. CANS was established in 2019 and focuses on antimicrobial resistance activities encompassing:

- Research
- Education
- Innovation
- Dissemination

CANS includes 16 research groups located at three different faculties at UiT, the Faculty of Health Sciences, the Faculty of Science and Technology, and the Faculty of Bioscience, Fisheries and Economics. Since start-up, the focus has been on recruiting new tenure-track-, associate professor-, PhD- and postdoc positions, and to establish arenas for interactions and communication, publications and external funding.



Research communities and their expertise that form the basis for CANS

The development of CANS proceeds along three strategic axes - consolidation, fortification and direction.

Consolidation by creating and nurturing a framework for ambitious interdisciplinary collaboration, generated by a centre-structure with management and overarching strategy. **Fortification** by adding resources to important but underdeveloped areas within the existing portfolio of activity. Finally, adding direction to the AMR research by establishing new research initiatives filling the competence gaps that inhibit our ability to realize the strategy.

The centre aims to strengthen current activities, and this has been done by granting research groups at the different faculties internal PhD and postdoc positions. Altogether 3 PhD and 5 postdoc positions have been granted.

The centre also aims to support new basic research in novel concepts for sustainable activities in AMR-prevention and treatment strategies. The establishment of new research areas has been done through

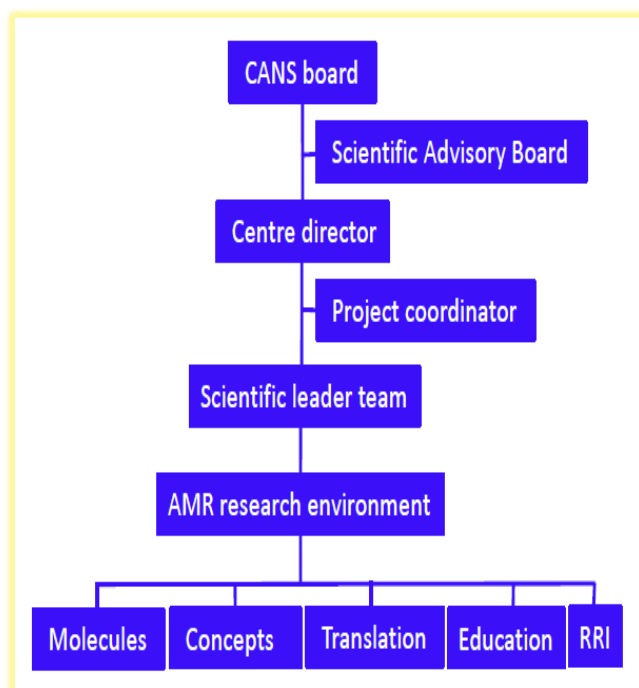
new permanent and temporary (tenure-track, postdoc, and PhD) positions in three missing research areas at UiT: human microbiota, viral bioprospection/phage therapy, and bioinformatics/machine learning. The main goal is to generate knowledge to establish new and sustainable strategies in the prevention and treatment of bacterial infections that minimize the development of antibiotic resistance and maintain microbiome integrity.

CANS Partners



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CANS organization



CANS board

The CANS board are made up of representatives from the three faculties and the Rector. The board is in charge of the overall direction of the centre.

Name	Faculty
Arne Smalås, chair	Dean, NT
Gunbjørg Svineng	Dean, HVF
Jørgen Berge	Dean, BFE

Scientific Advisory Board

The scientific advisory board (SAB) consists of representatives from similar centres. The SAB will provide scientific input, evaluate CANS' activity and provide strategic advice for future activities.

Name	Affiliation
Denize Tasdemir	GEOMAR Helmholtz Centre for Ocean Research Kiel; Germany
Jörgen Johansson	Department of Molecular Biology, Umeå University, Sweden
Ursula Theuretzbacher	Center for Anti-Infective Agents, Vienna, Austria
Ben Howden	Microbiological Diagnostic Unit (MDU) Public Health Laboratory, Melbourne, Australia

Scientific leader team

The scientific leader team is formed of professors from the three faculties. The members hold a 10% operational role in CANS and provide academic support for the centre leader, who is in a 50% position.

Name	Faculty
Arnfinn Sundsfjord, Centre Leader	HVF
Pål J. Johnsen	HVF
Lars Ailo Bongo	NTF
Klara Stensvåg	BFE
Lise Nordgård, coordinator	HVF

CANS research groups

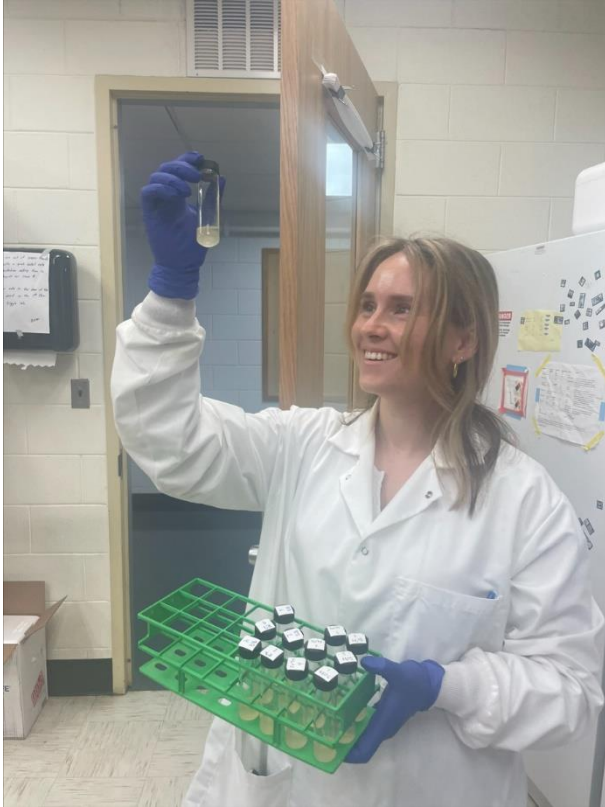
CANS' 15 research groups are located at three faculties and covers different topics within AMR research: design and synthesis of new antibiotics and resistance inhibitors, marine bioprospecting – identification and characterization of new antibacterial activities, the evolution and molecular epidemiology of AMR, host-microbe-drug interactions as well as antibiotic stewardship.

Research group	Group leader and Department
Antibiotic resistance breakers	Annette Bayer, Chemistry (IK)
Digibiotics	John S. Mjøen Svendsen, Chemistry (IK)
Drug Transport and Delivery research group	Natasa Skalko-Basnet, Pharmacy (IFA)
Health Data Lab	Lars Ailo Bongo, Informatics (IFI)
The Host-Microbe Interaction (HMI) group	Mona Johannessen, Medical Biology (IMB)
Identification and Prevention of Suboptimal Medicine Use	Lars Småbrekke, Pharmacy (IFA)
K-Res: Norwegian National Advisory Unit on Detection of Antimicrobial Resistance	Kristin Hegstad and Ørjan Samuelsen, The University Hospital of North Norway (UNN)
Marbio – an analytical platform for natural products	Jeanette Hammer Andersen, Fishery Science (NCFS)
Marine Bioprospecting	Klara Stensvåg, Fishery Science (NCFS)
Microbial Pharmacology and Population Biology	Pål J. Johnsen, Pharmacy (IFA)
Molecular Pharmacology and Toxicology	Ingebrigt Sylte, Medical Biology (IMB)
Natural Products and Medicinal Chemistry	Terje Vasskog, Pharmacy (IFA)
NORM – Norwegian organization for surveillance of antimicrobial resistance	Gunnar Skov Simonsen, The University Hospital of North Norway (UNN)
Oral Health Research Group	Mohammed Al-Haroni, Clinical Dentistry (IKO)
Research Group for Child and Adolescent Health	Jorunn Pauline Cavanagh and Claus Klingenberg, Clinical Medicine (IKM)

Presentation of three selected research projects

The enemy of my enemy is my friend: Using bacteriophages to combat infection

Dr. Ellinor Opsal Alseth, Young group leader/investigator at the Department of Pharmacy.

