Microbes and Society network news autumn 2023

Dear All,

Welcome to the autumn edition of the Microbes and Society newsletter!

Thanks to all of you who attended the Social Microbes meeting and the Microbes & Society symposium over the summer - both events were well received and the seeds of some future interdisciplinary working were sown, as well as cross-campus networking.

We're already thinking about what we can do going forward to galvanise the network, showcase our interdisciplinarity and make events more impactful in terms of preparing for future bids.

Our publications section has grown in this issue, due to the sheer number of publications over the summer from across the whole network. If we have omitted any, please let Emma know and we'll be sure to include it in the next newsletter.

There are also new sections, focusing on latest reports as well as other publications focusing on interdisciplinarity, policy and environmental legislation - we really hope these are useful, and welcome any feedback to enhance this newsletter further.

Steve, Edze, Jane and Will
Microbes & Society Network Co-Leads

Contents

17

Funding opportunities

Closing calls and pre-announcements

19

Latest publications

Latest research from across our network

15

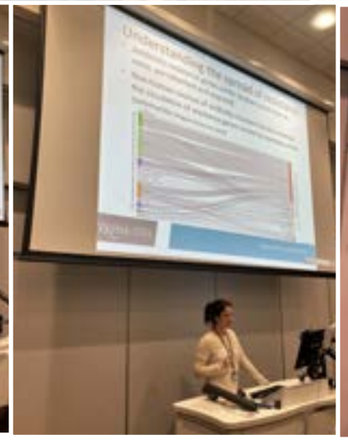
Latest events

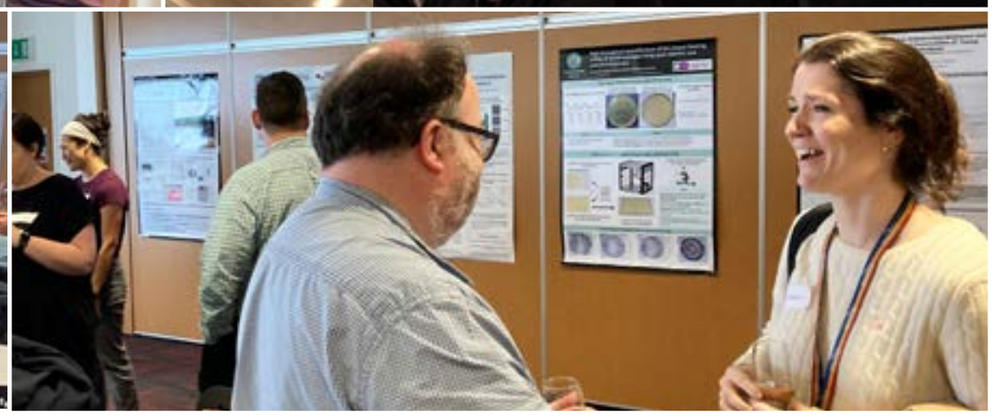
Online, hybrid and in-person

AMR latest	7	**CMM latest**	9
Microbiology latest	11	**WCCEH latest**	11
Reports and Policies	27	**Other publications**	28

Symposium 2023

The network's annual symposium was a success! Over 50 of you convened on Penryn campus for a day and a half of flash talks, posters, workshops and networking. Based around the four challenges of food security, pathogens, microbiomes and planetary health, the flash talks demonstrated the breadth of academic expertise present in the network, and the beginnings of interdisciplinary collaboration could be seen. On the second day, some great ideas to develop Microbes & Society were brought to the table, giving us something to work towards for the next symposium. Thanks again to all speakers, and to everyone who attended.





AMR news

Emily Stevenson spreads word on pharmaceutical and plastic pollution

PhD student and BSAC parliamentary intern Emily Stevenson led policy recommendations along with other BSAC interns, Baroness Natalie Bennett, and with policy input from academics Aimee Murray, Kelly Thornber and Ed Wilson at a policy brief launch at the House of Lords. Emily's internship was also featured in Chemistry World, and if that wasn't enough, she also could be heard on BBC Radio 4's Woman's Hour talking about Beach Guardian, her CIC company, raising awareness about plastic pollution. Congratulations Emily!

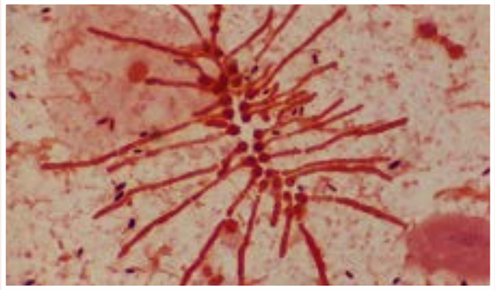
MbyRes success

Jonathan Warren has been awarded MbyRes for his thesis entitled 'Investigations of associations between catchment-scale processes and the abundance of E. coli in bathing waters that are phenotypically resistant to clinically important antibiotics'. Based part-time within the Environment Agency's Chief Scientist's Group, Jonathan's work brings a unique regulator's perspective to understanding the issues of monitoring antimicrobial resistance in bathing waters. He was supervised by Dr Anne Leonard and Professor William Gaze. Congrats Jono!

