



Controlling Bacteria in a Post-antibiotic Era

Popular Ideas about Bacteria, Antibiotics, and the Immune System

Kristofer Hansson, Department of Social Work, Malmö University, Sweden, kristofer.hansson@mau.se

Rachel Irwin, Department of Arts and Cultural Sciences, Lund University, Sweden, rachel.irwin@kultur.lu.se

This article addresses people's experiences with bacteria and the human body and examines the cultural meanings regarding concerns that society likely is running out of effective antibiotics. The empirical material comes from Sweden, and our analysis is framed through perspectives from the medical humanities. The interdisciplinary goal is to better understand the societal challenges of antibiotic resistance in the advent of a so-called post-antibiotic era. The study presents results from the "If antibiotics stop working" questionnaire which was distributed with the help of The Folklife Archives with the Scania Music Collections at Lund University. We argue that the concept of a post-antibiotic era can open a more imaginary way of thinking about what future relationships are possible if antibiotics were to lose their curative power.



The Post-Antibiotic Era

I wash my hands when I come home, when I deal with food, after toilet visits, etc. I avoid touching door handles on public toilets. (Woman born 1983)

This response comes from a written questionnaire on how people in Sweden relate to the growing awareness of antibacterial resistance in an imminent post-antibiotic era. In this quote, the respondent views bacteria as existing all around her and as something that she needs to deal with on a practical level. Daily actions include washing hands or avoiding door handles on public toilets. A focus on daily life can provide the researcher with a picture of cultural norms and ideals regarding the boundaries between one's own body and bacteria (Martin 1990, 1994; Lundgren 2015; Brown 2019). Focusing on human-microbe relations and how we as humans try to control the harmful bacteria that surround us allows us to look more closely into the cultural dimensions of medicine (Beck 1992; Jones et al. 2008; Cole, Carlin & Carson 2015; Whitehead & Woods 2016; Hansson 2021b).

One of the earliest discussions of a post-antibiotic era comes from physician Mitchell L. Cohen's review article in the journal *Science*: "Epidemiology of Drug Resistance: Implications of a Post-antimicrobial Era" (1992). Cohen tries to imagine what the consequences might be globally if there were no new antibiotics manufactured and at the same time bacteria became resistant to the antibiotics currently in use. Almost thirty years after Cohen's article, the post-antibiotic era is to some extent a reality. Although Sweden has been spared from many of its consequences, the Public Health Agency of Sweden has informed the public what these consequences could be:

Bacteria that have developed resistance to antibiotics are a growing public health problem that causes increased morbidity and mortality. [This problem] also involves large costs for health services, for example in the form of prolonged hospital stays and more expensive drugs. (Public Health Agency of Sweden 2020)

The post-antibiotic is less of an era with distinct temporal boundaries and more of an uneven journey into an unknown future. Yet at the same time, a clearer definition of the post-antibiotic era is needed to tackle the consequences. We therefore use approaches from anthropology and ethnology to examine peoples' experiences with bacteria and the human body, and to explore the cultural meanings ascribed to the emergence of antibacterial resistance in the Swedish context. While we asked questionnaire respondents specifically about bacteria, many of the responses were about "germs" including viruses, and daily hygiene practices more broadly, suggesting that some of our findings can be extrapolated to microbes at large (cf. Jones et al. 2008; Hansson 2021b).

Our analysis is framed using perspectives from the medical humanities and in this article, we ask how the societal challenges of antibacterial resistance can be understood from individuals' experiences. Our main argument is that popular ideas about bacteria, antibiotics and the immune system are central if we want a more nuanced picture of the societal challenges of antibacterial resistance – or to quote philosopher H. Martyn Evans' medical humanities perspective: “[to better] understand human nature through the lens of a critical examination of technological medicine and its limitations” (Evans 2007: 367). In the sections that follow, our objectives are to examine how people understand bacteria as both “dangerous” and “good”, and how bacteria are an entry point for understanding bodily boundaries. We also find that antibiotic resistance is used to critique a society that people feel is no longer able to control the risks of harmful bacteria, although this is not actually the case (cf. Public Health Agency of Sweden 2014; Pinder et al. 2017). Three important themes emerged from our material, that provide different framings of bacteria and antibiotics in the Swedish context. The first two themes focus on everyday practices, and the last theme focuses on imaginaries, giving us the possibility to argue that the concept of a post-antibiotic era can provide a discussion, influenced by medical humanities, about antibiotic use.