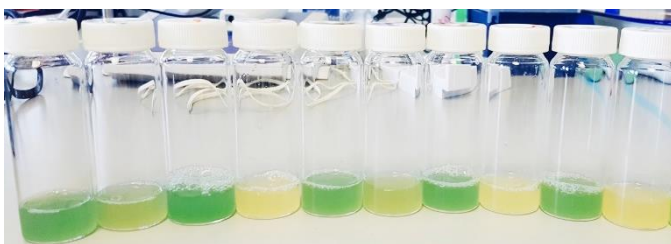


The MicroPop research group here at UiT is focused on fundamental research to better our understanding of microbial evolution. A key player on the microbial battlefield is bacteriophages: small viruses that infect bacteria, and that shape the course of evolution and diversification both in the microbial world and beyond. Phages are for instance estimated to cause up towards 40% of daily bacterial deaths, making them an important evolutionary driver for their hosts.

In 2024, I received a Researcher Project for Early Career Scientists (FRIPRO) grant from the Research Council of Norway, titled “Revealing ecological drivers of horizontal gene transfer and emerging phage resistance (RESIST)”. The goal of this project is to provide insight into the evolution of the bacterial immune system – the moniker given to the ever-growing list of putative defence mechanisms against phages (with CRISPR-Cas probably being the most famous one). Specifically, I aim to utilise the opportunistic bacterial pathogen *Acinetobacter baumannii* and its propensity for natural

transformation to untangle the role of horizontal gene transfer on phage resistance evolution. RESIST will also provide novel insights into the trade-offs between various defence mechanisms, specifically those that facilitate individual vs group-level survival.

Background



Born and raised in Norway, I moved to the UK to pursue a BSc in Evolutionary Biology at the University of Exeter (Penryn campus) in 2013. The world of microbiology and evolutionary ecology was introduced to me by Angus Buckling, in whose lab I also did my undergrad thesis work. Upon graduation, I

was offered a PhD position in the lab of Edze Westra and under the co-supervision of Angus, still at the University of Exeter. During my undergrad I had been introduced to the bacterium *Pseudomonas aeruginosa* and had experimented on how its virulence is modulated by the presence of other bacteria (in this case *Staphylococcus aureus*, *Acinetobacter baumannii*, and *Burkholderia cenocepacia*, aka the dream team).

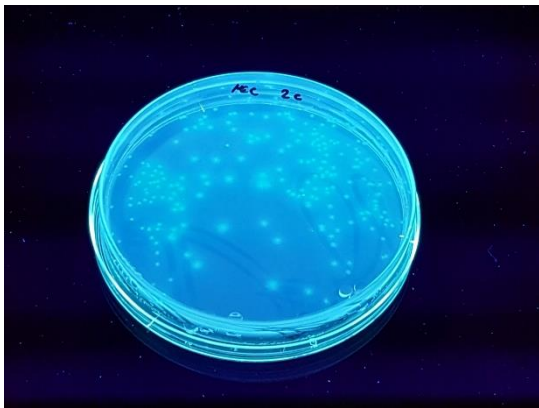
When I then joined Edze’s lab in 2017 his main focus was bacteriophages, which is how I was introduced to these wonderful little bacteria killers. Combining what I had learnt from my undergrad with what Edze’s lab was working on, I therefore ended up focusing my PhD on “the role of interspecific competition on the evolution of phage resistance in the bacterium *Pseudomonas aeruginosa*”. Besides

a small covid shaped bump in the road, my PhD proved rather productive, with two publications and a fair bit of travel to international conferences.

Upon earning my PhD in early 2022, I next moved to the US to start a prestigious position as the CMDI Early Career Award Fellow at the Georgia Institute of Technology. This position allowed me complete freedom to pursue the research I wanted, under the wonderful mentorship of Marvin Whiteley, Brian Hammer, Sam Brown, Steve Diggle, Joshua Weitz, Will Ratcliff, and Lauren Speare. It was before moving to Georgia Tech that I decided to make the jump from focusing on *P. aeruginosa* to *A. baumannii*. This switch was in part strategic, as I needed to find my own research niche, but also due to *A. baumannii* having become my new favourite bug. It was also at Georgia Tech that I discovered my very own *Acinetobacter* phage, which I named Mystique. This phage has since become a crucial part of my model system and has gone on a bit of a world tour – quite impressive for a virus that got its start in the Atlanta sewage system.

However, after a few good years at Georgia Tech it was time to think ahead again and thus, after 12 years abroad, it was time to head home.

Research Interests



I am an evolutionary biologist at heart. I love “why” questions and blue-skies research. In addition, I’m fascinated by bacteriophages and how bacteria evolve to overcome their molecular adversaries. These two interests combined have resulted in my research on bacteria–phage co-evolutionary dynamics.

The bacterial immune system is a hot and rapidly growing field, and I was lucky enough to be in on it from the start. Seeing the field grow from largely encompassing restriction-modification, CRISPR-Cas, and a handful of toxin-antitoxin/abortive infection systems to over 250 putative defence families has been a wild journey. Yet despite it seemingly being a microbial “world of defence” out there, there is a significant lack of empirical exploration on how and why these defences may have evolved (e.g. how do defences get acquired? Why may one defence be selected over another? Why are some defences so commonly found together? Are they even defences at all? So many questions...). This is the gap I aim to fill with my research.

What I perhaps enjoy the most is how these questions are not only fundamental in nature but might also have clinical relevance. Because, in the face of rising antibiotic resistance, phage therapy is regaining traction. *A. baumannii* for instance is a critical priority pathogen per the WHO, and is heavily associated with war zones like those in Ukraine and the Middle East where antibiotic resistance is a massive problem. It is here, when all else fails, that phages may once more become useful as a treatment against infection. And if I can help move us one step closer to that goal then I will consider all (okay, most) of my academic struggles worth it.



OptiRegi: An initiative to improve clinical decision-support and reduce antibiotic use

Vi Ngoc-Nha Tran, Associate Professor of Computer Science

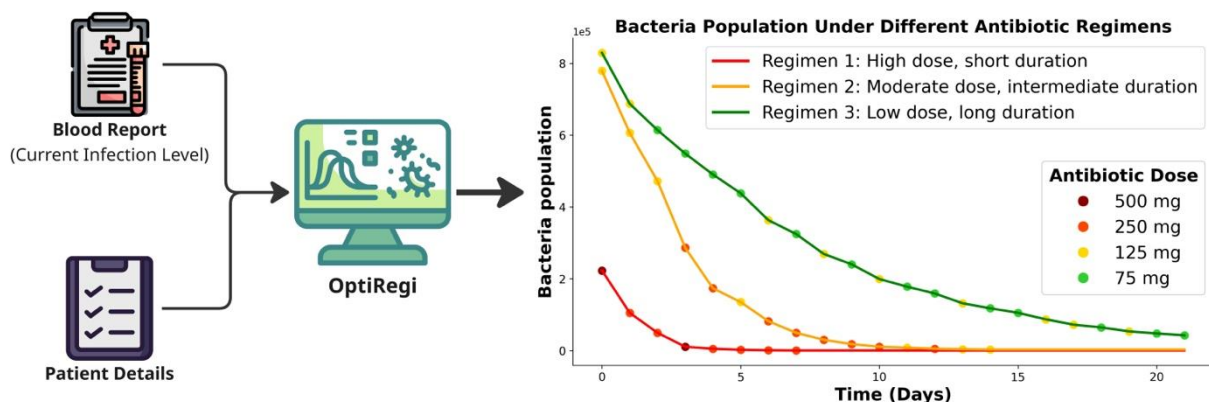
Antibiotic resistance remains a major global health concern, partly driven by dosing strategies that do not account for patient variability or the complex pharmacokinetic and pharmacodynamic interactions between bacteria and antibiotics. Researchers at UiT The Arctic University of Norway are investigating how artificial intelligence can support the design of personalized and adaptive antibiotic treatments.

The project is coordinated by Dr. Vi Ngoc-Nha Tran, Associate Professor and a member of the Health Data Lab at the Department of Computer Science, UiT. Her research explores the use of computational models and high-performance computing (HPC) to improve the understanding and optimization of drug dosing strategies.



This work builds on Dr. Tran's postdoctoral research with the Computational Pharmacology group, where she and her colleagues developed and published the simulation tool vCOMBAT in BMC Bioinformatics. The tool enables users to model how antibiotics interact with bacteria and explore different dosing scenarios, though its computational intensity limits large-scale treatment simulations in longitudinal studies.

To address this, Dr. Tran and her former master's student Adam Mawassi (now working with Microsoft, Tromsø) developed OptiRegi, a platform that applies machine learning and HPC to identify dosing regimens more efficiently. Preliminary simulations, such as those examining tuberculosis treatment with Rifampicin, suggest that the approach can substantially reduce computation time while identifying regimens that may lower antibiotic use by up to 30% without reducing efficacy.