Public engagement on water quality and AMR in Totnes

On 27 July, Elitsa Penkova, MD Sharma, and Anne Leonard delivered a public engagement workshop in Totnes on water quality and antimicrobial resistance in order to understand the community's concerns and perceptions about water quality, and involvement in research into antimicrobial resistance in inland bathing waters. This workshop was supported by the Enhancing Research Culture Fund.

Killer fungus at British Science Festival!



Experts from CMM were at the British Science Festival on 7 September, hosting an exciting, race-against-the-clock event to solve clues surrounding a mysterious illness taking over the local area.

Liz Ballou gives Lister Prize lecture

On 11 July, MRC CMM hosted Dr Elizabeth Ballou's 2022 Lister Prize award presentation. The Lister Institute of Preventive Medicine was founded in 1891 and is one of the UK's oldest medical charities. In 2022, Dr Ballou received the prize to allow her to progress her studies of the biology of the fungi that cause Mucormycosis; a little understood but serious infection with a mortality rate of 80%. Read more

MRC CMM attains prestigious international diamond status

The MRC CMM has been accredited with a top-level rating for excellence in research facilities and knowledge input, receiving a European Confederation of Medical Mycology (ECMM) Excellence Centre Diamond status - the highest conferrable award. Read more

Image by Theo Moye

Candida and Candidiasis 2023 in Montreal

In May, hundreds of Candida biologists gathered in Montreal, Canada to present and discuss new findings in the field including genomics, epidemiology, infection, host response, drug resistance and therapeutics. Some hot-topics included Candida auris, transcription factors involved in drug response and use of CRISPR technology throughout the field, and the conference provided opportunity for many members of the MRC Centre for Medical Mycology to present their work. Read more

CMM news

From the MRC Centre for Medical Mycology

Microbiology news

Immune systems develop 'silver bullet' defences against common bacteria

Research by Mark Hanson et al has shown how immune systems develop specific genes to combat common bacteria such as those found in food. Previous theories have suggested that antimicrobial peptides – a kind of natural antibiotics – have a general role in killing a range of bacteria. However, the new study, published in Science, examined how the immune systems of fruit flies are shaped by the bacteria in their food and environment. Read more

Successful application for Royal Society Hooke meeting

Microbiology colleagues will receive funding from the Royal Society to organise a scientific meeting on the Ecology and Evolution of Bacteria Defence Systems, to be held on 30 Sept and 1 Oct 2024 in London.

Introducing Penryn 2.0

The Cornwall Microbiology and AMR Research Groups are set to benefit from a new three-storey facility Penryn campus, which will build on the success of the Environment and Sustainability Institute. It will include a new lecture theatre, specialist, state of the art laboratories and collaborative space, and the Research Group will substantially grow its environmental and human health areas of research, train the next generation of environmentalists and engage further with businesses. Read more

Second Social Microbes residency features in Falmouth's Cornish Bank Festival

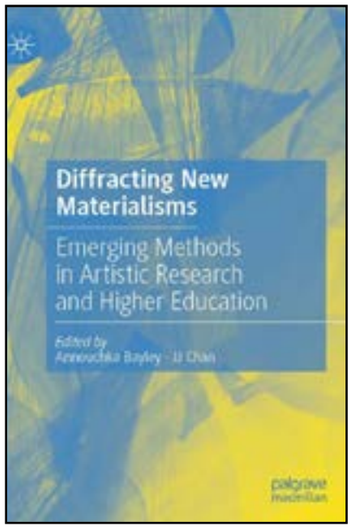
In July, dancer, choreographer and Social Microbes resident Francesca Willow collaborated with Dr Elze Hesse, Then Try This and Soul Farm to create 'Open a Window Under My Feet', inspired by the invisible networks of microbes and fungi beneath our feet that help plants communicate and exchange nutrients. Following a visit to Elze's microbiology lab, a painted-tile installation and performance were intertwined with two farm tours as part of the Cornish Bank Festival. The residency is one of three funded this year through Elze's UKRI Future Leaders Fellowship. Read more

Steve Hinchliffe publishes in The Lancet with Just Transitions for AMR Working Group

The commentary, entitled **'A just transition for antimicrobial resistance: planning for an equitable and sustainable future with anti-microbial resistance'**, emerged from the British Academy Global Convening Programme Award. Read here

THE LANCET

Chapter by Egenis researcher featured in new Palgrave Macmillan book, *Diffracting New Materialisms*



Astrid Schrader's chapter is entitled 'Diffraction as Cross-Disciplinary Methodology between Science and Arts'. The book considers the vital position of artistic research in landscapes and ecosystems of new materialism and post-humanisms, and contributes to the development of emerging inter- and transdisciplinary artistic research practices. Schrader's chapter envisions a diffractive cross-disciplinary narrative between Arts and Science, in which the disciplines get neither synthesised nor merely serve one another.