The Questionnaire “If antibiotics stop working”

Sweden is a useful case study because it is recognised internationally to be a forerunner when it comes to preventing the spread of resistant bacteria and reducing the improper use of antibiotics (Public Health Agency of Sweden 2014; Pinder et al. 2017). In general, the population's knowledge about antibiotic resistance is high, doctors tend to be conservative in prescribing antibiotics, and the government, along with civil society, has a long tradition of developing and implementing comprehensive strategies for preventing antimicrobial (as well as antibacterial) resistance, including a strong monitoring system (Brenthel & Hansson 2017).

At the same time, because bacteria are not visible to the naked eye, popular understandings of the microscopic world are most often mediated through scientific concepts that have been disseminated in the media and have become intertwined with popular ideas concerning bacteria, the body, illness, and sickness (Kleinman 1980, 1988; Fioretos, Hansson & Nilsson 2013). In our study, these ideas are defined according to folklorist Alan Dundes as “traditional notions that a group of people have about the nature of humanity, the world, and life in general” (Dundes 2007: 185). These popular ideas – or “folk ideas” to use Dundes words – are the building blocks of how people relate to the world – their thoughts and actions. But, as Dundes also points out, people

are not always fully conscious of the ideas they possess and therefore we as researchers need to “extrapolate” them from our data (Dundes 2007; Bernstein 2010).

The article’s empirical data were collected during 2017 and 2018 in the form of written answers to the questionnaire “If antibiotics stop working”.¹ This questionnaire was distributed with the help of the Folklife Archives with the Scania Music Collections at Lund University. The questionnaire went out in paper form to registered users, who receive invitations to all the archive’s questionnaires, and it was also published on the archive’s homepage; therefore, it was possible to answer it in digital form or on paper. These questionnaires have been sent out on a regular basis since 1932 and are publicly available at the Folklife Archives.²

In total, 51 replies were received from registered users on paper and 51 replies were received from those who answered the questionnaire in digital form via the website. The registered users tended to be older than those who answered digitally. Many were over 60 years old and regularly answered questionnaires sent out by the Folklife Archives three to five times every year. Their answers tended to be extensively written and could span several pages, whereas responses in digital form tended to be shorter. Overall, the collected material has a broad age distribution, with the oldest respondent born in 1929 and the youngest born in 1995. More women (75%) responded than men (25%).

The questionnaire was divided into several themes that were related to our research project about the so-called post-antibiotic era. Each theme had an empty field for writing freeform comments: (1) You and antibiotics, (2) Antibiotics and care in the future, (3) Bacteria and the body, (4) Antibiotics and the future, (5) Animals and antibiotics, (6) Social relations, and (7) Antibiotics and politics. In this article we have considered all the answers, but we focus here on themes relating to antibiotics, bacteria, and the body. Some of our questions were deliberately provocative – but not leading – to urge respondents to take a position and explain it, thus reducing the risk of brief yes and no answers. For example, the theme “Bacteria and the body” included the following questions: “Now we wonder if you are doing something to avoid being infected by bacteria? What should people do to stay healthy? Should you be careful about antibiotics or vaccinating children?”

We used an open-ended questionnaire that respondents filled out in writing (cf. Hagström & Marander-Eklund 2005). The method allowed for more free and well-reasoned answers, and the questionnaire can thus be likened to an interview, except that the respondent could take time to answer the questions and we could not ask

¹ The study is approved by the Ethics Review Board (Dnr 2017/744).

² Accessed November 5, 2022: <https://www.folklivsarkivet.lu.se/en/>.

counter-questions. We have analysed answers to the questionnaire with a focus on the various themes brought up by respondents, such as antibiotics, threats, and health. We organised the themes by reading through the answers several times and grouping the answers into common themes. Themes like antibiotics, threats and health were then categorised into subthemes, such as popular ideas about cures, how people adopt and convey meanings in their own contexts, and how they understand change in their lives (Kleinman 1988; Winroth 2004; Dundes 2007; Gripsrud 2011). In analysing how popular ideas are intertwined with scientific concepts, we find many similarities with anthropologist Roy Rappaport's interest in exploring "components, such as supernaturals, whose existence cannot be demonstrated by empirical procedures, but whose putative existence moves the actors to behave in the ways they do" (Rappaport 1979: 98). If we want to understand popular ideas about bacteria, antibiotics, and the immune system, we cannot only be interested in scientific concepts. Instead, we need to focus on people's culture – their own popular ideas – and not do any generalisations based only on, for example, medical knowledge (cf. Rappaport 1996). This is an important medical humanities perspective.

Reflecting on Immunitary Life

The answers from the questionnaire are analysed as narratives, descriptions, and/or arguments that people use to convey meaningful contexts and to understand change (cf. Labov 1972; Gripsrud 2011) in relation to antibiotics, threats, and health (cf. Winroth 2004). From this perspective, the answers can be seen as developing during the writing process. For most respondents in this study, this process was very short and the answers appear to have been written rather rapidly. This is particularly noticeable in the answers that came from those answering via the internet. But there are also answers that take the form of what narrative folklorist Amy Shuman (1986) calls *mediate storytelling* – a form of storytelling that depicts those parts of the past that are related to the individual's current situation (Shuman 1986). These answers are part of the individual's repertoire of different stories.

