ANTHROPOLOGY'S CONTRIBUTION TO AMR CONTROL

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This article will introduce emerging anthropological approaches to antimicrobials and AMR control across four broad themes: care, pharmaceuticals and markets, knowledge and ecologies. These themes echo calls for a One Health approach to AMR that connects disciplines, sectors and continents in its approach, constructing interventions that operate at the level of global systems as well as shaping possibilities in the local contours of care, life and livelihoods, engaging an important balance of social liveability with good governance.

Anthropology is interested in the everyday realities of people's lives and livelihoods, and how this reflects wider social, economic and political forms, asking, "what makes common sense here, and why?" Anthropologists concerned with antimicrobial resistance (AMR), then, are interested in how antimicrobial use makes sense in different contexts, as well as the science and practices around AMR emergence and transmission. Anthropological study of antimicrobial use around the globe dates back to the 1980s and has repeatedly demonstrated how use is shaped by cultural, political and economic systems, as much as by individual beliefs. Anthropologists have made important contributions to the study of infectious diseases over many decades too that can inform studies of AMR emergence and transmission, highlighting structural factors that affect the likelihood of contracting diseases, including structural violence and the notion of syndemics *(1, 2, 3)*. The work of anthropologists to understand the ways global health crises are constructed and responded to are also instructive for interpreting AMR *(4, 5, 6)*. Together, these accounts have illustrated the complex stories behind our relations with microbes and antimicrobial medicines across the world today and help us to study and anticipate consequences – intended or not – of both AMR and AMR control strategies globally.

Anthropological accounts bring to the fore the rich social-material worlds that microbes and antimicrobials are situated in, and in doing so offer policy-makers, scientists, and funders new ways to conceptualize and act upon AMR. For example, anthropologists might propose that antibiotics are so deeply embedded in the way our societies, politics, and economies work, that they have become are a kind of infrastructure that enables life as we know it *(7)*. If antimicrobials are infrastructure, it is important to understand the extent and nature of the way we have become intertwined with these medicines in order to anticipate the consequences of resistance and the best ways to control it. While a "rational use" framework has informed many AMR policy undertakings over the past few decades *(8)*, and anthropologists have provided evidence of consumers' own rationalities for use of medicines, it is valuable to go beyond the rational-irrational dichotomy if we are to understand and address our collective dependencies on antibiotics and the ways we have come to relate to and control microbes today *(7)*.

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Care

Antibiotics often take the form of care in contemporary life. They are objects that "care" for our sick and vulnerable. Giving antibiotics, then, is often a central way that caregivers perform their care. From a physician with limited time for a patient, to a parent with a sick child running out the door to work, or even the humanitarian necessity of bestowing affordable pharmaceuticals on the developing world, antibiotics are a central part of how we give and receive what we think of as "good care". This complicates, of course, many approaches to AMR control. In the Philippines, for example, Mark Nichter's *(9)* ethnographic work explores how and why the use of antibiotics

as prophylaxis has emerged as the main way that sex workers and their clients believe they can protect themselves from Sexually Transmitted Infections (STIs). Here, sex workers and their clients used antibiotics as a preventative care strategy. They made decisions to take antibiotics before sex, after sex, occasionally or routinely, depending upon their own situations and familiarity with particular sex workers or clients. Antibiotics, in this case, are imagined as a kind of care that can be self-administered in a context where sex workers, and those who have sex with them, routinely encounter stigma and vulnerability within healthcare systems. Self-administering antibiotics as prophylactic is a way to diminish potential harm within the (healthcare) system.

In anthropology, we say then that care is situated and contextual *(10, 11, 12, 13)*. This means that we cannot take for granted that practice is based on the exercise of reason, but instead see that practice is emergent in a wider picture. What are the particularities, immediate details, socioeconomic or cultural expectations behind a certain care decision that shapes antibiotic use? It is easy to fall into the trap of casting behaviour as "misguided", but by highlighting the institutional, ethical, and everyday forms of care that hinge on antimicrobial use (and vice versa), we open a space to think differently about care and its contexts.