The team is now exploring further development in collaboration with Norinova, including opportunities for testing and refinement. OptiRegi is intended as a decision-support resource for researchers and healthcare professionals working on antibiotic optimisation. The project contributes to broader efforts to promote responsible antibiotic use and supports the UN Sustainable Development Goals related to health, innovation, and sustainable production.

Smart nanotechnology for pulmonary delivery of new generation antimicrobial peptides to combat respiratory superinfections (SNAPPS)

(project number **352760**, The Research Council of Norway)

Story so far:

SNAPPS can be seen as a brainchild of both the Centre for New Antibacterial Strategies (CANS) and UiT's strategy to combat antimicrobial resistance. The seeds were planted when Prof. Skalko-Basnet and Prof. Gøril Eide Flaten at Drug Transport and Delivery Research Group (DTD) at the Department of Pharmacy (IFA) were granted one PhD position through project funding from UiT's *tematiske satsninger* (2018) funded project in a consortium led by Prof. Morten B. Strøm. Here the peptides patented by him and his collaborators at Department of Chemistry were for the first time formulated in liposomes aiming at improving their efficacy, modulate their toxicity and move them a step closer in the drug development process. The PhD student, now researcher at IFA, Dr. Lisa Hemmingsen, successfully developed liposome-based formulations enhancing their antimicrobial potential and disseminating the findings through highly recognized publications (<https://munin.uit.no/handle/10037/27103>).



During that PhD period, CANS was also established and the multidisciplinary, particularly the clinical relevance, was available to non-clinical researchers. At the same time, world stood in shock over COVID-19 pandemics. There was a clear need for antivirals and their carriers (formulations). Recognizing the needs of the moment as well as future, Prof. Arnfinn Sundsfjord put us in contact with Pharma Holdings who developed antiviral peptide that bear potential to become a drug, however, needed formulation for clinical translation. Therefore, CANS linked formulation scientists with peptide inventors, and we were two and ready to proceed. But the question as always was how to attract funding.

During the COVID-19 pandemic we learned the hard way that lung function can be heavily reduced following an acute respiratory infection leading to serious consequences both for patients and health care system. Respiratory infections are considered the fifth "burden" to society measured by years lost through death or disability. Especially lower respiratory tract infections, caused by viruses and/or resistant bacteria strains, are a leading cause of death and disability. Unfortunately, in spite all efforts

current antimicrobial therapy is often failing to reach deep lung site where the core of most infections is found. Our DTD at IFA has developed advanced delivery systems for different routes of drug administration, aiming to assure high antimicrobial concentration on infection site. Pharma Holdings had antiviral peptide and were eager to explore the in pulmonary route of drug delivery.

Our first attempt was the EU PATHFINDER Call where we joined forces with Pharma Holdings in a large consortium to deliver antivirals to act locally in lungs. Although we did not gain funding, we were highly encouraged by the high scoring on impact to continue the quest for funding. Norwegian Research Council opened the call we were waiting for: *Collaborative Project to Meet Societal and Industry-related Challenges*. To address the call, we needed stronger antimicrobial arsenals. Our industrial partner Pharma Holdings brings a highly promising antiviral LTX-109 that we aim to develop as an inhalable nanoformulation to treat locally lower respiratory tract infections. To assure broad spectra activity against viruses and bacteria, the endolysin, recently developed bacteriophage-product by our other industrial partner ACD Pharma was brought as extra arsenal in the inhalable formulation. And then we were three, stronger than ever and finally received the funding for the SNAPPS project.



The SNAPPS team. From left: Stephen Dela Ahator, Gøril Eide Flaten, Natasa Skalko-Basnet, Sybil Obuobi.

In SNAPPS we will use advanced nanotechnology to deliver novel antimicrobials in combined formulation for the first time, hoping that the different elements will work in synergy. The project is expected to elevate the academic/industrial prestige of Norway, and open opportunities for further EU funding to continue and expand the project in the future. Just last month we hired experienced researcher Dr. Stephan Dela Ahator as driving force in the laboratory work. We are now ready for combat, follow us in our journey.

<https://en.uit.no/project/snapps>

Highlights

Education and training

PhD thesis completed.

Name	Research group	Title of PhD-thesis
Kenneth Lindstedt	Host Microbe Interaction	Human gut colonisation by the <i>Klebsiella pneumoniae</i> Species Complex: improving detection and understanding of the presence, duration, dynamics, and microbiome associations
Srijana Bastakoti	Host Microbe Interaction	Identification of key determinants for <i>Staphylococcus aureus</i> throat colonization: A transcriptomic approach
Md Jalal Uddin	Host Microbe Interaction	Identification and validation of new enzymatic activities in pathogenic bacteria by activity-based protein profiling
Floriane Baussière	Haugland-Grange lab	Visible light-mediated alkyl radical additions to alkenyl and alkynyl silanes.
Victoria Fulgencio Queiroz	Marine bioprospecting group	SOBRE A DESCOBERTA, GENÔMICA, BIOLOGIA E TAXONOMIA DE VÍRUS GIGANTES
Ataur Rahman.	Marine bioprospecting group	Bioactivity profiling and mode of action studies of antibacterial and antibiofilm agents of marine origin.
Hymonti Dey.	Marine bioprospecting group	Antimicrobial activities and mechanisms of action of peptide analogues of marine origin
Celine Sarah marine Richard	Marine bioprospecting group	Engineering novel bacterial biosensors for the characterization of membrane active natural products
Aline Bjerkhaug	Research Group for Child and Adolescent Health - Infection	Treatment and prevention of neonatal sepsis.
Dagny Hemmingsen	Research Group for Child and Adolescent Health - Infection	Neonatal Risk factors for hearing impairment
Runa Wolden	Research Group for Child and Adolescent Health - Infection	Adhesion mechanisms and bacteriocins in <i>Staphylococcus haemolyticus</i> - new targets for the prevention and treatment of infections
Trym Flygel	Research Group for Child and Adolescent Health - Infection	HIV Infected African Children: Gut microbiota in relation to chronic lung disease and long-term antibiotic treatment
Øyvind Lorentzen	MicroPop	Microbial evolution in biofilms

Master's thesis completed.

Name	Research group	Title of master thesis
Marit Melbye Sørensen:	Drug Transport and Delivery	<i>Application of bEVs as a bacterial membrane model for interaction studies with NMR</i>
Brage Hjelle Braa	Drug Transport and Delivery	<i>Exploring the viability of using liposomes and bacterial extracellular vesicles (bEVs) in interaction studies by calorimetric methods</i>
Marte Kristensen:	Drug Transport and Delivery	<i>Liposome-based delivery system for chlorogenic acid - novel methods to evaluate biological activities.</i>
Cecilie Thanh Loan Dang	Drug Transport and Delivery	<i>Liposome-based delivery system for quercetin – optimization of delivery system and novel methods to evaluate biological activities.</i>
Arthur Aichelmann	Haugland-Grange lab	Preparation of antibiotic conjugates with a cleavable linker.
Lukas Bätcher	Host Microbe Interaction	Characterisation of Fms15, an unexplored virulence factor of <i>Enterococcus faecium</i> .
Efat Muhammad Arshad	Host Microbe Interaction	Characterization of <i>Bifidobacterium longum</i> carbohydrate metabolism by mass spectrometry-based omics
Thomas Lien	Host Microbe Interaction	Characterization of <i>Bifidobacterium longum</i> carbohydrate metabolism by mass spectrometry-based omics
Helle Stenseth	Host Microbe Interaction	Pilot study of untargeted metabolomics methods to evaluate fecal metabolome of infants receiving probiotics or placebo (ProRIDE trial)
Mia Petrell Langaas	Host Microbe Interaction	The gut resistome in a community-based adult population
Jasmin Wilhelmsen	Host Microbe Interaction	Characterizing heterogeneity of <i>Staphylococcus aureus</i> Fibronectin binding protein
Balkees Adeola Olobada	Host Microbe Interaction	Probes for <i>Klebsiella pneumoniae</i> and possible interactions
Brede Bjerke Eiken	Marbio	Secondary Metabolites from Marine Invertebrate Extracts
Simmen Karoliussen	Marbio	Beneath the Surface: Fungal Community Associated with Brown Alga <i>Saccharina latissima</i> A Molecular Characterization through DNA Extraction, PCR Amplification, Nanopore sequencing and BLAST Analysis
Vincent M. Edoziem.	Marbio	Selective Isolation of Actinobacteria from Marine Invertebrates: A Bio-Prospective Search for New Producer Strains.
Julie Marie Lesjø	Marbio	Isolation and biological evaluation of phomenins from the marine fungus <i>Parafenestella</i> sp
Julia Schrammel	Marbio	Mass spectrometry-based untargeted metabolomic profiling of Arctic marine fungi.
Ida Amalie Nystad Reierth	Marbio	Exploring the Potential of Marine-Derived Compounds as HDAC Inhibitors in Cancer Therapy.
Ida Skogseth	Marbio	A 5' fusion peptide causes heterologous over-expression: designing, cloning and testing the effect of multiple fusion peptide variants in <i>Escherichia coli</i> and <i>Aliivibrio wodanis</i> .
Fauzia Ahmed	Marine bioprospecting group	Characterization of Norwegian bacteriophages capable of infecting <i>A. salmonicida</i> and <i>C. maltaromaticum</i>
Arthur Kruse Sørensen	Marine bioprospecting group	Bacteriophages of the arctic bacterium <i>Staphylococcus borealis</i> -isolation, host range, anti-biofilm effect.
Fauzia Ahmed	Marine bioprospecting group	Inhibition of bacterial zinc metalloproteinases.