However, there are also answers that diverge from this typical idea because their questions focus on a future that does not yet exist – a future-as-imagined with no clear ending (cf. Georgakopoulou 2006; Hyvärinen 2012; Jansson 2017). These answers say something about how people in their contemporary contexts are describing a future that can be described as post-antibiotic. These responses about the post-antibiotic era are contextualised in relation to what sociologist Nik Brown describes as a society where people live an "immunitary life" (Brown 2019; cf. Esposito 2008, 2011). This is a society in which people are increasingly focused on immunitary knowledge in relation

to practices like cleanliness and hygiene. The concept also describes a more neoliberal society in which individuals have more responsibility to care for the self when it comes to bacteria and health (cf. Alftberg & Hansson 2012). Brown develops this in the following way:

[The concept of] Immunitary Life explores the recent and growing intellectual and political interest in the biopolitics of immunity, immunisation and autoimmunity (...) Here, immunity is seen to resonate with cultural and historical shifts away from “community” or the “commons” and towards biological technologies of personal protection, security, isolation, defence and withdrawal. (Brown 2019: 3)

The concept of care for the self – or self-care – in our analysis is directly related to what Brown sees as biological technologies. How can care for the self be used to analyse those mechanisms of “personal protection, security, isolation, defence and withdrawal” that are central to protect oneself from dangerous bacteria in a Swedish context? How do people relate to bacteria and antibiotics in everyday life when they take care of their bodies? In our thematic analysis we specifically look for answers that give an elaborated description of self-care focusing on personal protection from bacteria. We have chosen the quotes and data examples that deal with the respondents’ everyday practices and when selecting the quotes, we have striven for a balance in terms of age and gender. However, we have not analysed the responses based on age and gender as this has already been done in a previous article (Hansson 2019).

Central to our cultural analysis is an understanding that some of these answers are imaginaries of how the respondents conceive and narrate a future with antibiotic-resistant bacteria. That is, the answers contain narratives of what this forthcoming might look like. This post-antibiotic imaginary, in which people re-imagine and reshape how they relate to bacteria and antibiotics (Brown & Nettleton 2016), is analysed here as fantasies that frame how people narrate their future (cf. Glynos 2001; Howarth 2010; Brenthel & Hansson 2019). Respondents did not always need their own life experiences of the post-antibiotic era, since they already had second-hand knowledge from the news and popular media about a future in which antibiotics may no longer be effective and therefore some bacterial infections will be incurable. This form of popularisation of biomedicine – framed as *biopop* (Hansson 2005) – can be found in Hollywood films like *Outbreak* (1995), *I am legend* (2007) and *Pandemic* (2016). At the same time, *biopop* is a complex phenomenon, and comparisons between *biopop* and everyday practice are explicitly found in only a few of the respondents’ answers. This perspective should therefore be seen as exploratory in our material.

From our questionnaire, as stated earlier in this article, emerge three important themes that provide different framings of bacteria and antibiotics as part of self-care in an immunitary life in the Swedish context. In presenting the first two themes, our focus is on everyday practices in the past or present. In the last theme – bacteria as an object to critique contemporary society – our focus is on imaginaries. By focusing on these three themes, we address people’s experiences with bacteria and the human body, and we examine the cultural meanings regarding concerns that society is likely to run out of effective antibiotics.

Something to Control

I always wash my hands when I have been shopping or have visited a health centre, pharmacy, hospital, for example. Always before I cook and of course after toilet visits. When I handle chicken, I am very careful. (Woman born 1939)

Survey respondents defined and categorised certain situations in which hand hygiene was central: washing hands after coming home, after preparing food, visiting the toilet, or more specifically avoiding door handles on public toilets. The woman quoted at the start of this article narrates a story of how she handles everyday practices where bacteria are all around her. Similarly, in the quote above, the respondent – a woman born 1939 – has a clear picture of how she handles bacteria and dirt in her everyday life.

This can be analysed as an example of mediated storytelling that is related to the individual’s immediate situation and how she handles infection risks every day (Shuman 1986; Brown 2019). In this narrated life, some bacteria are categorised as dangerous and something that should be controlled. It is a categorisation that is linked to a specific understanding of bacteria that are invisible but are commonly known to exist in specific places, for example public toilets and pharmacies, and on specific objects, like door handles and raw chicken meat (cf. Douglas [1996]2002). Scientific knowledge conveyed through popular media not only makes the invisible bacteria visible, but also categorises them as potentially dangerous for a person’s health. Anthropologist Emily Martin relates this knowledge to modernity in the context of the United States, where the public has gained scientific and medical knowledge about bacteria and what risks they pose (Martin 1994). She argues that medicine in the 1950s produced a metaphor of the body as a fortress whose outside boundaries, meaning skin, functioned to prevent “invading” bacteria from entering the body.