Pharmaceuticals and markets

Anthropological research aims to situate medicines as they are prescribed, sold, and traded within local and global networks of relations embedded in particular histories, legacies and political economies. On a global scale, antimicrobials operate within the business models of the multinational pharmaceutical industry. Anthropologists have written extensively on the ways in which the operationalization of these models of pharmaceutical distribution has shaped approaches to disease and health. For example, on the global scale, one of the unintended consequences of scaling up international action on health – from malaria to HIV/AIDS treatment – has been observed as "the consolidation of a model of public health centred on pharmaceutical distribution" (14, p.84) rather than prevention and/or clinical care. For many in the Global South, while pharmaceuticals are becoming more widely available, it can still be impossible to actually see a physician when visiting a public health clinic. Many social scientists now refer to this shift in health delivery as the "pharmaceuticalization" of public health *(14, 15, 16, 17)*. Pharamaceuticalization, here, is a term used to capture the prevailing pharmaceutical-centric approach to health and care, leading to the neglect of other health necessities, such as healthy living conditions, preventative care and/or ease of access to physicians, nurses or community health workers.

More locally, "pharmaceuticalization" can play out in complex ways. Our own research in Uganda suggests that people often turn to "informal" providers of antibiotics when they cannot get to a health clinic *(18)*. The reasons for being unable to access a healthcare unit are varied, including day wage labour work, parenting responsibilities, lack of transportation to out of reach clinics, and severe understaffing in available clinics. Our research found that these providers operate on the boundaries of legitimacy, echoing what others have found elsewhere in the Global South. Sarah Pinto *(19)*, for example, suggests that the way informal providers fill the gaps where legitimate public health institutions have been too weakened to operate means they are informally sanctioned by the state. In policy and development debates about "informal providers" and their clients, these informal providers are often characterized as "irrational" and exploitative. On the other hand, "formal" institutions are understood as decidedly rational actors and purveyors of legitimate biomedical knowledge *(19)*. The danger here is formal and informal providers get defined in opposition to each other, and we fail to understand the knot of reasons why informal providers are trusted and called-on in the everyday lives of those who seek healthcare in environments with limited "formal" options.

When considering AMR control measures in these contexts we need to be attuned to potential unintended consequences of further limiting access to medicines or uncritically delegitimizing the informal vendors many access medicines from. Medicines are not just material things, they are social things too, that are ascribed specific social and cultural meaning *(20, 21)*. For example, globally, "poor women" are consistently understood as the "target" of public health interventions *(22, 23, 24)*. Played out on the local level, control policies and programmes often get funneled through public healthcare systems towards poor communities, sharpening a perception among these communities that medical technologies and best-care practices – which at times is equated with provision of antibiotics – are not being safeguarded generally, but specifically for the rich and well connected *(25, 26)*.

Knowledge

Public health practitioners are increasingly observing that knowledge does not always equate to practice. From smoking to obesity, researchers have observed that having more knowledge rarely results in behaviour change. And yet, most of our AMR strategies start at this point; with the assumption that if patients or doctors were simply better informed, they would act differently, and thus energy and funds are directed to knowledge assessment and awareness raising activities *(27, 28)*. What anthropological research has widely demonstrated, however, is that knowledge about "rational" antimicrobial

use does not always equate to following recommendations in practice for patients or clinicians *(29, 30)*. What people deem "rational" tends to be what makes sense in their own particular context, and top-down "rational" guidelines can seem out of sync with local needs and desires. This prompts anthropologists to ask what other ways are there to think about AMR and antimicrobial use? And to question why we so often start with individual cognition.

Anthropologists have increasingly drawn attention to the complex set of beliefs embedded in biomedical science and practice, pointing out the ways in which science and technologies are culturally made and shaped *(31, 32, 33)*. Duana Fullwiley (34), for example, has written on the ways that the science of sickle cell disease is a product of postcolonial genetic science, structural adjustment policies, and patient activism in West Africa. She argues that how we have come to know the African sickle-cell is a product of ethnic, national and global relations of power.

Taking the perspective of biomedical science-as-culture can be informative for understanding how AMR has become conceptualized as both an urgent problem and a kind of scientific object that can be studied. Anthropologists of Science often focus on the networks, language, and actors that come together in order to practice and produce science, illustrating the dependence of the sciences on society and politics, rather than its independence and pure objectivity *(35)*. Science is always partly shaped by cultural ideas about the body, mind, gender and race, among other factors *(36, 37, 38, 39)*. For example, we know that policy-guidelines and scientific studies often attribute the rise in AMR to individual behaviour of doctors, patients, drug sellers and their customers. This makes sense within models that locate individual human action at the centre. However, how well these models map on to the materialities of microbial, genetic and antimicrobial ecosystems is still unclear. One approach to understanding how we have ended up with these particular models of biology is tracing the social history of biology and locating dominant narratives within their wider context. For example, we learn in Roberto Esposito's *(40)* Immunitas how entwined our visions of microbial life are with our political histories in Europe, and how this has shaped what we have seen as possible anti-microbial measures.

