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The Constructing of Antimicrobial Resistance: A Workshop

3rd August 2016, Latimer Place, Chesham, UK

Abstracts Booklet

Background

Anti-microbial resistance (AMR) is posed in media and policy discourses as one of the greatest threats to life as we know it. Seen as a threat to every-day health care as well as global security, images of an apocalyptic future (or 'era') are driving imperatives to act. Governments and global agencies have become compelled to respond and are setting targets and measures of action. Scientists are being galvanised to provide evidence for policy. And social scientists are being called upon to ensure that populations, as medicines users, are aware of AMR and are behaving appropriately.

The discourse of catastrophe, requiring urgent action to pre-empt crisis, brings with it a need for expedition. When evidence for action is missing, a 'precautionary principle' is proposed. Estimated risks, based on probability models, suffice to inform policy. As in other situations that emerge as humanitarian crises, ends and means become muddled, and being slow is not an option.

In this context of urgency, we propose opening up a space for pause. Following others who call for 'slow' research, we suggest benefit to making time to take stock, learn from history, studies of science, ethics and critical theory. The scientific evidence base that underlies the development of AMR policies largely draws on ideas from evolutionary biology, genetics and immunology, and to some extent on human behavioural studies. There is a relative dearth of discussion around for example counterfactuals, the concept of AMR itself, the burden of AMR for different actors, the suppositions behind the framing of AMR and its response, the making of AMR through metrics and targets and so on.

Furthermore, the nature of discourse around AMR allows an assumption that *it* is a single *thing*. When we consider the multiplicity of 'bugs and drugs', of biological definitions (is it the bug, the genome, the transposon that it 'resistant?'), of intradisciplinary opinion (such as the role of microbiota) as well as of perspectives on what constitutes a (solvable) problem, the idea that AMR is a fixed, even material, entity is destabilised.

By exploring the natural, discursive and social processes that construct AMR, and that make its responses possible and desirable, we can raise important questions over the direction of current strategies and even highlight potential alternative futures.

This workshop aims to bring together scholars from across social science disciplines to discuss and share perspectives on how AMR is being constructed within and between different arenas of science, policy, public health, clinical practice and the media.

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Scope

In this workshop we will explore from different disciplinary perspectives how AMR is constructed, and what this means for how policy, science and practice are being made and remade.

Topics will include the construction of AMR as a phenomenon of nature / pharmaceuticalisation / philanthrocapitalism / multispecies interaction / ecology / material proximities / catastrophic futures / historical artefact / ruination / science fiction / delocalized factish / techno-scientific opportunity.

Programme

Time	Title	Speaker
8.30-9	Introductions, scene setting	All, Clare Chandler (LSHTM)
9-10.30	Theme 1: Constructing AMR science <i>Utopias, Dystopias, and Metagenomic Landscapes: Seeing Human Society as a Bacterial Environment</i> <i>To cull or care: a multispecies approach</i> <i>The good, the bad, and the bugly: A narrative of faecal bacteriotherapy and human-microbial relations</i>	Hannah Landecker (California) Coll Hutchison (LSHTM) Carmen McLeod (Nottingham) <i>Discussant: Ann Kelly (KCL)</i>
10.30-11	Refreshments	
11.00-12.30	Theme 2: Constructing AMR policy <i>Managing the consequences of pharmaceuticalised public health? discourses of antimicrobial resistance in global public health</i> <i>Antibiotic Resistance, Pharmaceutical Innovation, and the Collision of Dystopias</i> <i>The uses of 'market failure' and the framing of the AMR crisis</i>	Eleanor Hutchinson (LSHTM) Scott Podolsky (Harvard) Javier Lezaun (Oxford) <i>Discussant: Hayley MacGregor (IDS)</i>
12.30-1.30	Lunch	
1.30-3	Theme 3: Constructing a public AMR <i>Economic imaginaries and the politics of fear in AMR</i> <i>Constructing microbial publics: concepts and methods for politicizing AMR</i> <i>An Interpretive Phenomenology of AMR: Implications for Public Policy and Consumer Culture in China</i>	Nik Brown (York) Jamie Lorimer (Oxford) Ming Lim (Liverpool) <i>Discussant: Helen Lambert (Bristol)</i>
3-3.30	Refreshments	
3.30-5	Theme 4: Constructing AMR at the interfaces of science-policy-publics <i>Anticipating Epistemic Controversies in Governing Antimicrobial Resistance</i> <i>Ambivalent Solutions to Antimicrobial Resistance: Bioprospecting Microbiota</i> <i>Antibiotics as infrastructure: what can we learn from convalescence?</i>	Sujatha Raman (Nottingham) Andrea Núñez Casal (Goldsmiths) Clare Chandler (LSHTM) <i>Discussant: Alice Street (Edinburgh)</i>
5-5.30	Closing reflections and future plans	Clare Chandler (LSHTM)
5.30-7	Break, chance to explore grounds, swimming pool	
7-7.30	Drinks reception	
7.30-	Dinner	