Successful art exhibition for BCI-Hub

'Embodied', an exhibition supporting the WCCEH's collaboration with the WHO, was held on 11 September at the Forum, exploring the ways that attention to behavioural and cultural aspects of life and existence contribute to better health outcomes for people, communities and planet.

Microbial Humanities & Social Science news

Events

28 September 2023
MycoTalks: Jatin Vyas and Carol Munro.
16.00-17.00. Register here

28 & 29 September 2023

AMR Insights International Masterclass AMR 2023 13.30-17.30. Online. Register here

30 September & 01 October 2023
Agile Rabbit Pop-Up Curiosity Shop of Science and Culture. 10.00-15.00, The Cornish Bank, Falmouth. More details

02 October 2023
EGENIS seminar: The New N=1 problem.
15.30-17.00, Hybrid. Register here

04 October 2023
WCCEH & M&S event: Antibiotic Stewardship on the Agricultural Commons.
16:00-17:30, Hybrid. Register here

04 October 2023
BSAC Online Conference:
Into Clinical Practice: Meeting the Challenges of Gram-Negative Infection Management. Online. Register here

09 October 2023
Penryn Campus Microbiology Seminar & drinks reception
15:30-16:30 Email David Sunderhauf for Teams link

16 - 20 October 2023
Conférences Jacques Monod. A Matter of Scale: Within-host and between-host processes driving coevolution with parasites. Roscoff (France). Register here (abstract submission essential).

17 - 19 October 2023

Targeting Microbiota 2023. Venice, Italy. Register here

23 October 2023
Penryn Campus Microbiology Seminar
15:30-16:30 Email David Sunderhauf for Teams link

30 October 2023
EGENIS seminar: What Makes an Experiment Beautiful? 15.30-17.00, Hybrid. Register here

6 November 2023
Penryn Campus Microbiology Seminar
15:30-16:30 Email David Sunderhauf for Teams link

14 - 15 November 2023
Federation of Infection Societies (FIS) Conference. Edinburgh. Register here

14 - 16 November 2023
ADR Conference. Public data for resilience and inclusion. More information

27 November 2023
EGENIS seminar: The Role of Automated Review within the Paradigm of Inclusive Science.
15.30-17.00, Hybrid. Register here

30 November - 0 1 December 2023
BSAC Winter Conference: Addressing AMR across the tightrope of politics, policy and practice. QEII Centre, London and online. Register here

12 - 13 December 2023 BSAC Antibiotic Resistance and Mechanisms (ARM) Workshop for Researchers. Birmingham Conference and Events Centre, Birmingham. Register here

In collaboration with the Microbes & Society network, the WCCEH are hosting **Antibiotic Stewardship on the Agricultural Commons** on Wednesday 4 October, 16:00 – 17:30.

Listen to Chris Degeling, Associate Professor in the School of Health and Society at the University of Wollongong, talk about his recent study on governing antibiotic risks in beef and dairy farming in Australia using communitarian /common goods arguments to unpick stewardship and compliance issues. This is a hybrid event and is available to join via Zoom. Book here!

Funding calls

Large funding opportunities

BBSRC - UKRI-DFG Lead Agency Agreement: Pilot Call on the 'Integrative Microbiome': Generate new fundamental knowledge relating to the function of the integrated microbiome. Closing date 10 October. Award max £2 million. More info

UKRI - UK-US partnerships: ecology and evolution of infectious diseases. Work in partnership with the USA to understand ecological, evolutionary, and social drivers that influence the transmission dynamics of infectious diseases of animals, humans and plants. **Up to £10 million available.** Closing date 13 December. More info

UKRI - Pre-announcement: transdisciplinary funding to tackle antimicrobial resistance. This award supports transdisciplinary networks to connect and expand the UK AMR communities with researchers from a broad range of disciplines across all UKRI council remits. More info

British Mycological Society - Research Grants. apply to fund biology research-related activities at different levels. Max amount £10,000. Closing date 31 March. More info