Another approach is to delve further into the details of processes through which AMR has written a "biology of history" as Hannah Landecker *(41)* has pointed out. Landecker depicts how mass consumer culture, differences in access and regulation of antimicrobials, and neoliberal market politics have all been inscribed into the biology of AMR. These examples demonstrate how understanding the co-construction of science and policy of AMR can open up new spaces for knowledge production. Indeed, Landecker's work on antibiotics explores how the meanings associated with terms such as "antibiotic resistance" or "microbes" shifts both historically, but also in different contexts, demonstrating the effects of scientific knowledge on the world, its potential limitations, and the way alternatives can be side-lined or ignored. When such anthropological works are combined with historical analysis, this allows us to reveal the contingency of networks and practices, and the role of shifting biological and social ideas, in determining particular scientific understanding and technologies (For other historical work that have explored entanglements between science, politics, companies and publics in relation to AMR, see for example *(42)*, *(8)*, and *(43)*.

Ecologies

The concept and policy mandate of One Health requires an opening up of the research agenda to think about the ways human life coexists with microbes, animals, plants and the environment. We are asked to decentre the human in our understanding of health and disease and to instead consider human life within complex ecologies. Our relationships, for example, with animals – from pets to livestock – bring us into contact with the microbial worlds inside these animals. Seemingly mundane questions about how we care for animals, where they sleep, whether we consider them family or food (or both), and what we choose to inject them with, are all components that shape our entanglement with the microbial world and the conditions of AMR today.

In anthropology, we refer to this approach of "decentering" human life as Multi-species Ethnography *(44)*. In other words, we must take the lives of other species besides humans seriously. In doing so, multi-species ethnography seeks to contribute to a better understanding of how we live with and against other species, such as mammals, insects, fungi and even microbes themselves *(45, 46, 47, 48, 49)*. Multi-species ethnography offers a way to empirically explore the contingency of human-nonhuman-antibiotic-microbe relations in the production and movement of AMR, the specificity of contexts where it arises, and the different responses mobilized.

Heather Paxson's *(48)* ethnographic work among artisanal cheese makers and their relationships with microbial life is one interesting way to consider the dynamic ways we think about bacteria and its place in human life. Paxson outlines how artisanal cheese producers must compete with prevailing Pasteurian conceptions of microbial life that takes all microscopic organisms to be inherently "risky" to consumers. These cheesemakers, however, take a "post-Pasteurian" point of view, one that attributes different bacterial and fungal strains to unique tastes and meanings. Here, microscopic life is not a potential danger, but instead a form of potential value.

Steve Hinchliffe and Kim Ward *(50)* provide another excellent

example of this entanglement of microbials and human life and health through their ethnographic work on piggeries in the United Kingdom. They outline the ways that farmers actively work with, rather than against, complex microbial environments in the "making of safe life" for pigs and humans. They explain how vets, breeders and farmers have situated knowledge and practices that are "obscured and even endangered when biosecurity is reduced to the simple protection of disease-free livestock" (50, p. 136). Raising and keeping healthy pigs – that are healthy for humans and the environments alike – is a complex dance that is more than just keeping microbes out. In fact, the relations and interactions of animals, microbes and people are conceptualised by farmers as key to ensuring health. When AMR control policies attempt to reduce these complex relations into universal categories called "disease-free" or "biosecure" these framings risk becoming part of the problem, not the solution.

Conclusion

Antimicrobial usage and AMR control are social, political and economic in nature. Anthropologists, and other social scientists can help to inform courses of action to address these complex interactions. Without a collaborative and interdisciplinary approach, effective ways to address AMR may be missed, and the global community will risk implementing programmes with potentially adverse and unintended consequences. By highlighting how antimicrobials form key infrastructures within our societies, anthropological work can elucidate why behaviour change or knowledge-focused initiatives may be useful if well informed, but ultimately will be insufficient to address widespread antimicrobial use. Control programmes and policies that understand antimicrobials as key infrastructures – part and parcel of modern life as we know it – will take measures to address AMR at the level of global systems as well as attending to local contours of antimicrobial use, balancing social liveability with good governance. As well as drawing attention to context, anthropologists can inspire new research and policy avenues by highlighting the ways that our frameworks of science and action are culturally constructed, offering alternative lenses through which to construct the problem and generate action to address this major public health issue. ■

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