Abstracts

Theme 1: Constructing AMR science

Utopias, Dystopias, and Metagenomic Landscapes: Seeing Human Society as a Microbial Environment

Hannah Landecker, University of California

The rise of the microbiome and the crisis of antibiotic resistance have both produced extensive efforts to map microbial life in both space and time. On the one hand there is the utopian narrative of ecological management of beneficent commensals and thus the pursuit of normal or healthful population structures, with restoration ecology the solution to degraded or compromised communities. On the other hand there is dark specter of antibiotic resistance, resurgent diseases, and failing medications. The need to understand how antibiotic resistance arises and spreads has produced a stunning amount of knowledge about horizontal gene transfer and microbial evolution (which includes bacteria, but also fungi and bacterial viruses). Of course the aim of this effort is to visualize, map, and account for microbial life. However, because of the role of human society in producing many of the environments in which microbial life exists, these maps of microbial life are simultaneously social and historical tracings of human life. Because these social and historical maps are not made with concern for the macroscopic things that humans would naturally put on maps - freeway offramps, bridges, cities, waterways - they are in a sense “from the perspective” of the microbe, or at least from the perspective of the technologies designed to tracked microbial genetics. In this paper, I ask what images and maps of human society are being produced in microbial mapping, and historical accounts of microbial evolutionary change. What do we see when we depict human society as a microbial environment?

Perpetuating microbial war or possibilities for multi-species care?

Coll Hutchison, LSHTM

Hurling in from the future, antimicrobial resistance, and more specifically antibiotic resistance (ABR), is presented as an impending global apocalypse. Prophetic scientific, policy and media warnings of imminent medical catastrophe (ineffective antibiotics), societal regression (pre-antibiotic era) and continued microbial wars (need for new antibiotics) fuel demands for imperatives to act and minimise further bacterial resistance. War metaphors form a central aspect of the circulation of these discourses, perpetuating sharp dichotomies between insiders/outside, self/other, individual/community, friend/foe etc., and facilitate foreclosure of spaces to explore and propose alternative strategies that do not merely affirm the mass reduction of global antibiotics use. Surveying these discourses, particularly those that rely on war metaphors, I explore their power to limit serious engagement with ongoing scientific research on the microbial ecology and metagenomics of ABR evolution. I then outline how they may occlude or retard the development and implementation of alternative strategies, in particular those sensitive to both more nuanced relations between humans, bacteria and antibiotics and the diversity of these same organisms. In response, I explore the possibilities of multispecies care as an alternative discourse, open to the ecological entanglements of humans, microbes and medicines, where a focus on care rather than war blurs sharp dichotomies and boundaries, while not shying away from the need to cull and control other nonhuman species and the difficulties that come with it.

The good, the bad, and the bugly: A narrative of faecal bacteriotherapy and human-microbial relations

Carmen McLeod, University of Nottingham

Faecal bacteriotherapy (FMT) is a procedure in which faecal matter is collected from a donor, mixed with a saline or other solution, strained, and placed in a patient, usually by colonoscopy or enema. It is a relatively new, and somewhat controversial, treatment for *Clostridium difficile* (*C. diff*) infections, which are most often acquired within hospital settings by elderly patients. Significantly, the development of *C. diff* infections is linked to antibiotic use. This paper uses faecal bacteriotherapy as a case study for exploring the complex relationship between humans, microbes and antibiotics. The research uses a multispecies ethnography approach and seeks to explore the construction of binaries, such as 'good'/'bad' bacteria, through the study of interspecies encounters. Fieldwork includes participant observation within laboratory and hospital settings. This paper presents emerging findings from interviews with microbiologists and gastroenterologists working on the treatment of *C. diff* infections, as well as analysis of online patient discussion boards and other documentary material relating to FMT.