Adele Knutson Dahl	Marine bioprospecting group	Characterization of fish skin mucus using mass spectrometry methods. Investigation of biochemical differences in mucus of different fish species and sea lice
Marte Kristensen	Drug Transport and Delivery Research Group	Liposome-based delivery system for chlorogenic acid - novel methods to evaluate biological activities
Cecilie Thanh Loan	Drug Transport and Delivery Research Group	Liposome-based delivery system for quercetin – optimization of delivery system and novel methods to evaluate biological activities

Bachelor`s degrees completed.

Name	Research group	Title
Sigrud Dahlen Konow	Haugland-Grange lab	Synthesis of nitroxides for evaluation of anti-biofilm activity
Johanne H Sjønden	Host Microbe Interaction	Exploring carbohydrate utilization and metabolism of <i>Lactiplantibacillus plantarum</i> strain PPLP-217™ by shotgun proteomics
Sina Jæger and Emma Brox	Marbio	Bioactivity potential in marine organisms. Bioprofiling of marine fractions with emphasis on anticancer activity.
Helmi Sofia Katariina Järveläinen	Marine bioprospecting group	Antimicrobial compounds from marine invertebrates
Ane Myrvold	Marine bioprospecting group	Utvikling av metoder for manipulasjon av <i>Shewanella</i> isolater
Kristine Bjelkåsen Sleire	Marine bioprospecting group	Mass production of bioactive material from marine bacterial strains showing activity in co-cultures
Synnøve Holmebukt and Oda Aspenes Gundersen	Child and adolescents health	Viridans group streptococci (VGS) – antimicrobial resistance in children with sepsis
Pernille Akselsen	Child and adolescents health	Diarrhea in infants in low-income countries A secondary analysis of a randomised trial on the use of probiotics to infants in Tanzania

Mobility students

PhD candidate Martin Christensen from the Child and adolescents health stayed at Professor Victor Nizets lab at UC San Diego, USA from 01.08.2024-01.11.2024.

Research visit

Einar Holsbø to Prof. Anders Gorm Pedersen, Technical University of Denmark, January to June, 2024.

Professor Luis Felipe Leomil Coelho (UNIFAL- Brazil) to the Marine Bioprospecting group (UiT), 28.10.24 to 9.11.24.

External funding initiatives

In 2024, CANS applied for funding from different external funds. The table shows the projects that were granted funding.

International funding

Research group	Title	Programme
Host Microbe Interaction	<u>Nordic Consortium to Monitor and Research AMR</u> (Pettersen as a project partner)	NordForsk
MicroPop	Exploring Novel Drivers of Antibiotic Resistance (END-AMR) PJ Johnsen UiT Supervisor (one of 9).	Horizon MSCA-DN
Marine bioprospecting group	Isolating the first ARCTic Glant viRUSES and their bioactive compounds (ARCGIRUS).	MSCA fellowship
Marine bioprospecting group	PhagEs against multidrug Resistant Enterococcus faecium - PETRI.	MSCA fellowship – granted but cancelled because the candidate got a permanent position
Marine bioprospecting group	Phage application to fish health: prophylaxis and treatment.	CNPq Nº 22/2024 (Brazil). Networking grant and salary for mobility staff. Start in 2026.
Marine bioprospecting group	From waste to taste: exploring innovative food applications of postharvest fish losses	EU (Marine bioprospecting group are partners).

National funding

Research group	Title	Programme
Host Microbe Interaction Research Group	CAS Alumni Fellowship , period august 2025 - june 2027	The Centre for Advanced Study (CAS) at The Norwegian Academy of Science and Letters
Marbio	Infrastructure grant	Skipsreder Tom Wilhelmsens Stiftelse. Amount: 4 mill NOK.
MicroPop	“Revealing ecological drivers of horizontal gene transfer and emerging phage resistance	FriPro early career grant”
Drug Transport and Delivery	SMART NANOTECHNOLOGY FOR PULMONARY DELIVERY OF NEW GENERATION ANTIMICROBIAL PEPTIDES TO COMBAT RESPIRATORY SUPERINFECTIONS (SNAPPS)	Norwegian Research Council

Regional funding

Research group	Title	Programme
K-res	Reviving the use of first-line drug ampicillin (beta-lactam) against multidrug resistant enterococci	Northern Norway Regional Health Authority Medical (NNRHAM) Research Programme
K-res	Preventing <i>Klebsiella pneumoniae</i> infections and spread of antimicrobial resistance through microbiome modulation	Northern Norway Regional Health Authority Medical (NNRHAM) Research Programme
HMI	PhD-project in collaboration with K-res: The North-Norwegian study on bloodstream infections in small hospitals (NORBISH) – Impact of rapid diagnostics on antimicrobial treatment, clinical outcomes, and healthcare costs for Hege Sjøvik	Northern Norway Regional Health Authority
MicroPop	Postdoc project “Cancer chemotherapy as potential driver of antibiotic resistance and pathogen success”	Northern Norway Regional Health Authority
MicroPop	PhD project “Antineoplastic drugs targeting bacteria: identifying bacterial evolutionary responses causing antibiotic resistance and pathogen success”.	Northern Norway Regional Health Authority
Child and adolescents health	PhD funding from 2024-2027 Probiotics to improve health in Tanzanian infants. Dr. Museveni Justine	Northern Norway Regional Health Authority

UiT funding

Research Group	Title	Programme
Marbio	UiT Talent infrastructure grant. Espen Holst Hansen	UiT Talent infrastructure grant.

The Nordic AMR Research Centre Conference 2024

CANS, as part of the Network of Nordic AMR Centers, invited researchers, PhDs and postdocs from all Nordic AMR Centres to a conference that included lectures, posters and exciting mixture of networking and cross-disciplinary discussions to Tromsø from 13 to 15 March 2024.

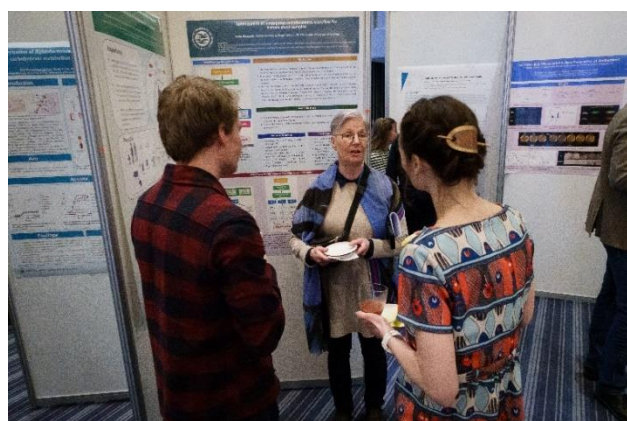
Among the different topics that were presented and discussed was:

- Alternative strategies
- Clinical aspects of AMR
- Diagnostic
- Economy
- Emergence and spread
- Environmental AMR
- Evolution
- Global challenges
- Microbiome
- New antibiotics
- Stewardship



The following Nordic AMR centres was represented:

CANS from UiT, Uppsala Antibiotic Center (UAC), Umeå Centre for Microbial Research (UCMR), Centre for Antibiotic Resistance Research (CARE) in Göteborg, the International Centre for Antimicrobial Resistance Solutions (ICARS) in Copenhagen, the Finnish Multidisciplinary Centre of Excellence in Antimicrobial Resistance Research in Finland (FIMAR), Turning the Tide of Antimicrobial Resistance (TTA) in Oslo, and CAMRIA (Combatting Anti-Microbial Resistance with Interdisciplinary Approaches) in Bergen.