HORIZON EUROPE - HORIZON-HLTH-2024-DISEASE-08 - tackling diseases. This supports proposals that set out a credible pathway to contributing to tackling diseases and reducing disease burden. Award max €8 million. Closing date 11 April 2024. More info

ESRC - Embedding methodological development in social science research. Supports proposals that will refine methodological approaches developed since March 2020 to enable them to be fully embedded in research practice. Max award £800,000. More info

Royal Society - APEX Awards. These enable established, independent researchers with a strong track record in their respective area to pursue genuine interdisciplinary and curiosity-driven research to benefit wider society. Closing date 01 November. More info

Leverhulme Trust - Research Project Grants. For researchers based at universities, institutions of higher education or registered charities with university-equivalent research capacity, to undertake an innovative and original research project. Award max £500,000. Closing date 21 March. More info

Smaller funding opportunities

Wellcome Trust - Conference bursaries. These enable PhD students to attend a conference highlighting the mechanisms of communication beween the microbiome & host. Closing date 7 November. Up to 50% off standard registration fee. More info

Wellcome Trust - AMR - genomes, big data and emerging technologies conference bursaries. Apply for funding to cover up to 50% of registration fee. Deadline 19 December. More info

European Society for Paediatric Infectious Diseases - Postgraduate teaching visits to resource-poor countries. Up to 10 awards available each year, worth between €1,000 and €1,500 to cover transportation costs. Closing date 01 December. More info

Microbiology Society - Poster prizes. Enter your poster into a number of prizes at the Annual Conference. More info

Healthcare Infection Society - Career Development buraries. Supports the continuing professional development of career grade members. Closing date 01 February 2024. More info

British Academy/Leverhulme small research grants. Available to support primary research in the humanities and social sciences. Max £10,000 available. Closing date 08 November. More info

Publications

Estell C, Davidson L, Eaton JD, Kimura H, **Gold, V A M, West, S.** A restrictor complex of ZC3H4, WDR82, and ARS2 integrates with PNUTS to control unproductive transcription. *Molecular Cell*

Rowlands E, Galloway T, Cole M, **Lewis C,** Hacker C, Peck VL, Thorpe S, Blackbird S, Wolff GA, Manno C. Analysis of potential nature-based solutions for the Mun River Basin, Thailand. *Aquatic Toxicology*

Wang Y, Zhang C, **Chen AS**, Wang G, Fu G. Exploring the relationship between urban flood risk and resilience at a high-resolution grid cell scale. *Science of the Total Environment*

Pierce RL, Gallifant J, Celi LA. Reform Response: Tying Equity to Reimbursements. *Health Affairs Forefront*

Shrader A. Diffraction as Cross-Disciplinary Methodology between Science and Arts. *Diffracting New Materialisms (chapter)*

Varga D. Missing Pieces: Integrating the socialist world in global health history. *History Compass*

Morwool P, Dimitriu T, Crickmore N, **Raymond B**. Group Selection as a Basis for Screening Mutagenized Librarys of Public Goods (Bacillus thuringiensis Cry Toxins) *Applied and Environmental Microbiology*

Hughes ES, He Z, **Ballou ER**, Wallace, EWJ. A trade-off between proliferation and defense in the fungal pathogen Cryptococcus at alkaline pH is controlled by the transcription factor GAT201. *bioRxiv*

van Rhijn N, Zhao C, Al-Furaji N, Storer I, Valero C, Gago S, Chown H, Baldin C, Fortune-Grant R, Bin Shuraym H, Ivanova L, Kniemeyer O, Kruger T, **Bignell E**, Goldman G, Amich J, Delneri D, Bowyer P, Brakhage A, Haas H, Bromley M. Functional analysis of the Aspergillus fumigatus kinome reveals a DYRK kinase involved in septal plugging is a novel antifungal drug target. *Research Square*

Grant C, Singh KS, Hayward A, Hunt BJ, Troczka BJ, Pym A, Zeng B, Gao C-F, Leroux A, Daum E, Suess P, Souza D, Elias J, **Ffrench-Constant RH,** Vontas J, Roditakis E, Beilza P, Zimmer CT, Bass C. Overexpression of the UDP-glycosyltransferase UGT34A23 confers resistance to the diamide insecticide chlorantraniliprole in the tomato leafminer, *Tuta absoluta*. *Insect Biochemistry and Molecular Biology*

Freda I, Exertier C, Barile A, Chaves-Sanjuan A, Vega MV, Isupov MN, **Harmer NJ**, Gugole E, Swuec P, Bolognesi M, Scipioni A, Savina C, Di Salvo ML, Contestabile R, Vallone B, Tramonti B, Montemiglio LC. Structural insights into the DNA recognition mechanism by the bacterial transcription factor PdxR. *Nucleic Acids Research*