Theme 2: Constructing AMR policy

Resistance and global public health: AMR as a form of and a response to processes of pharmaceuticalisation

Eleanor Hutchinson, LSHTM

"The volume of antibiotic consumption associated with preventable diarrhoeal illness is therefore substantial modelling commissioned by the Review suggested that across four middle income countries (India, Indonesia, Nigeria and Brazil), close to 500 million courses of antibiotics are each year used to treat diarrhoea. With universal access to improved water and sanitation, though, this would be reduced by some 60 per cent" (O'Neill 2016).

For the last three decades, as international public health has shifted into new, neoliberal forms of intervention under the rubric of global public health, the scale up of access to pharmaceutical products has formed a core activity for philanthrocapitalists, donor agencies, international organisations and global public private partnerships. The role of medicines in global public health is, however, set to shift. Concerns about antimicrobial resistance, developed as a problem by European policy makers (in the United Kingdom and Germany in particular), but defined as an issue in and of the globe (rather than one of and for nations or regions), have been exported into the global public health arena. AMR is emerging as a policy object to be diffused into ministries of national health in developing countries to form the basis for intervention in these settings.

It is possible to interpret this rise in microbial resistance to medicines in low-income settings as an outcome of an overemphasis by global health actors, national governments, international companies and citizens themselves on pharmaceuticals as the mechanisms through which health can be delivered. The historical evidence suggests that major improvements in public health outcomes witnessed in developed countries did not occur through better access to medicines but rather came about because of changes in sanitation and infrastructure, the development of health services and progressive social policy. Indeed, it seems likely that while undeniably important individuals with particular diseases amenable to treatment, the introduction of antimicrobials (antibiotics in particular) revolutionised practices of bio-medicine (enabling complex operations and interventions which can be catastrophic for immune systems) but are unable to provide the sort of transformative

change to health outcomes at a population level in Africa as was seen in Europe over the past 200 years.

With this in mind, concerns about the failure of medicines under the weight of microbial resistance could be the basis of a more radical global public health agenda, one that challenges a pharmaceuticalised model of global health and through which health outcomes could be connected to other forms of social change and development (decent work, sanitation and better infrastructure, better nutrition, housing). This would be in line with critics from Medicines Sans Frontiers and Richard Horton writing in the *Lancet*, for example, who argue that from a humanitarian or development perspective it simply does not make sense to focus on scaling back access to medicines in many low income settings when people living in poor quality housing, without access to effective sanitation, nutritious food and good health services are more likely to die from treatable infectious diseases rather than taking medicines rendered useless by AMR.

Yet, rather than rendering visible the limitations of this pharmaceuticalised model of healthcare and opening a space for new global health practices to emerge, policy frameworks which are likely to forge a significant part of the global public health landscape over the next few years focus on limiting medicine use through the introduction of new health commodities - rapid point of care diagnostic tests - and the improvement and upgrading of laboratories.

This paper considers what these consequences seem likely to be in terms of global health discourse and practice. It shows how current narratives work to make medicines appear more powerful and more attractive; they ways they shift the means and the ends of global health intervention - with the protection of medicines becoming the goal, and a variety of developmental, economic, social, cultural interventions being drawn upon to realise it (see O'Neill above); and how in the process people can disappear.

Antibiotic Resistance, Pharmaceutical Innovation, and the Collision of Dystopias

Scott Podolsky, Harvard University

Futures – whether utopias or dystopias – can be *performative* in the sense that they not only describe future technologies and policies but also help bring them into being. The advent of the sulfa drugs and antibiotics during the 1930s, 1940s, and 1950s was characterized both at the time and thereafter – by clinician-scientists, the media, and the pharmaceutical industry alike – as ushering in a “therapeutic revolution” that would herald not only the conquest of infectious diseases, but the power of the pharmaceutical industry and the medical profession to conquer an ever-wider array of diseases more generally.