The next Nordic AMR Research Centre Conference will take place in **Helsinki 4th-6th March 2026**. For more information, [click here](#)!

Outreach activities

CANS seminars

The CANS seminars are a valuable platform for invited speakers and CANS researchers to present and discuss different areas within AMR research. In 2023, CANS hosted 10 seminars with international speakers as well as internal speakers.

	Speaker	Title of presentation
1	Professor Tom Coenye, Laboratory of Pharmaceutical Microbiology at Ghent University, Belgium	Carbon sources and marine natural products as anti-biofilm agents
2	Professor Gunnar Skov Simonsen & Professor Ørjan Samuelsen	Surveillance and research – a perfect combination
3	Associate Professor Veronica Pettersen, Department of Medical Biology, Faculty of Health Science, UiT	The Knowns and Unknowns of Antimicrobial Resistance in the Human Gut Microbiome
4	Associate Professor Gabriel de Freitas Almeida, Department of Norwegian College of Fishery Science, Faculty of Biosciences, Fisheries and Economics	Viruses of microbes of the Arctic
5	Associate Professor Christian Lentz, Department of Medical Biology, Faculty of Health Science, UiT	Of clone armies, preppers and team players. Dissecting the social life of bacterial cells during infection
6	Sailesh Maharjan, PhD candidate, Marbio research group.	Metabolomics-driven discovery of new antimicrobial compounds: the case of marine-derived Pleosporales sp. with ophiobolin-type sesterterpenes
7	Fabrizio Clarelli, senior advisor at the Norwegian Medicines Agency (Direktoratet for medisinske produkter).	Multiple drug model in AMR: a mechanistic approach in pharmacodynamics
8	Researcher Christina Gabrielsen Ås, St. Olavs hospital.	Trends in molecular epidemiology and antibiotic resistance of methicillin-resistant <i>Staphylococcus aureus</i> in Norway.

Media coverage and popular science presentations

Alexandra Sousa/DTD:

Bacteria have a new mortal enemy: DNA. Sciencenorway/Researchers' zone
The incredible power of DNA. UiT Research corner

- <https://www.sciencenorway.no/bacteria-dna-research/bacteria-have-a-new-mortal-enemy-dna/2304048>
- https://en.uit.no/nyheter/forskerhjornet/834950/the_incredible_power_of_dna

Jónína Guðmundsdóttir/MicroPOP:

Kreftmedisiner kan gi antibiotikaresistens, og Jónína skal finne ut hvor stort problemet er. Uit.no
Cancer drugs and AMR: Painting the whole picture (en.uit.no)

- https://uit.no/nyheter/artikkel/kortnytt?p_document_id=836736
- https://uit.no/nyheter/artikkel/kortnytt?p_document_id=836731

Gunnar Skov Simonsen/NORM:

Kan bakterier muteres til å muteres seg enda raskere? Abels tårn (NRK)
https://radio.nrk.no/podkast/abels_taarne/l_da82377e-28a5-48b9-8237-7e28a518b9c3

Arnfinn Sundsfjord/Hege Sjøvik/Kristoffer Endresen/HMI

Studie: Hurtigtest ved mistanke om sepsis ga sikre prøvesvar nesten to dager tidligere
(Dagens medisin+)

- <https://www.dagensmedisin.no/antibiotika-antibiotikaresistens-forskning/studie-hurtigtest-ved-mistanke-om-sepsis-ga-sikre-provesvar-nesten-to-dager-tidligere/618114>
- <https://www.nordlandssykehuset.no/nyheter/ny-test-for-blodforgiftning-gir-raskere-og-sikre-provesvar/>
- <https://www.helgelandssykehuset.no/nyheter/forskning-bekrefter/>
- <https://www.ranano.no/ny-test-for-blodforgiftning-gir-raskere-og-sikre-provesvar/s/5-158-37393>
- <https://kommunikasjon.ntb.no/pressemelding/18049034/ny-test-for-blodforgiftning-gir-raskere-og-sikre-provesvar>
- <https://www.radionordkapp.no/pressemelding/ny-test-for-blodforgiftning-gir-raskere-og-sikre-provesvar/>
- <https://www.helg.no/unike-funn-i-hsyk-vekker-oppsikt-pasientene-vare-skal-ha-et-like-godt-tilbud-som-andre/s/5-24-940088>
- <https://www.eurekalert.org/news-releases/1034385>
- <https://www.miragenews.com/eurekas-sepsis-test-delivers-speedy-reliable-1173908/>
- https://uit.no/nyheter/artikkel?p_document_id=839059
- <https://clpmag.com/disease-states/sepsis/new-sepsis-test-provides-faster-and-reliable-results/>
- <https://www.nrk.no/nordland/denne-maskinen-kan-revolusjonere-behandling-av-alvorlig-syke-i-distriktene-1.16770549>
- <https://www.forskning.no/blod-medisinske-metoder-partner/raskere-testsvar-pa-blodforgiftning-betyr-liv-eller-dod-for-pasienten/2327634>

Veronika K Pettersen/HMI: iTromsø: «Dritbra» hvis ungdom gir oss avføringen sin (25.02.2024), UiT Nyheter: UiT-forskerne trenger ungdomsbæsjen (20.02.2024), Pingvinavisa: UNN-FORSKERNE TRENGER UNGDOMSBÆSJ (23.02.2024)

- <https://www.itromso.no/nyheter/i/0QPB9B/er-du-18-eller-under-da-vil-denne-gjengen-ha-baesjen-din>
- <https://www.pingvinavisa.no/unn-forskerne-trenger-ungdomsbaesj/>
- https://uit.no/nyheter/artikkel/kortnytt?p_document_id=839526
- <https://www.nrk.no/tromsogfinnmark/baesj-fra-ungdom-i-tromso-skal-gi-bedre-behandling-av-syke-barn-i-fremtiden-1.16776830>

Marius Haugland-Grange:

"Krydrer" antibiotika for å lure bakteriene (Forskersonen, uit.no)

- <https://www.forskersonen.no/antibiotikaresistens-medisin-og-helse-meninger/krydrer-antibiotika-for-a-lure-bakteriene/2333337>
- <https://uit.no/nyheter/forskerhjørnet/841033/krydrer-antibiotika-for-a-lure-bakteriene>

Kristin Hegstad/K-res, Dagfinn Skaare, Jørgen Vildershøj Bjørnholt.

Nå må vi ta enterokokkene på alvor (Dagens Medisin)

- <https://www.dagensmedisin.no/na-ma-vi-ta-enterokokkene-pa-alvor/622704>

Arnfinn Sundsfjord/HMI, CANS:

Samler kreftene i kampen mot antibiotikaresistens (NRK Troms og Finnmark+)

- <https://kommunikasjon.ntb.no/pressemelding/18057157/samler-kreftene-i-kampen-mot-antibiotikaresistens>
- https://uit.no/nyheter/artikkel?p_document_id=843058
- https://uit.no/nyheter/artikkel?p_document_id=843061
- <https://www.nrk.no/tromsogfinnmark/nordiske-forskningsmiljoer-samlet-i-tromso-til-felles-kamp-mot-antibiotika-resistens-1.16802532>
- <https://fauna.no/nordiske-forskere-forener-krefter-mot-antibiotikaresistens/>
- <https://radio.nrk.no/serie/helgemorgen/sesong/202403/DNRR62102124#t=50m>

Maxim Bril'kov/DTD:

Bacterial membrane satellites prove important testing ground for new antibiotics

(Sciencenorway, uit.no)

- https://en.uit.no/nyheter/forskerhjørnet/844670/bacterial_membrane_satellites_prove_important_testing_ground_for_new_antibiotics
- <https://www.sciencenorway.no/bacteria-biologi-medicine/bacterial-membrane-satellites-prove-important-testing-ground-for-new-antibiotics/2361919>

Srijana Bastakoti/HMI:

Denne bakterien er den snikende—og noen ganger farlige-leieboeren i halsen din. (Forskersonen.no, sciencenorway, uit.no)