Attrill EL, Lapinska U, **Westra ER,** Harding SV, **Pagliara S.** Slow growing bacteria survive bacteriophage in isolation. *ISME Communications*

Douglas, EJA, Palk, N, Brignoli T, Altwiley D, Boura M, Laabei M, **Recker M**, Cheung GCY, Liu R, Hseih RC, Otto M, O'Brien E, McLoughlin RM, Massey RC. Extensive remodelling of the cell wall during the development of Staphylococcus aureus bacteraemia.
Elife

Forsyth JH, Barron NL, Scott L, **Watson BNJ**, Chisnall MAW, Meaden S, **van Houte S, Raymond B.** Decolonizing drug-resistant E. coli with phage and probiotics: breaking the frequency-dependent dominance of residents. *Access Microbiology*

Larcombe AE, Bohovych IM, Pradhan A, **Ma Q**, **Hickey E**, Leaves I, Cameron G, Avelar AM, de Assis LJ, Childers DS, Bain JM, Lagree K, Mitchell AP, Netea MG, Erwig LP, **Gow NAR, Brown AJ P**. Glucose-enhanced oxidative stress resistance - A protective anticipatory response the enhances the fitness of Candida albicans during systemic infection. *PLoS Pathogens*

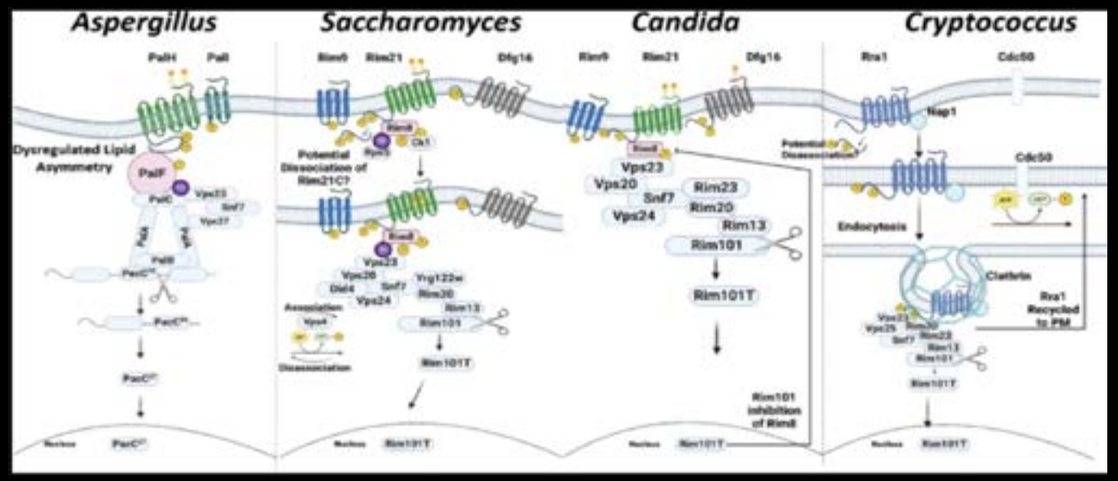
Publication Spotlight

Conserved and divergent features of pH sensing in major fungal pathogens - Farhadi Cheshmeh Morvari S, **McCann BL, Bignell EM** (Current Clinical Microbiology Reports)

"Collectively, the threat posed by fungi to humans, plants and ecosystems is significant. The gravity of this challenge has been brought to the forefront in light of the significant number of life threatening fungal co-infections seen during the COVID-19 pandemic, as well as the success of the post-apocalyptic TV series; The Last of Us. In 2022 the World Health Organization (WHO) published a list of **Fungal Priority Pathogens (FPPs)** including many deemed of critical concern that are the subject of ongoing research at the MRC CMM. Our work focusses on the mechanisms enabling these pathogens to adapt to host-imposed stresses and how we can target these mechanisms to develop urgently required novel antifungal drugs.

All of the FPPs must sense and adapt to host imposed pH stress in order to colonise tissues and cause infections. Whilst the crucial regulatory mechanism related to this relies upon the activity of highly conserved pH-responsive transcription factors, the means by which extracellular pH is sensed and transduced via intracellular signalling is not universally conserved.

Our review outlines the current understanding of the conserved and divergent mechanisms of the pH sensing machinery in model and pathogenic fungal species, as well as important unanswered questions that must be addressed to inform the future study of such sensing mechanisms and to devise therapeutic strategies for manipulating them."