Nevertheless, from the 1950s onward, such futures were offset by contemporaneous counter-projections and frank dystopias. The first, originating in the mid-1950s from such leading antibiotic researchers as Maxwell Finland and Harry Dowling, depicted a future of “irrational” medicines, of therapeutic exuberance and expansion taking place amidst a regulatory vacuum (in which the FDA could not explicitly adjudicate therapeutic efficacy) and pharmaceutical over-marketing. This was a projected future in which, as Dowling described in his famous “Twixt the Cup and the Lip” speech before the AMA in 1957, “the pharmaceutical industry will lose its prestige and ... will fall, and the medical profession will be dragged down with it.” The efforts of such reformers, predicated upon the utility of the stringently conducted controlled clinical trial to tame the therapeutic marketplace, would help lead to the passage of the Kefauver-Harris amendments of 1962 (mandating proof of therapeutic efficacy via controlled trials prior to FDA approval of new drugs) and the regulatory defining of the rigorously conducted randomized controlled trial itself that would emerge by the end of the 1960s and that persists to this day.

However, a second dystopia emerged from the 1950s onward, paralleling the discovery of widespread antibiotic resistance and entailing a “post-antibiotic era” in which the pharmaceutical industry would be unable to keep up in the arms race with resistant bugs. While such dystopias were projected as early as the 1950s, the politicization and even commodification of antibiotic resistance from the 1980s onward has led to ever more alarming depictions of “superbugs” amidst an “apocalypse,” and to potential salvations from such dystopic futures. Among these solutions – predicated upon the notion that the FDA has become a bottleneck in the ability of drugs to make it through the pipeline and hence has served as a negative inducement for industry to develop novel antibiotics – has been the proposal to alter current FDA standards of approval so as to make it cheaper and faster to get antibiotics into the marketplace. The prospect of less-studied remedies is envisioned as a warranted price to pay in the setting of a projected antibiotic-bereft future. Such a “limited population antibiotic discovery (LPAD)” mechanism has been featured in several U.S. congressional bills, and now in the proposed 21st Century Cures Act itself.

This presentation will thus not only describe the generative power of projected antibiotic futures, but will demonstrate the manner by which such futures can come into direct conflict both diachronically and synchronically. Antibiotic futures and their economic, moral, political, and public health components continue to be mobilized on behalf of such onetime miracle drugs. It is important to engage in the work these future visions do in a world of evolving microbes, patients, and histories.

The uses of 'market failure' and the framing of the AMR crisis

Javier Lezaun, University of Oxford

This paper analyzes the rise of ‘market failure’ as an interpretive frame to characterize and explain insufficient therapeutic provision in key biomedical areas, specifically antimicrobial resistance. The lack of appropriate therapeutic options, the argument goes, is due to an absence of sufficient economic incentives on the supply side of the market for new health products. Such a framing defines both problem and solution: antimicrobial resistance is understood as a problem of pharmaceutical innovation (not enough new-generation antibiotics), which is to be addressed by the creation of new profit expectation and the subsequent re-orientation of R&D investments. The paper focuses on the use of ‘market failure’ in contemporary policy frameworks in the UK, most notably the *Review on Antimicrobial Resistance* commissioned by former Prime Minister David Cameron. The paper also excavates some earlier uses of the concept in international health policy forums, and the growing influence of neoclassical economics in the characterization of biomedical R&D systems. In fact, the rise of ‘market failure’ as an interpretive heuristic arguably marks a clear point of transition from Cold War programs of international health to the contemporary, market-oriented and market-making global health regime.

Theme 3: Constructing a public AMR

Economic imaginaries and the politics of fear in AMR

Nik Brown and Sarah Nettleton (University of York, UK)

In this paper, we focus on the way economy and immunity have become increasingly entwined in scientific and political debates about antibiotic resistance (AMR). AMR registers a particular turn taking place in the politics of the bioeconomies, premised increasingly on discourses of anticipatory pre-emption of a hostile microbial resurgence (Brown and Nettleton 2016 in press; Cooper 2006). But, what we want to do here is explore the way in which AMR becomes the basis for performing certain forms of 'economic imaginary' (Jessop & Oosterlynck 2008) by projecting and restructuring economic and geo-political orders.