This metaphor of the body as a fortress is still central to today’s care for the self and is found in many different perspectives that people share about their bodies, their health and their relationship to bacteria (cf. Brown 2019). In our questionnaire responses, it is

also an answer that was given by both young and old respondents, by women as well as men. The following quote comes from an older man born in 1935:

Of course, I try to avoid places where the risk of infection appears to be bigger, such as handles on shopping carts. I apply hand wash, and abroad I use hand sanitiser. In my opinion one should always be careful with antibiotics and do what you can to not get infected. (Man born 1935)

For this man, his relationship to bacteria and attitudes towards his own older body seem to be related to the different situations he finds himself in. He categorises some situations as riskier than others (cf. Beck 1992). Some of these situations are connected to different objects, for example handles on shopping carts. But there is also a loose distinction between countries, as he views going on vacation to another country as riskier than staying at home. The body-as-fortress metaphor seems to enable him to argue that the body is more heavily under attack the farther from home he travels. In this answer, a form of personal self-care can be seen as something active, in which the individual develops practices in daily life to manage bacteria and dirt in different ways. This, as the male respondent wrote, is a practice for which the individual should take responsibility. That is, the individual should strive to “do what you can to not get infected”.

Practices that strive to avoid infection can also be a form of everyday know-how connected to knowledge of which diseases are circulating at the time. The woman quoted below, born 1995, explained that she was more careful during winter:

I use hand sanitiser in times of sickness when I know influenza, winter vomiting sickness, etc. is around. To avoid getting sick. Good hand hygiene is extremely important to me, I think it helps to “keep me healthy”. (Woman born 1995)

Although influenza and winter vomiting sickness are caused by viruses and not bacteria, this woman relates her hygienic practices to what season it is and what microbes might be circulating at the time. From this perspective she feels it is “extremely important” to take care of her hand hygiene when the winter vomiting sickness is circulating in the community. What is also interesting in this quote is the use of the word “healthy” and how the woman narrates her own health in relation to how she tries to keep microbes from entering her. By controlling microbes in relation to the body she expresses that she is taking responsibility for her health (cf. Alftberg & Hansson 2012).

This responsibility – manifested as washing hands or using hand sanitiser – can be seen as a very ordinary form of self-care. But it can also mean that the individual tries

to avoid touching various objects, or is extra careful in different places, situations or at specific times of the year. From this perspective, bacteria – and microbes at large – are not stable phenomena, but are rather entities that are always changing and trying to break through the body’s boundaries. Central to understanding this self-care is an examination of how individuals try to control the boundaries between the body and bacteria. In relation to expectations of individual responsibility for maintaining these boundaries (cf. Frykman & Löfgren 1987; Martin 1994; Brown 2019), we revisit an old idea about hygiene found in middle-class life which emerged during the twentieth century in a transatlantic context. Brown uses Emily Martin’s work to trace it to the 1930s and he writes:

During this period, there is an emphasis upon the internal maintenance of a “purity of self within the borders of the body” (1994, 53), a clear and absolute separation between the self and an invading barbarous “out there”. The “immune system” is therefore forged in the context of a twentieth century heightened preoccupation with hygiene. Hygienism had, [Martin] writes, “moved [immunity] to the very centre of our culture’s conception of health” (1994, 16), specifically in a transatlantic culture steeped in the culture and geopolitical influence of germ theory. (Brown 2019: 10)

In recent neoliberal and especially pandemic times during which the society has promoted the idea of self-care as central for the individual to succeed with his or her own health, this boundary-work has become even more important. In our study we argue that this “hygienism” is still an important part of popular notions regarding the responsibility to care for the body. It is the individual who must take responsibility to maintain these bodily boundaries. At the same time, not all respondents considered bacteria to be our enemies, something that is foreign and “barbarous ‘out there’” (Brown 2019: 10). In the next section, we examine how some respondents saw bacteria as important to the body’s functioning.