- <https://www.forskersonen.no/bakterier-meninger-populaervitenskap/denne-bakterien-er-den-snikende-og-noen-ganger-farlige-leieboeren-i-halsen-din/2361719>
- <https://www.sciencenorway.no/bacteria-biology-illness/mrsa-bacteria-the-sneaky-and-sometimes-dangerous-tenant-in-your-throat/2361746>
- <https://uit.no/nyheter/forskerhjørnet/846548/mrsa-den-snikende-og-noen-ganger-farlige-leieboeren-i-halsen-din>

- https://en.uit.no/nyheter/forskerhjornet/846556/mrsa_the_sneaky_and_sometimes_dangerous_tenant_i

Christopher Fröhlich/MicroPOP:

Naturens egen magi: Når 2+2 blir 12 (Forskersonen)

<https://www.forskersonen.no/antibiotikaresistens-biologi-enzym/naturens-egen-magi-nar-22-blir-12/2371723>

Ken Lindstedt/HMI:

From the sea to the snow (Bairsdale Advertiser)

<https://bairsdaleadvertiser.com.au/3126/from-the-sea-to-the-snow/>

Yannik Schneider/Marbio:

Lovende funn i Barentshavet: Nyoppdaget bakterie kan hindre dødelig sykdom

(NRK Troms og Finnmark)

<https://www.nrk.no/tromsogfinnmark/uit-forskere-kan-ha-funnet-losning-pa-antibiotikaresistente-bakterier-i-barentshavet-1.17027562>

Aline Bjerkhaug/Child and Adolescents Health:

Studie: Streptokokk-vaksiner trygge og effektive (forskning.no, sciencenorway, uit.no)

- https://uit.no/nyheter/artikkel?p_document_id=861037
- https://uit.no/nyheter/artikkel?p_document_id=861102
- <https://www.forskning.no/partner-uit-norges-arktiske-universitet-vaksiner/ny-studie-streptokokk-vaksiner-er-bade-trygge-og-effektive/2410408>
- <https://partner.sciencenorway.no/health-medical-methods-medicine/new-study-streptococcal-vaccines-are-both-safe-and-effective/2411318>

Christian Lentz, Jonathan Hira, Bhupender Singh/HMI:

Gjennombrudd i bakterieforskning. Fant bakterienåla i høystakken

(forskning.no, Eurekalert, uit.no+)

- https://uit.no/nyheter/artikkel?p_document_id=862208
- <https://www.innovations-report.com/health-life/life-sciences/bacterial-breakthrough/>
- <https://www.technologynetworks.com/tn/news/finding-the-bacterial-needles-in-a-haystack-391741>
- <https://promia.ru/2024/10/04/platforma-sortirovki-kletok-s-aktivaciei-flyorescencii-predlagaet-novyi-sposob-izycheniia-otdelnyh-bakterii/>
- <https://www.eurekalert.org/news-releases/1060238>
- <https://www.forskning.no/antibiotikaresistens-celler-helse/gjennombrudd-i-bakterieforskning-fant-bakterienåla-i-hoystakken/2415500>
- <https://www.dagensmedisin.no/antibiotika-antibiotikaresistens-bakterie/haper-nyutviklet-metode-skal-motvirke-uforklarlig-svikt-i-antibiotika-behandling-1/656496>

Claus Klingenberg/Child and Adolescents Health:

RS-virusepidemiene blant spedbarn kan unngås. Hvis myndighetene vil (Aftenposten, uit.no)

- <https://www.aftenposten.no/meninger/debatt/i/8qOO6r/rs-virus-epidemiene-blant-spedbarn-kan-unngaas>
- https://uit.no/nyheter/forskerhjornet/864424/de_arlige_rs-virusepidemiene_blant_spedbarn_kan_u

Jorunn Pauline Cavanagh/Child and Adolescents Health:

- Pint Of Science (13.05.2024). «Hunting new bacteria under the northern lights»
- Kvinnehelse turneen (24.09.2024). «Brystbetennelse og bakterier»

Jeanette Grunnvåg/HMI:

Når antibiotika slutter å virke (forskning.no, uit.no)

- https://uit.no/podkaster/podkast?p_document_id=811000#v-pills-8657112
- <https://www.forskning.no/antibiotikaresistens-medisiner-partner/antibiotikaresistens-er-uunngaeleg-sa-kva-kan-vi-gjere/2433984>

Nadia Aftab/HMI

Antibiotikaresistens, AMR Awareness week (Pakistansk morgen-TV)

Ørjan Samuelson/K-res.

E. coli bakterie spres kjapt i Europa (VG)

<https://www.vg.no/nyheter/i/936byE/e-coli-bakterie-spres-kjapt-i-europa>

Scientific Publications

1. Hira J, Singh B, Halder T, Halder T, Mahmutovic A, Ajayi C, Sekh AA, Hegstad K, Johannessen M, Lentz CS. 2024. Single-cell phenotypic profiling and backtracking exposes and predicts clinically relevant subpopulations in isogenic *Staphylococcus aureus* communities. *Commun Biol.* 7:1228. Doi: 10.1038/s42003-024-06894-z.
2. Grunnvåg J, Hegstad K, Lentz C. 2024. Activity-based protein profiling of serine hydrolases and penicillin-binding proteins in *Enterococcus faecium*. *FEMS Microbes.* 5:xtae015. Doi: 10.1093/femsmc/xtae015.
3. Ahator SD, Hegstad K, Lentz C, Johannessen M. 2024. Deciphering *Staphylococcus aureus*-host dynamics using dual activity-based protein profiling of ATP-interacting proteins. *mSystems* 9:e0017924. Doi: 10.1128/msystems.00179-24.
4. Wagner TM, Pöntinen AK, Fenzel CK, Engi D, Janice J, Almeida-Santos AC, Tedim AP, Freitas AR, Peixe L, van Schaik W, Johannessen M, Hegstad K. 2024. Interactions between commensal *Enterococcus faecium* and *Enterococcus lactis* and clinical isolates of *E. faecium*. *FEMS Microbes.* 5:xtae009. Doi: 10.1093/femsmc/xtae009.
5. Ahator SD, Wenzl K, Hegstad K, Lentz CS, Johannessen M. 2024. Comprehensive virulence profiling and evolutionary analysis of specificity determinants in *Staphylococcus aureus* two-component systems. *mSystems* 9:e00130-24. Doi: 10.1128/msystems.00130-24.
6. AL Rubaye M, Janice J, Bjørnholt JV, Löhr IH, Sundsfjord A, Hegstad K. 2024. The first *vanE*-type vancomycin resistant *Enterococcus faecalis* isolates in Norway – phenotypic and molecular characteristics. *J Global Antimicrob Resist.* 36:193-9. Doi: 10.1016/j.jgar.2023.12.021.
7. Janice J, Wagner TM, Olsen K, Hegstad J, Hegstad K. 2024. Emergence of vancomycin-resistant enterococci from vancomycin susceptible enterococci in hospitalized patients under antimicrobial therapy. *J Global Antimicrob Resist.* 36:116-22. Doi: 10.1016/j.jgar.2023.12.010.
8. Hegstad K, Pöntinen AK, Bjørnholt JV, Paulsen EQ, Sundsfjord A. 2024. The first tigecycline resistant *Enterococcus faecium* in Norway was related to tigecycline exposure. *J Global Antimicrob Resist.* 36:112-5. Doi: 10.1016/j.jgar.2023.12.002.
9. Wagner TM, Pöntinen AK, Rubaye MAL, Sundsfjord A, Hegstad K. 2024. Adaptive cell wall thickening in *Enterococcus faecalis* is associated with decreased vancomycin susceptibility. *Clin Microbiol Infect.* 30:396.e1-396.e5. Doi: 10.1016/j.cmi.2023.12.002.
10. Larsen AL, Pedersen T, Sundsfjord A, Ross TA, Guleng AD, Haug JB, Pöntinen AK, Samuelson Ø. Hospital toilets and drainage systems as a reservoir for a long-term polyclonal outbreak of clinical infections with multidrug-resistant *Klebsiella oxytoca* species complex. *Infect Prev Pract.* 2024 Dec 21;7(1):100430. eCollection 2025 Mar. <https://doi.org/10.1016/j.infpip.2024.100430>
11. Tsang KK, Lam MMC, Wick RR, Wyres KL, Bachman M, Baker S, Barry K, Brisse S, Campino S, Chiaverini A, Cirillo DM, Clark T, Corander J, Corbella M, Cornacchia A, Cuénod A, D'Alterio N, Di Marco F, Donado-Godoy P, Egli A, Farzana R, Feil EJ, Fostervold A, Gorrie CL, Hassan B, Hetland MAK, Hoa LNM, Hoi LT, Howden B, Ikimiukor OO, Jenney AWJ, Kaspersen H, Khokhar F, Leangapichart T, Ligowska-Marzeta M, Löhr IH, Long SW, Mathers AJ, McArthur AG, Nagaraj G, Oaikhena AO, Okeke IN, Perdigão J, Parikh H, Pham MH, Pomilio F, Raffelsberger N, Rakotondrasoa A, Kumar KLR, Roberts LW, Rodrigues C, Samuelson Ø, Sands K, Sassera D, Seth-Smith H, Shamanna V, Sherry NL, Sia S, Spadar A, Stoesser N, Sunde M, Sundsfjord A, Thach PN, Thomson NR, Thorpe