Buchholz HH, **Bolanos LM**, Bell AG, Michelsen ML, Allen MJ, **Temperton B.** Novel pelagiphage isolate Polarivirus skadi is a polar specialist that dominates SAR11-associated bacteriophage communities at high latitudes. *ISME*

Krylov VB, Gomez-Redondo M, Solovev AS, Yashunsky DV, **Brown AJP**, **Stappers MHT**, **Gow NAR**, Arda A, Jimenez-Barbero J, Nifantiev NE Identification of a new DC-SIGN binding pentamannoside epitope within the complex structure of Candida albicans mannan. *The Cell Surface*

Farhadi Cheshmeh Morvari S, **McCann BL**, **Bignell EM**. Conserved and Divergent Features of pH Sensing in Major Fungal Pathogens. *Current Clinical Microbiology Reports*.

Malavia-Jones D, Farrer RA, Stappers MHT, Edmondson MB, Borman AM, Johnson EM, Lipke PN, **Gow NAR.** Strain and temperature dependent aggregation of *Candida auris* is attenuated by inhibition of surface amyloid proteins. *The Cell Surface*

Piovani L, Leite DJ, Yañez Guerra L A, Simpson F, Musser JM, Salvador-Martínez I, Marlétaz F, **Jékely G**, Telford MJ. Single-cell atlases of two lophotrochozoan larvae highlight their complex evolutionary histories. *Sci Adv. 2023*

Hanson MA, Grollmus L, Lemaitre B. Ecology-relevant bacteria drive the evolution of host antimicrobial peptides in Drosophila. *Science*

Hatinguais R, Leaves I, Brown GD, Brown AJP, Brock M, **Peres da Silva R.** CRISPR-based tools for targeted genetic manipulation in pathogenic Sporothrix species. *Microbiology Spectrum*

Zhong ZP, Vik D, Rapp JZ, Zablocki O, Maughan H, **Temperton B,** Deming JW, Sullivan MB. Lower viral evolutionary pressure under stable versus fluctuating conditions in subzero Arctic brines. *Microbiome*

Debowski AW, Bzdyl NM, Thomas DR, Scott NE, Jenkins CH, Iwasaki J, Kibble EA, Khoo CA, Scheuplein NJ, Seibel PM, Lohr T, Metters G, Bond CS, Norville IH, Stubbs KA, **Harmer NJ,** Holzgrabe U, Newton HJ, Sarker-Tyson M. Macrophage infectivity potentiator protein, a peptidyl prolyl cis-trans isomerase, essential for Coxiella burnetii growth and pathogenesis. *PLoS Pathogens*

Farmer C, O'Toole B, **Barnish MS**, Trigg LA, Hayward S, Crathorne L, Kasten Z, Spoors J, **Melendez-Torres GJ.** Early access schemes for innovative health technologies: the views of international stakeholders. *International Journal of Technology Assessment in Health Care*

Erdos Z, Studholme DJ, Raymond B, Sharma MD. De novo genome assembly of Akanthomyces muscarius, a biocontrol agent of insect agricultural pests. *Access Microbiology*

Gallfant J, Celi LA, **Pierce RL**. Digital determinants of health: opportunities and risks amidst health inequities. *Nature Reviews Nephrology*

Publications contd

Villanueva P, Crawford NW, Garcia Croda M, Collopy S, Araújo Jardim B, de Almeida Pinto Jardim T, Marshall H, Prat-Aymerich C, Sawka A, Sharma K, Troeman D, Wadia U, **Warris A**, Wood N, Messina NL, Curtis N, Pittet LF. Safety of BCG vaccination and revaccination in healthcare workers. *Human Vaccines & Immunotherapeutics.*

Njovu IK, Nalumaga PP, Ampaire L, Nuwagira E, Mwesigye J, Musinguzi B, Kassaza K, Taseera K, Kiguli Mukasa J, Bazira J, Iramiot JS, Baguma A, Bongomin F, Kwizera R, Achan B, Cox MJ, King JS, May R, **Ballou ER,** Itabangi H. Investigating Metabolic and Molecular Ecological Evolution of Opportunistic Pulmonary Fungal Coinfections: Protocol for a Laboratory-Based Cross-Sectional Study. *JMIR Research Protocols*

Harrison J, Hussain RMF, Greer SF, Ntoukakis V, Aspin A, Vicente JG, Grant M, **Studholme DJ**. Draft genome sequences for ten strains of Xanthomonas species that have phylogenomic importance. *Access Microbiology*

Rogers S, Zhang C, Anagnostidis V, Liddle C, Fishel ML, **Gielen F, Scholpp S**. Cancer-associated fibroblasts influence Wnt/PCP signaling in gastric cancer cells by cytoneme-based dissemination of ROR2. *PNAS*