The immunitary performance of economy in AMR can be seen to follow two key trajectories. The first we have called 'economies of resistance' and examines the way in which principles of economy are borrowed into biological explanations of AMR. This, we suggest, is most clearly expressed in theories of 'genetic capitalism' in microbiology where capitalism itself is seen to furnish microbial life with modes of economic behaviour and conduct. 'Economies of resistance' are evidence of the naturalisation of socio-economic structures in expert understandings of AMR. The second trajectory with which we are interested is concerned with the way microbial life is re-deployed in the large-scale reconfiguration of political agendas about the future of economy, of the public-private interface, of migration and race. This, we suggest, can be expressed as the 'resistance of economies' and is empirically located in an analysis of high profile political interventions on AMR spanning several decades going back to the mid 2000s. 'Economies of resistance' and the 'resistance of economies' are not however unrelated but mutually constituting dynamics in the co-production of AMR. We intellectually anchor this discussion in a number of influences, but particularly Derrida's reflections on auto-immunity as a form of traumatic imagining, a catastrophism that lays the foundations for a renewable cycle of auto-immunitary excess.

Constructing microbial publics: participatory approaches for politicizing AMR

Jamie Lorimer, University of Oxford

This paper will reflect on some of the opportunities and challenges for making AMR public, and thus for opening up a wider politics of AMR. At present the detection, attribution and assessment of exposure risk of AMR are scientific practices. They require access to technologies and forms of expertise beyond the budgets and skillsets of the diverse affected publics. This is understandable, but it is necessary to democratise the construction of AMR and to make it a genuine matter of concern. Moving in this direction the paper first reflects on an ongoing project developing participatory approaches to metagenomics (www.goodgerms.org). This intervention allows households to design and undertake experiments in domestic kitchen hygiene practices and to interpret their effects upon the domestic microbiome. The paper then explores the possibilities for developing this method to explore the presence, risks and politics of AMR in the wider environment. Focusing on AMR emerging in the sewage effluent and farm wastes that flow into the river Thames, it outlines some thoughts towards a framework for making AMR public.

An Interpretive Phenomenology of AMR: Implications for Public Policy and Consumer Culture in China

Ming Lim, University of Liverpool

In common with virtually all heavily mediated discourses around public health (the Zika virus, SARS, swine flu and so on), AMR is rapidly becoming entrenched in the public imagination as yet another project of de-autonomization and existential threat. This discourse, I argue, stands in contrast – and violates, in extreme cases – our *embodied* intelligence about how to react to health crises. This insight -- a key contribution of phenomenological critique to our understanding of consumers' agency and choices in situations of health and illness -- holds rich insights for reframing both the AMR crisis and public policy around the issue. In line with critical scholars of AMR who interrogate strategies in a post-antibiotic era where 'innate immunity (has) gone awry,' this presentation considers how the consumer/patient has become entangled in a socio-technical-bureaucratic web made up of the microorganism, the environment, the market, social norms and the helpless body, thus putting embodied understanding at risk. Put another way, AMR is a *system* marked by radical difference and cruel rhythms, endangering and marginalising the potency of embodiment as skilled performance, tacit knowing, the intuitive informatics of a continuous and productive dialogue between the body and, and in, time/space.

To illustrate my argument, I focus on media communications of intravenous treatment of outpatients in hospitals in China (Jiangsu, Anhui and Zhejiang provinces). By examining press articles in mainstream Chinese newspapers and online citizen blogs and forums, this presentation aims to bring to life the narrated experiences of the nuanced *gradations* of AMR in, and through, different (human) bodies and the technical discourses systems that facilitate and constrain them. Finally, key implications of this perspective for public policy and the consumption of AMR are opened up for further debate and discussion. Thus and thereby, we can make progress towards addressing a new question on this topic: how can an interpretive phenomenology of AMR illuminate the nature and extent of consumer agency and thus and thereby, the practices and policies of governments and global institutions at present and in the future?