- HA, Torok ME, Trang VD, Trung NV, Vornhagen J, Walsh T, Warne B, Wilson H, Wright GD, Holt KE, KlebNET-Gsp Amr Genotype-Phenotype Group. Microb Genom. 2024 Oct;10(10):001294. <https://doi.org/10.1099/mgen.0.001294>.
12. Witteveen S, Hans JB, Izdebski R, Hasman H, Samuelsen Ø, Dortet L, Pfeifer Y, Delappe N, Oteo-Iglesias J, Żabicka D, Cormican M, Sandfort M, Reichert F, Pöntinen AK, Fischer MA, Verkaik N, Pérez-Vazquez M, Pfennigwerth N, Hammerum AM, Hallstrøm S, Biedrzycka M, Räisänen K, Wieters CC, Urbanowicz P, de Haan A, Westmo K, Landman F, van der Heide HG, Lansu S, Zwitter RD, Notermans DW, Guzek A, Kondratiuk V, Salmanov A, Haller S, Linkevicius M, Gatermann S, Kohlenberg A, Gniadkowski M, Werner G, Hendrickx AP. Dissemination of extensively drug-resistant NDM-producing *Providencia stuartii* in Europe linked to patients transferred from Ukraine, March 2022 to March 2023. Euro Surveill. 2024 Jun;29(23):2300616. doi: 10.2807/1560-7917.ES.2024.29.23.2300616.
 13. Khawaja T, Mäklin T, Kallonen T, Gladstone RA, Pöntinen AK, Mero S, Thorpe HA, Samuelsen Ø, Parkhill J, Izhar M, Akhtar MW, Corander J, Kantele A. Deep sequencing of *Escherichia coli* exposes colonisation diversity and impact of antibiotics in Punjab, Pakistan. Nat Commun. 2024 Jun 18;15(1):5196. <https://doi.org/10.1038/s41467-024-49591-5>
 14. Fostervold A, Raffelsberger N, Hetland MAK, Bakksjø R, Bernhoff E, Samuelsen Ø, Sundsfjord A, Afset JE, Berntsen CF, Bævre-Jensen R, Ebbesen MH, Gammelsrud KW, Guleng AD, Handal N, Jakovljevic A, Johal SK, Marvik Å, Natvik A, Sandnes RA, Tofteland S, Bjørnholt JV, Löhr IH; Assoc. on behalf of The Norwegian Study Group on *Klebsiella pneumoniae*. Risk of death in *Klebsiella pneumoniae* bloodstream infections is associated with specific phylogenetic lineages. J Infect. 2024 May;88(5):106155. <https://doi.org/10.1016/j.jinf.2024.106155>.
 15. Pöntinen AK, Gladstone RA, Pesonen H, Pesonen M, Cléon F, Parcell BJ, Kallonen T, Simonsen GS, Croucher NJ, McNally A, Parkhill J, Johnsen PJ, Samuelsen Ø, Corander J. Modulation of multidrug-resistant clone success in *Escherichia coli* populations: a longitudinal, multi-country, genomic and antibiotic usage cohort study. Lancet Microbe. 2024 Jan 4:S2666-5247(23)00292-6. [https://doi.org/10.1016/S2666-5247\(23\)00292-6](https://doi.org/10.1016/S2666-5247(23)00292-6).
 16. Mohammed MMA, JA Bruun, VK Pettersen. Label-free quantitative proteomics of oral microbial communities Metaproteomics: Methods and Protocols, 2024 155-164
 17. Pettersen VK. Metaproteomics of Gut Fungi in Gnotobiotic Mice Metaproteomics: Methods and Protocols, 2024, 127-137
 18. Hapnes NC, Stensvold HJ, Bjørnland K, Sæter T, Guthe HJT, Støen R, Moltu SJ, Rønnestad A, Klingenberg C; Norwegian Neonatal Network. Surgery for intestinal injuries in very preterm infants: a Norwegian population-based study with a new approach to disease classification. BMJ Paediatr Open. 2024 Sep 18;8(1):e002722. doi: 10.1136/bmjpo-2024-002722. PMID: 39299770
 19. Dimopoulou V, Klingenberg C, Navér L, Nordberg V, Berardi A, El Helou S, Fusch G, Bliss JM, Lehnick D, Guerina N, Seliga-Siwecka J, Maton P, Lagae D, Mari J, Janota J, Agyeman PKA, Pfister R, Latorre G, Maffei G, Laforgia N, Mózes E, Størdal K, Strunk T, Stocker M, Giannoni E; Antibiotic exposure for culture-negative early-onset sepsis in late-preterm and term newborns: an international study. AENEAS Study Group. Pediatr Res. 2024 Sep 17. doi: 10.1038/s41390-024-03532-6. Online ahead of print. PMID: 39289592
 20. Glaser K, Härtel C, Klingenberg C, Herting E, Fortmann MI, Speer CP, Stensvold HJ, Huncikova Z, Rønnestad AE, Nentwich MM, Stahl A, Dammann O, Göpel W; German Neonatal Network, the Norwegian Neonatal Network Investigators, and the Infection, Inflammation, Immunology and Immunisation section of the European Society for Paediatric Neonatal Sepsis Episodes and Retinopathy of Prematurity in Very Preterm Infants. Research.JAMA Netw Open. 2024 Jul 1;7(7): e2423933. doi: 10.1001/jamanetworkopen.2024.23933. PMID: 39052290
 21. Bjerkhaug AU, Ramalingham S, Mboizi R, Le Doare K, Klingenberg C. The immunogenicity and safety of Group B Streptococcal maternal vaccines: A systematic review. Vaccine. 2024 Jan 12;42(2):84-98. doi: 10.1016/j.vaccine.2023.11.056. Epub 2023 Dec 9. PMID: 38072754
 22. Duignan SM, Lakshminrusimha S, Armstrong K, de Boode WP, El-Khuffash A, Franklin O, Molloy EJ; Neonatal sepsis and cardiovascular dysfunction I: mechanisms and pathophysiology. Infection, Inflammation, Immunology and Immunisation (I4) section of the European Society for Paediatric Research (Klingenberg C). Pediatr Res. 2024 Apr;95(5):1207-1216. doi: 10.1038/s41390-023-02926-2. Epub 2023 Dec 4. PMID: 38044334
 23. Huncikova Z, Stensvold HJ, Øymar KAA, Vatne A, Lang AM, Støen R, Brigtsen AK, Moster D, Eriksen BH, Selberg T, Rønnestad A, Klingenberg C. Variation in antibiotic consumption in very preterm infants-a 10 year population-based study. J Antimicrob Chemother. 2024 Jan 3;79(1):143-150. doi: 10.1093/jac/dkad358. PMID: 37986613