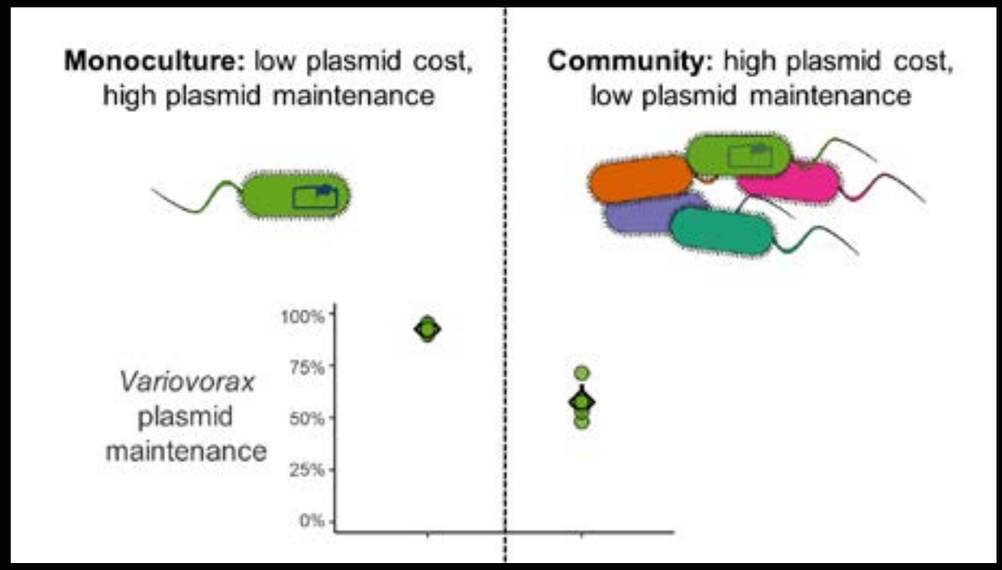
Mukaremera L. Why I care about Cryptococcus neoformans. *Nature Microbiology*

Sunderhauf D, Klumper U, **Gaze WH, Westra ER, van Houte S.** Interspecific competition can drive plasmid loss from a focal species in a microbial community. *ISME*

King J, **Dambuza IM**, Reid DM, **Yuecel R, Brown GD**, **Warris A**. Detailed characterisation of invasive aspergillosis in a murine model of X-linked chronic granulomatous disease shows new insights in infections caused by *Aspergillus fumigatus* versus *Aspergillus nidulans.* *Frontiers in Cell Infection*

Publication Spotlight

Interspecific competition can drive plasmid loss from a focal species in a microbial community. **Sunderhauf D,** Klumper U, **Gaze WH, Westra ER, van Houte S.** (ISME)



“Through this research, we found that cost and maintenance of plasmids can depend on the community context of their host.

This is important because plasmids often carry antimicrobial resistance (AMR) genes, and can be passed on between different bacteria by conjugation. Understanding (or manipulating!) when plasmids are maintained can be key to tackling AMR, and to understanding ecology and evolution of bacterial populations.

Previous work has shown that when a plasmid host is moved from monoculture into a community context, this can lead to more plasmid maintenance due to re-infection of the original plasmid host by conjugation. In our model system of a synthetic soil bacterial community conjugation is negligible. Intriguingly, we found that focal species Variovorax loses the plasmid pKJK5 more rapidly when placed in a community context than when it is growing in monoculture. We show that this is due to increased cost of the plasmid to its host when it is also growing together with competing species. We further observe this cost-dependent plasmid loss in a second species in the model communit, and assaying plasmid maintenance of a lower-payload version of pKJK5 matches with these predictions in that it becomes lost less rapidly than high-payload pKJK5. ”

Publication Spotlight

Transient eco-evolutionary dynamics early in a phage epidemic have strong and lasting impact on the long-term evolution of bacterial defences - **Watson BNJ,** Pursey E, Gandon S, **Westra ER** (PLoS Biology)

"Bacteria and their viruses (phages) are an ideal model system for studying the interactions between hosts and parasites: as they have a short generation time, it's straightforward to work with large population sizes and bacteria can easily be engineered to make new genotypes. In our study, we used the opportunistic human pathogen, Pseudomonas aeruginosa, and its phage, DMS3vir, to investigate what drives the evolution of parasite resistance mechanisms, that are either constitutive (always active) or inducible (elicited by parasites). P. aeruginosa can evolve resistance to DMS3vir by either losing the phage receptor on the cell surface to prevent phage entry (surface mutants, constitutive) or by using its CRISPR-Cas system to acquire 'spacer' sequences that will target the phage DNA for degradation (induced).