Theme 4: Constructing AMR at the interfaces of science-policy-publics

Anticipating Epistemic Controversies in Governing Antimicrobial Resistance (AMR)

Sujatha Raman, University of Nottingham

“The science around antimicrobial resistance is less contested than that of climate change” (Observer editorial 2014). This statement gives voice to an otherwise unspoken assumption in contemporary public, public health and research policy discourses on AMR. This is the expectation that it will be possible to manage two different strands in the response to AMR that pull in potentially opposing directions. The first and predominant strand to date is the effort to raise awareness about the significance of AMR and the need to curtail inappropriate demands for and uses of antibiotics. The second emerging strand is increasing support for scientific research on detection and mechanisms of AMR and its transmission (in order to underpin evidence-based action), as well as innovation research on new classes of antibiotics. If the science of AMR is ‘less contested’, there is no reason to suppose that asking for more scientific evidence will lead us down the rabbit-holes of scepticism as has been the case with climate change. If technological innovation is an essential part of the response to AMR, there is no reason to suppose that invoking future ‘breakthroughs’ will be a distraction from efforts to deal with patterns of use in the here-and-the-now.

But what if these assumptions are flawed? In this talk, I want to build on the spirit of frameworks of anticipatory governance (developed largely in relation to emerging rather than declining technologies) to set out some reasons why pausing to reflect on these assumptions might be valuable. The history of science-based policymaking as explored in the STS literature shows that consensus cannot be taken for granted – it is a provisional achievement that requires negotiating across scientific *and* political commitments (in the category of which some STS scholars include commitments to justice).

STS on science-based/evidence-based policymaking suggests that tacit assumptions which are an inevitable bedrock for any kind of research can be opened up to critical scrutiny and contestation when political stakes become higher. In the early history of climate change, some apparently straightforward assumptions in the US-based World Resources Institute’s (WRI) assessment of carbon emissions associated with tropical forests became altogether less so when researchers at India’s Centre for Science and the Environment (CSE) highlight reasons why all forms of pollution are not necessarily the same – an intervention that became the basis for the distinction between ‘subsistence’ and ‘luxury’ emissions and which has been invoked in numerous STS accounts (Hulme, Jasanoff, Yearley) to highlight disjunctures between scientific universality and public meaning. In other controversies, notably around GMOs, arguments over the scientific evidence have been a proxy for disputes over global trade arrangements in the context of World Trade Organization (WTO) rules.

In the case of AMR, attention to ensuring ‘access’ to antibiotics as well as curtailing ‘excess’ is certainly highlighted in official commitments including most recently in the AMR O’Neill Review (2016). In this respect, the subsistence/luxury distinction is perhaps already acknowledged, although its translation into practice remains to be seen. However, what is less evident is reflection on a persistent pattern in the directionality of travel of resistant strains in AMR discourse, namely, of strains inevitably ‘discovered’ first in the global South and then ‘transmitted’ to the global North (sticking for the moment with these potentially problematic labels). Yet, scientific evidence of one type of discovery that has figured prominently in the headlines has been followed by a more complex picture in other parts of the scientific and public health domain, though these nuances

rarely become publicised in the same way. For example, the 2010 NDM-1 New Delhi superbug story was widely reported as the first case of carbapenem-resistance discovered first in India. Yet, on the sidelines, others in the CDC and in the scientific literature were highlighting previous and more widespread cases of carbapenem resistance associated with the KPC gene which was first isolated in the US and subsequently picked up in other countries including Israel and the UK. Likewise, the more recent story of colistin-resistance was reported as emerging in China's livestock industry, but once again, other research suggests a 'still unfolding' story with examples cited of colistin-resistance in chicken meat imported *from France to Tunisia*. If evidence were needed that bugs travel in more than one direction – and that scientific assumptions about direction of travel can be cast into doubt or possibly overthrown – one can also turn to the tale of origins of tuberculosis in humans. It was long assumed that *M.tuberculosis* in humans was a result of contact with cattle with the rise of their domestication, but recent genetic research suggests that 'we' may have instead 'given' TB to 'them'.