Letting Bacteria Be Part of the Body

My view is that you should not be afraid of a “little dirt under the fingernails”. I think that those who are exposed to viruses and bacteria also have better resistance and maybe fewer allergies. I know that it works that way when it comes to viruses, how it is scientifically with bacteria I do not really know. (Woman born 1959)

In this example, the respondent struggles to differentiate between bacterial and viral risks, and how they affect the body. Her understanding of bacteria comes not only from

scientific concepts, but also from popular ideas about bacteria that can be good for the immune system (cf. Kleinman 1980, 1988), illustrating how different understandings are intertwined (cf. Rappaport 1979). In this answer, accepting some bacteria into the body becomes part of a self-care – a biological technology, to use Brown’s terminology – to strengthen the immune system from the inside (cf. Brown 2019). We here develop Brown’s terminology by arguing that we must examine how people individually and collectively relate to how they wish to organise their everyday lives – and how they have a responsibility to care for their bodies (cf. Alftberg & Hansson 2012). The practices by which they choose to do this express what they understand as good bacteria and bad bacteria in relation to the life they want to live (cf. Rose 2007).

The example above highlights the popular idea that bacteria are important, and that respondents see them as entities with which they as humans should nurture a relationship (cf. Wemrell 2021). Focus is less on how the boundaries of the body should be maintained and more on how the individual can learn to live with bacteria – which includes the importance of being exposed to viruses and bacteria. To return to Martin’s discussion about body metaphors, we argue that this kind of answer conjures a perception of the body not as a fortress but more as something flexible (Martin 1994). For Martin, the flexible body is a body that is understood as having an intertwined dependence on the environment. This metaphor of the flexible body lends itself, therefore, to the idea that the body and bacteria – not too dangerous though – should come together under certain circumstances. For instance, the following respondent draws upon this metaphor when he not only tells his specific view of the human body, but also criticises contemporary society’s way of handling bacteria:

We live in an overly-clean society, many people cannot handle the simplest infection simply because they isolate themselves from all bacteria... I think it is important that children and, for that matter, adults have “dirty” fingers and do not grow up in a sterile environment. (Man born 1961)

In this narrative, popular ideas about “some dirt under the fingernails” are central. To have “dirty fingers” is something good for a person’s health so that the body can develop immune protection against dangerous microbes. This is a perspective that critiques not only the idea of the body as “a fortress”, but how we live our lives in contemporary society. Clean and sterile is not seen as positive, but instead as something that can harm the body in the long run. This criticism of an “overly-clean society” – sometimes called the “hygiene hypothesis” – was directed towards a society that had tried too hard to protect the individual from contagion and thus became a threat to the human body by hindering the natural processes of the immune system (cf. Bloomfield et al.

2006). The respondent here argued for a perspective in which “dirty fingers” are seen as a form of positive self-care. But how can this positive self-care be more open and receptive to people’s experiences of how bacteria are important for the body’s development of resistance? How can the body be analysed and culturally understood as something that needs exposure to both good and bad bacteria and, in this way, learns to fight infections?

Martin’s flexible body metaphor opens our understanding of the individual’s responsibility to take care of oneself. The male respondent in the previous example seems to argue that it is the individual, or the parents of children, who have a responsibility to expose the body to the right amount of dirt – dirt that contains microbes – so that the immune system in the body can properly develop. The idea that it is harmful to grow up or live in a sterile environment also features in the following response:

Overall, I believe that bacteria are our friends. I’m not overly careful about myself. I never think about avoiding bacteria, and hand sanitiser I find totally unnecessary in the home. I think you stay healthier if you get a mixed dose of bacteria so that the immune system get to work. (Woman born 1936)

This respondent says the same as the previous respondent, that one should not try to avoid bacteria at all costs. We interpret the words “so that the immune system gets to work” as presenting another metaphor commonly found in the medical humanities, namely that of the body-as-machine. From the respondent’s perspective, the right mix of bacteria starts up the immune system which, in turn, works like a factory. The whole body can be seen as a factory, and is not something that is hidden and unaffected by what the individual does, rather the inside and the outside are connected in different – and flexible – ways.

Particularly in a more neoliberal society, this form of self-care in relation to the body has been seen as something that the individual, not the community, should take responsibility for (Brown 2019). It is the individual who, through various self-care practices, is responsible for protecting the body from that which is unhealthy (cf. Alftberg & Hansson 2012). This, as the respondent above argues, can be done by seeing bacteria as “our friends” rather than by keeping bacteria at a distance. What is key in this perspective on self-care practices is the understanding that the boundary between the inside and the outside of the body is blurry or porous. When the individual allows (some) bacteria into the body, the body as a machine can start working on the achievement of good health. When the bacteria are part of the body it can also be seen as a bodily shift in which the bacteria become an integral part of the immune system and thus serve to protect the body.