We collaborated with mathematical modeller, Dr Sylvain Gandon (Montpellier, France), to develop theoretical predictions about what influences the evolution of these two types of resistance, and we then experimentally tested these predictions. The model predicted that the evolution of one type of resistance reduces selection for the alternative resistance type. We also predicted and experimentally demonstrated that, since surface mutations arise stochastically due to errors in replication, surface mutants were more abundant in conditions where bacteria can replicate more, whereas the evolution of CRISPR-Cas immunity occurs when bacteria are infected, and we showed that factors increasing phage exposure, including initial phage dose, and the culture density, increased the proportion of CRISPR-Cas resistance. This analysis involved developing statistical models, which was carried out by Dr Ellie Pursey (former PhD student with Prof Edze Westra, now a Wenner-Gren funded postdoc at Lund University, Sweden).

If you want to know any more about this work and what implications it has for host ecology and pathogenicity, please get in touch! "

Publications contd

Watson BNJ, Pursey E, Gandon S, **Westra ER.** Transient eco-evolutionary dynamics early in a phage epidemic have strong and lasting impact on the long-term evolution of bacterial defences *PLoS Biology*

Pitchforth E, Ali GC, Smith E, Taylor J, Rayner T, Lichten C, d'Angelo C, Gradmann C, Berridge V, Bertscher A, **Allel K.** What and how can we learn from complex global problems for antimicrobial resistance policy? A comparative study combining historical and foresight approaches. *Journal of Global Antimicrobial Resistance*

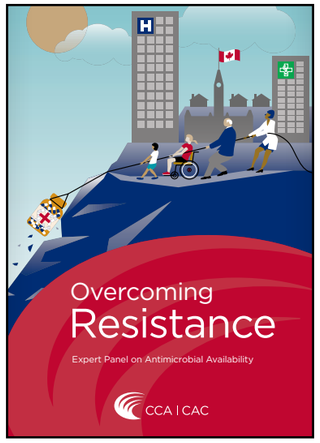
Wu J, Guo S, Lin H, Li K, Li Z, Wang J, **Gaze WH,** Zou J. Uncovering the prevalence and drivers of antibiotic resistance genes in soils across different land-use types. *Journal of Environmental Management*

Fones HN, Soanes D, **Gurr SJ**. Epiphytic proliferation of Zymoseptoria tritici isolates on resistant wheat leaves. *Fungal Genetics and Biology*

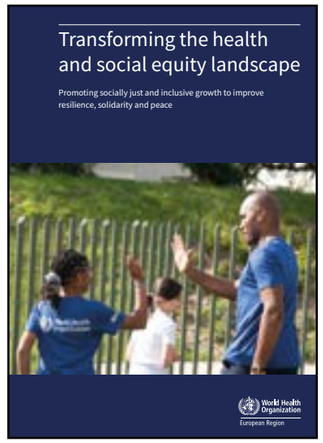
Agnandji ST, **Recker, M**, Mordmuller B, Glockner S, Adegnika AA, Lell B, Otieno L, Otieno W, Owusu-Agyei A, Asante KP, Agbenyega T, Ansong D, Macete E, Aide P, Sorgho H, Tinto H, Mturi N, Lusingu JPA, Gesase S, Hoffman I, Masoud NS, Newton CR, Bojang K, Krause G, Kremsner PG. Prostration and the prognosis of death in African children with severe malaria. *International Journal of Infectious Diseases*

Reports, Policy Briefs

Eco-directed and sustainable prescribing of pharmaceuticals in the United Kingdom - BSAC, July 2023

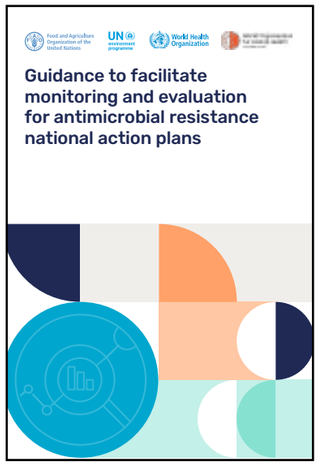


Overcoming Resistance - CCA, Sept 2023



Transforming the health and social equity landscape, WHO, July 2023

GLASS manual for antimicrobial resistance surveillance in common bacteria causing human infection, WHO, August 2023



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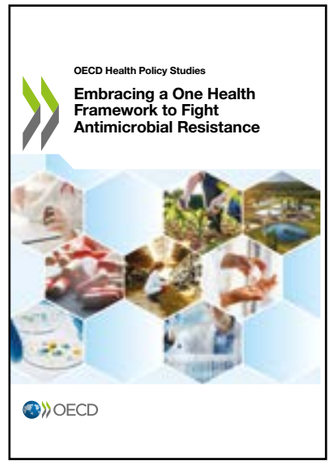

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