As the sheer number and disciplinary diversity of fundamental research findings on AMR can be expected to increase, the hope for a shared public message based on scientific consensus on the need to curtail human uses of antibiotics might be premature. Disagreements on the nature of evidence linking agricultural antibiotics with AMR in humans already have a longer history (Morris et al, 2016).¹ Scientists are also calling for a more complex set of investigations on AMR (e.g., distinguishing the 'mere' presence of resistance-genes in the environment from specific clinical impacts), but is it not clear how different approaches and their different implications for AMR interventions will be reconciled. This is likely to become a bigger issue with more research on environmental AMR which includes consideration of how the wider class of antimicrobial compounds associated with industrial processes and consumer goods (disinfectants, biocides, as well as antibiotic uses in lesser known instances outside of farms and human medicine) co-selects for antibiotic resistance once these objects mingle in the soil and water. A recent debate in *Nature Microbiology* on how the risks of resistance-genes in the environment should then be prioritized suggests that these issues may unfold in unexpected ways in the future. Without more attention to the question of what we want from scientific evidence and how evidence should be judged in the context of political and ethical commitments, one might anticipate future controversies in the making where responsibility for AMR actions are placed on some actors more than others.

Finally, the capacity to maintain messages of prudence and stewardship alongside competing messages of technological breakthroughs for fighting superbugs might also be called into question. In this context, frameworks of responsible innovation (which again have been deployed largely in relation to technologies of the future) might be productively appropriated to ask new questions. Before worrying about public beliefs that innovation will resolve the challenges of AMR (as some surveys report and that are seen to pose a threat to efforts to curtail antibiotic use in the present), one might ask where these beliefs about the future come from, how they might be reinforced by expectations raised by science, and how we might engage in conversation around them.

Ambivalent Solutions to Antimicrobial Resistance: Bioprospecting Microbiota

Andrea Núñez Casal, Goldsmiths, University of London

In 2014, the World Health Organisation (WHO) warned that antimicrobial resistance (AMR) poses a "major global threat" that endangers "the achievements of modern medicine" inaugurating a "post-

¹ Morris, C., R. Helliwell and S. Raman. 2016 'Framing the Agricultural use of Antibiotics and Antimicrobial Resistance in UK National Newspapers and the Farming Press'. *Journal of Rural Studies*. DOI: [10.1016/j.jrurstud.2016.03.003](https://doi.org/10.1016/j.jrurstud.2016.03.003)

antibiotic era” in which common infectious and minor injuries that have been treatable for decades can now kill (WHO, 2014). Resistance points us to the close intertwinement of industrial agriculture, histories and practices of medicine with our biological selves and microorganisms (Landecker, 2015). Yet, despite antimicrobial resistance being one of the greatest contemporary global challenges to public global health, critical research into social and cultural analysis of antibiotics remains limited. A contemporary understanding of human microbiome science in relation to antimicrobial resistant bacteria illuminates how the cultural politics of modernisation and industrialisation is articulated in the biological, producing, in turn, new forms of toxicity materialised in the West as the increase in 'lifestyle diseases' such as diabetes, asthma, obesity and some types of cancer. The empirical data obtained from the ethnographic fieldwork of an interdisciplinary microbiome research team working in the Brazilian and Peruvian Amazon on the development of effective probiotics makes explicit the ambivalent ways in which microbiome research tackles antimicrobial resistance. While probiotics could indeed become a novel solution to the 'bodily toxicity' generated by antibiotic overuse, I will argue that the very research process through which this possibility arises (i.e. bioprospection of microbial DNA of indigenous communities) reproduces health disparities and an old politics of (neo)colonial practices. Examining the tensions between inequalities and innovation associated with the individualisation of microbiome clinical practice predominantly occurring in Northern regions, this paper will then consider the ways in which the social sciences and humanities might reconfigure the 'biosocial' character of microbiome science.

Antibiotics as infrastructure

Clare Chandler, LSHTM

Concerns over antibiotic resistance reemphasise the centrality of these substances for maintaining the health of current and future populations. Antibiotics have long been considered essential to human health, with access to them enshrined as primary health care in the Alma Ata declaration signed by 134 countries around the world in 1978. Current apocalyptic discourses of the loss of antibiotic efficacy due to mounting resistance draw attention to the impact for future individuals who may face fatal consequences of infections now considered minor thanks to antibiotics. In this paper I will argue that the significance of antibiotics goes beyond health; that these substances are built into the infrastructure of our collective social, political and economic lives. I will trace a hypothetical example of convalescence to illuminate the spaces, connections and frameworks that antibiotics currently hold together. From this perspective, more nuanced and mundane futures for living without antibiotics may become apparent.