Bacteria from “dirty fingers” can then be seen as “part of the body” instead of being only something negative for the body (cf. Esposito 2011; Brown 2019). We argue that this transformation of how to relate to bacteria can be found in the everyday explanations of our respondents about letting microbes into the body and in this way protect the body from more dangerous diseases. What these dangerous diseases are in the respondents’ answers varies. They can be something abstract such as one’s own health, but they can also be specific diseases or protection against various infections. For example, the woman quoted in the beginning of this section wrote about allergies: “maybe fewer allergies”. This is an answer that relates to the “hygiene hypothesis”, and how allergies are explained as coming from over-clean homes in which the immune system is given no microbes with which to work and instead turns against its own body (cf. Holbreich et al. 2012).

Medical research has long shown how bacteria are an integral part of the body – and popular understandings of this also came up in our questionnaire as themes related to healthy lifestyles and people eating probiotic food to strengthen their bodies (cf. Wemrell 2021). Probiotics are living microorganisms found in various food products, both commercially produced and “homemade”. Often found in fermented food, probiotics have a long history and have been found in virtually all societies since the beginning of time. Today, many probiotics have been commodified and marketed as health products that can improve or restore intestinal flora and thereby have positive effects on general health. In advertisements, such products are closely linked to a form of self-care, promoting the notion that the individual should take self-responsibility by buying and using these products (cf. Day et al. 2019; Wemrell 2021). This was expressed in one of the responses:

In all that, I try to live a life where the processes in my body can work as closely to what was intended as possible. For example, opting out of foods that contribute to inflammation / causing imbalance in the body’s bacterial flora and, for example, disrupting normal body processes and causing harmful processes. (Woman born 1954)

The goal for this woman was to find a balance that could incorporate good bacteria into the body and in this way avoid the “disruption” of health-enhancing processes – a self-care technology in which the body, with the help from bacteria, can create an immune system that can stop the spread of more dangerous bacteria from inside. Central for this mode of self-care is the maintenance and promotion of health by letting bacteria into the body. These themes around “dirty fingers” in contrast to a sterile environment,

and around letting “good bacteria” into the body, are central to the final theme of our analysis: how mainstream society’s relationship to bacteria and antibiotics is a focal point for critique of contemporary society.

Living with “Dangerous” Bacteria

I think we are in trouble. Resistant bacteria in hospitals are already a big problem. Doctors have become more restricted with prescriptions. Antibiotics to animals are probably a bigger problem. Whether they will succeed in developing new medicines I cannot say, but I think it is difficult. I’m not worried for myself but for my children and grandchildren. (Woman born 1939)

This respondent, a woman born in 1939 whom we met in a previous section, was answering a question about how healthcare and its relationship to antibiotics will develop in the future. Her response does not address controlling bacteria outside the body. Instead, for her antibiotic-resistant bacteria are a growing problem in and for society. This creates yet another relationship to bacteria, one in which antibiotics will lose their efficacy because of *societal* overuse. The female respondent does not think this is a problem for her personally, but she sees a near future where it could become a problem for her children and grandchildren. Some bacteria will be more dangerous in the future because they will have become resistant to known antibiotics and healthcare will no longer be able to control them.

This theme of a shift in the relationship between humans and bacteria differs from the two thematic relations described previously, and the dystopian future it expresses already affects both politics and policy concerning antimicrobial resistance in many countries, including Sweden (Brown & Nettleton 2016; cf. Brenthel & Hansson 2017; Irwin 2020a, 2020b). While many of the first discussions around resistance and the post-antibiotic era (Cohen 1992) took place in the early 1990s, the danger of antimicrobial resistance was already mentioned by Alexander Fleming in the 1940s (Fleming 1945). Returning to Rappaport, these ideas of which we are unaware – in forms we cannot make visible in everyday life – affect us nonetheless, and influence people’s everyday lives when facing risk. As Rappaport points out, the existence of these ideas “cannot be demonstrated by empirical procedures” directly in people’s everyday lives, at the same time as they “[move] the actors to behave in the ways they do” (Rappaport 1979: 98). These popular ideas create the feeling described by the woman quoted above who was worried “for my children and grandchildren” and become imaginaries and fantasies that frame how people narrate their futures in living with dangerous and contagious bacteria (cf. Glynos 2001; Howarth 2010; Brenthel & Hansson 2019). We frame these

answers as fantasies because they do not always describe actual everyday practices, but instead how people imagine their lives could be in the imminent future. Even if there are many alarming reports about antibacterial resistance, and if our questionnaire “If antibiotics stop working” created space for our respondents to think along these lines, we still do not know how the issue will develop in the future (cf. Public Health Agency of Sweden 2014, 2020).

The responses to our questionnaire are part of an emerging infectious diseases discourse, much of which has played out in the media (cf. Satcher 1995; Washer 2004, 2010; Hansson 2021b). This discourse can be found from the 1980s onwards relating to human immunodeficiency virus (HIV), Ebola and Lassa (1990s), H1N1 (2000s) and most recently Covid-19 (SARS-CoV-2). The post-antibiotic era should be seen as part of this discourse of emerging infectious diseases, not least in how researchers use the concept of emerging infectious disease as a platform to explain how humans have exploited nature, pointing to “climate change, biodiversity loss, habitat degradation, and an increasing rate of wildlife–human contacts” (Schmeller, Courchamp & Killeen 2020).