24. Mushunje PK, Dube FS, Olwagen C, Madhi S, Odland JØ, Ferrand RA, Nicol MP, Abotsi RE; BREATHE study team (Cavanagh JP, Flægstad T). Characterization of bacterial and viral pathogens in the respiratory tract of children with HIV-associated chronic lung disease: a case-control study. *BMC Infect Dis*. 2024 Jun 26;24(1):637. doi: 10.1186/s12879-024-09540-5. PMID: 38926682
25. Berglin M, Cavanagh JP, Caous JS, Thakkar B, Vasquez J, Stensen W, Lyvén B, Svendsen JS, Svenson J. Flexible and Biocompatible Antifouling Polyurethane Surfaces Incorporating Tethered Antimicrobial Peptides through Click Reactions. *Macromol Biosci*. 2024 Apr;24(4):e2300425. doi: 10.1002/mabi.202300425. Epub 2023 Dec 5. PMID: 38009664
26. Flygel TT, Hameiri-Bowen D, Simms V, Rowland-Jones S, Ferrand RA, Bandason T, Yindom LM, Odland JØ, Cavanagh JP, Flaegstad T, Sovershaeva E. Exhaled nitric oxide is associated with inflammatory biomarkers and risk of acute respiratory exacerbations in children with HIV-associated chronic lung disease. *HIV Med*. 2024 Feb;25(2):223-232. doi: 10.1111/hiv.13565. Epub 2023 Oct 7. PMID: 37804064
27. Liljegren MM, Gama JA, Johnsen PJ, K Harms. Plasmids affect microindel mutations in *Acinetobacter baylyi* ADP1. *Plasmid* 131, 102733
28. Winter, M M Vos, A Buckling, PJ Johnsen, K Harms. Effect of chemotherapeutic agents on natural transformation frequency in *Acinetobacter baylyi*. *Access Microbiology* 6 (7), 000733. v4
29. Liljegren MM, JA Gama, PJ Johnsen, K Harms. The recombination initiation functions DprA and RecFOR suppress microindel mutations in *Acinetobacter baylyi* ADP1. *Molecular Microbiology* 122 (1), 1-10
30. Fröhlich C, HA Bunzel, K Buda, AJ Mulholland, MW Van der Kamp, PJ Johnsen, HKS Leiros, N Tokuriki. Epistasis arises from shifting the rate-limiting step during enzyme evolution of a β -lactamase. *Nature Catalysis* 7 (5), 499-509
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33. Almeida GM de F, Ravantti J, Grdzelišvili N, et al. Relevance of the bacteriophage adherence to mucus model for *Pseudomonas aeruginosa* phages. *Microbiology Spectrum*. 2024;12(8):e03520-23. doi:10.1128/spectrum.03520-23
34. Queiroz VF, Tatara JM, Botelho BB, Rodrigues RAL, Almeida GM de F, Abrahao JS. The consequences of viral infection on protists. *Commun Biol*. 2024;7(1):1-15. doi:10.1038/s42003-024-06001-2
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Other Publications (Workshops, meetings, conferences)

45. Hegstad K. NordicAST LRE TRE study. Oral presentation NordicAST workshop, May 29th 2024, Malmö, Sweden.
46. Haldorsen BC, Småbrekke L, Matuschek E, Skjold F, Augustinussen M, Helgason KO, Holzknecht B, Ilmavirta H, Kahlmeter G, Sundsfjord A, Hegstad K, the NordicAST LRE-TRE study group. Performance of the EUCAST disk diffusion method for linezolid susceptibility testing in enterococci: a Nordic multicentre study. Poster P1580 34th European Congress of Clinical Microbiology and Infectious Diseases (ECCMID), Barcelona, Spain.
47. Samuelsen Ø (2024) Nye β -laktam- β -laktamase inhibitor (BL-BLI) kombinasjoner. Deltakermøte for NORM 2024, Gardermoen, Norway
48. Samuelsen Ø (2024) β -lactams, β -lactamases & β -lactamase inhibitors (Gram-negatives). NDPIA - Antibiotics and Antibiotic Resistance Course, 15-19.04.2024, Sigtuna, Sweden.
49. Samuelsen Ø (2024) Gleder og sorger som referanselaboratorium. Norsk Forening for Medisinsk Mikrobiologi – vintermøte i medisinsk mikrobiologi, Gardermoen, Norway.
50. Pettersen, 2024 March - The Nordic AMR Research Centre Conference – Keynote talk on dynamics of early life gut resistome and mobilome
51. Pettersen, 2024 February – Institute of Microbiology of the Czech Academy of Sciences - invited talk
52. Almeida GMF. Viruses of microbes as a resource for marine bioprospection. FIV seminar series (fish immunology vaccine group). 7.3.2024. UiT - NFH. Talk.
53. Almeida GMF. Phages in the North – the first two years. Nordic AMR Research Centre Conference. 14.3.24. Tromsø. Talk.
54. Almeida GMF. Nordic Viruses of Microbes. BFE fagdag. 6.12.24. UiT – NFH. Talk.
55. Md Sabuj Hosen, Aatur Rahman, Klara Stensvåg, Gabriel MF Almeida. The Nordic AMR Research Centre Conference. Isolation and Characterization of Bacteriophages from the Arctic. Tromsø. Poster.
56. Juliana Miranda Tatara, Victoria Queiroz, Waleed Abbas, Zaroony Ricky, Klara Stensvåg, Gabriel Magno de Freitas Almeida. The Nordic AMR Research Centre Conference. First viruses of protist isolated in North Norway. Tromsø. Poster.
57. Arthur Kruse Sørensen, Jorunn Pauline Cavanagh, Klara Stensvåg, Gabriel Magno de Freitas Almeida. The Nordic AMR Research Centre Conference. *Staphylococcus borealis* and phages: Isolation attempts, host range and anti-biofilm effect. Tromsø. Poster.
58. Klara Stensvåg, Hans-Matti Blenke, Andrea Iselin Elvheim, Christoffer Sivertsen, Aatur Rahman, Ida Kristine Østnes Hansen, Gabriel Almeida, Tor Haug. The Nordic AMR Research Centre Conference. Health-beneficial antimicrobials from marine natural Arctic and sub-arctic resources. Tromsø. Poster.
59. Juliana Miranda Tatara, Victoria Queiroz, Klara Stensvåg, Jônatas Abrahão, Gabriel Magno de Freitas Almeida. VoM -2024. GIANT VIRUSES FROM THE ARCTIC. Cairns, Australia. Poster.

60. Tatara JM, Queiroz V, Stensvag K, Abrahão J, Almeida GMF. 35 Congresso Brasileiro de Virologia. *Acanthamoeba* sp. AS HOSTS FOR GIANT VIRUSES FROM THE ARCTIC AND THE POTENTIAL PRODUCTION OF ANTIMICROBIALS DURING THE INFECTION. Foz do Iguacu, Brazil. Poster.
61. Aatur Rahman, Manuel Karl Langer, Bartosz Michno, Hans-Matti Blencke, Tor Haug, Morten B. Strøm, Annette Bayer, Johanna Ulrica Ericson, Tomasz Prajsnar, Klara Stensvåg. Novel synthetic cationic antimicrobial peptides and their potential as antibiofilm agents. EUROBIOFILMS, Copenhagen 26.-29. June, 2024. Poster
62. Monsø, Sunniva Hanset; Hansen, Ida Kristine Østnes; Hansen, Kine Østnes; Stensvåg, Klara; Haug, Tor. 2024. Exploring Arctic sponges for antimicrobial compounds, The Nordic AMR Research Centre Meeting. UIT. Poster
63. Stensvåg, Klara; Blencke, Hans-Matti; Elvheim, Andrea Iselin; Sivertsen, Christoffer; Rahman, Aatur; Hansen, Ida Kristine Østnes; Haug, Tor. Antibiofilm compounds from marine natural Arctic and sub-Arctic resources. 2024, EuroBioFilms. UIT. Poster
64. Rahman, Aatur; Langer, Manuel Karl; Michno, Bartosz; Blencke, Hans-Matti; Haug, Tor; Ericson, Johanna Ulrica; Strøm, Morten B.; Bayer, Annette; Prajsnar, Tomasz; Stensvåg, Klara. Novel synthetic cationic antimicrobial peptides and their potential in combating antibiotic resistance. 2024, 1st Nordic AMR Research Centre Conference 2024. UIT Oral presentation.
65. Hymonti Dey, Danijela Simonovic, Celine Sarah Marine Richard, Ingrid Sofie Norberg-Schultz Hagen, Natascha Johansen, Frode Jacobsen Øye, Elisabeth Aarag Fredheim, Strøm, Morten B.; Bayer, Roger Simm, Hans-Matti Blencke, Haug, Tor. Combining outer membrane active synthetic antimicrobial peptides with vancomycin or erythromycin increases antibacterial and antibiofilm activities. 2024, EuroBioFilms, Copenhagen. UIT. Poster.
66. Baussière, Floriane; Haugland-Grange, Marius. Overall redox-neutral intramolecular Si-to-C radical atom transfer of alkynes and alkenes. 1-4 September 2024, The 15th European Conference on Free Radicals, Manchester, UK. Poster.
67. Sowinski, Mateusz; Mocanu, Elena; Cordes, David; Lovett, Janet; Haugland-Grange, Marius. Pericyclic reactions as tools for preparation of rigid nitroxide spin labels. 1-4 September 2024, The 15th European Conference on Free Radicals, Manchester, UK. Poster.
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