This wider discourse around emerging infectious diseases can also be seen as a form of criticism against contemporary society. This critical narrative of how humanity has impacted nature and has contributed to environmental pollution with antibiotics is not prominent in the questionnaire responses but does appear occasionally. For instance, one woman already quoted, sees the misuse of antibiotics as a negative aspect of “Western culture”:

I feel so oppressed to see how the whole Western culture is based on alleviating symptoms and it is a pattern that exists there whether it is about (...) antibiotics, economy, environmental pollution, sexual harassment and so on. (Woman born 1954)

In her answer, she sees “Western culture” as a concept characterised by many related and interconnected problems whose real causes are never cured or alleviated. Instead, the woman points out that society needs to fundamentally change and “to wake up and see the reality” (Woman born 1954). The woman ties antibiotic resistance to environmental pollution at large, the economy and sexual harassment. This very dystopian view lacks any hope that humanity could solve its problems now or in a post-antibiotic society (cf. Danowski & Castro 2016; Hansson 2021a). While this response is relatively extreme in relation to the others, it is valuable for imagining a post-antibiotic era in a near future. In a society where people do not feel that harmful

bacteria – or viruses for that matter – can be controlled, but will instead generate risks, people will, like this woman, come up with alternative opinions about future progress. The woman's explanations focus on what is happening outside the body but continues to affect individuals negatively – at the same time as it cannot be controlled within the body (cf. Esposito 2011). Living with “dangerous” bacteria should therefore not be seen only as a relationship between bodies and bacteria, but also as something that changes as we observe the emergence of a new risk society with emerging and re-emerging diseases and infections that cannot be easily controlled by antibiotics (cf. Beck 1992).

Conclusions

In this article popular ideas have been a guiding concept in examining the answers that people have about bacteria in what could be described as a post-antibiotic era with an unknown future. We have analysed three different thematic themes that contribute to a medical humanities' understanding of how people relate to bacteria and antibiotics: (1) bacteria as something to control, (2) letting bacteria be part of the body, and (3) living with “dangerous” bacteria. These themes encompass not only the relationships between bacteria and the human body but also, in a Swedish context, what it means for a society to possibly run out of effective antibiotics. We have built upon the concept of immunitary life by focusing on these popular ideas and how medical knowledge can be interpreted in an everyday context and in relation to self-care (cf. Brown 2019; Hansson & Irwin 2020). Societal and individual understandings of microbes are a central topic within medical humanities and something that anthropology, ethnology, and folklore can utilise to further conceptualise various understandings of the body, disease, bacteria, and “germs” (cf. Cole, Carlin & Carson 2015; Whitehead & Woods 2016). Popular ideas, we argue, are therefore fundamentally important to incorporate into the medical humanities.

For the first theme we argued that hygiene has become more central in a post-antibiotic era and that control over bacteria is decisive in relation to hygiene. Some of the respondents defined and categorised certain situations and practices as vital to controlling “germs” and promoting hygiene. What emerged in the responses to our questionnaire was a need to keep bad bacteria away from the body. This contrasts with the second theme that focuses on how both good and (some) bad bacteria need to enter the body. Letting bacteria be part of the body was seen as important for developing the immune system and for ensuring that the body functioned properly, thus a society that is too clean was seen as dangerous. This was related to the third and final theme that focused on criticisms of contemporary society. Here, emerging infectious diseases,

including resistant bacteria, were seen as essential to a critical discourse about contemporary society and the concept of a post-antibiotic era.

In this way, we argue that the post-antibiotic era should not only be understood with Brown's (2019) perspective on how individuals can – to paraphrase – protect, secure, isolate, defend, and withdraw from dangerous bacteria. Instead, it is central to also see how this ordinary handling of bacteria can inhere a critique of society and how society handles relations between bacteria, antibiotics, and the immune system. The concept of a post-antibiotic era can, in other words, open a different and more imaginary way of thinking about what future relationships are possible if the antibiotics were to lose their curative power. What would happen if the project to manage bacteria became riskier, if antibiotics were not always available? Are these “cultural and historical shifts away from [care by the] ‘community’ or the ‘commons’” (Brown 2019: 3) even possible? The post-antibiotic era is a concept that can help us within medical humanities to better understand the highly individualist project of handling and controlling bacteria, and to instead see how this concept of self-care can be contested in today's world with growing numbers of resistant bacteria. As these are bacteria that cannot be controlled within the body (cf. Esposito 2011), we need to find new and innovative knowledge to deal with them.

Acknowledgements

The study was funded by the Crafoord Foundation, the Erik Philip-Sörensen Foundation, and the Pufendorf Institute for Advanced Studies at Lund University. Thank you for the support and the opportunities to conduct this research! We would also like to thank Gabi Louisedotter at the Folklife Archives with the Scania Music Collections at Lund University for knowledgeable help in designing the questionnaire and our colleague Adam Brenthel for inspiring collaboration.

Competing Interests

The authors have no competing interests to declare.

References

- Alftberg, Åsa & Kristofer Hansson 2012: Introduction: Self-care Translated into Practice. *Culture Unbound: Journal of Current Cultural Research* 4: 415–424. DOI: <https://doi.org/10.3384/cu.2000.1525.1243>
- Beck, Ulrich 1992: *Risk Society: Towards a New Modernity*. London: Sage.
- Bernstein, Jay H. 2010: Folk concepts. New York: City University of New York (CUNY Academic Works), Publications and Research Kingsborough Community College, https://academicworks.cuny.edu/cgi/viewcontent.cgi?article=1014&context=kb_pubs (accessed December 6, 2020).
- Bloomfield, Sally F., Rosalind Stanwell-Smith, R.W.R Crevel & John Pickup 2006: Too clean, or not too clean: The Hygiene Hypothesis and Home Hygiene. *Clinical & Experimental Allergy* 36: 402–425. DOI: <https://doi.org/10.1111/j.1365-2222.2006.02463.x>
- Brenthel, Adam & Kristofer Hansson 2017: The Post-antibiotic Era: Cultural and Social Perspectives on Globally Increasing Antibiotic Resistance. *Working Papers in Medical Humanities* 3(1): 1–41, <https://journals.lub.lu.se/medhum/article/view/18068/17057> (accessed January 5, 2021).
- Brenthel, Adam & Kristofer Hansson 2019: Waiting for a Cure: Cultural Perspectives on AIDS in the 1980s. In: Elisabet Björklund & Mariah Larsson (eds.), *A Visual History of HIV/AIDS: Exploring the Face of AIDS Film Archive*. London: Routledge Advances in the Medical Humanities. DOI: <https://doi.org/10.4324/9781315145310-9>
- Brown, Nik 2019: *Immunitary Life: A Biopolitics of Immunity*. London: Palgrave Macmillan. DOI: <https://doi.org/10.1057/978-1-137-55247-1>
- Brown, Nik & Sarah Nettleton 2016: There is worse to come: The Biopolitics of Traumatism in Antimicrobial Resistance (AMR). *The Sociological Review* 65(3): 493–508. DOI: <https://doi.org/10.1111/1467-954X.12446>
- Cohen, Mitchell L. 1992: Epidemiology of Drug Resistance: Implications for a Post-antimicrobial Era. *Science (Washington)* 257(5073): 1050–1055. DOI: <https://doi.org/10.1126/science.257.5073.1050>
- Cole, Thomas R., Nathan Carlin & Ronald A. Carson 2015: *Medical Humanities: An Introduction*. Cambridge: Cambridge University Press.

- Danowski, Déborah & Eduardo Batalha Viveiros de Castro 2016: *The Ends of the World*. Cambridge: Polity Press.
- Day, Ricard LJ., Ashton J. Harper, Rachel M. Woods, Owen G. Davies & Liam M. Heaney 2019: Probiotics: Current Landscape and Future Horizons. *Future Sci OA* 5(4): FSO391. DOI: <https://doi.org/10.4155/fsoa-2019-0004>
- Douglas, Mary (1996)2002: *Purity and Danger: An Analysis of Concept of Pollution and Taboo*. London: Routledge.
- Dundes, Alan 2007: Folk Ideas as Units of Worldview. In: Simon J. Bonner (ed.), *The Meaning of Folklore: The Analytical Essays of Alan Dundes*. Logan: Utah State University Press. (Original work published 1971.)
- Esposito, Roberto 2008: *Bíos: Biopolitics and Philosophy*. Minneapolis: University of Minnesota Press.
- Esposito, Roberto 2011: *Immunitas: The Protection and Negations of Life*. Cambridge: Polity Press.
- Evans, H. Martyn 2007: Medical Humanities: Stranger at the Gate, or long-lost Friend? *Medicine, Health Care Philosophy* 10(4): 363–372. DOI: <https://doi.org/10.1007/s11019-007-9079-x>
- Fioretos, Ingrid, Kristofer Hansson & Gabriella Nilsson 2013: *Vårdmöten: Kulturanalytiska perspektiv på möten inom vården* [Care meetings: Cultural analytical perspectives on meetings in health care]. Lund: Studentlitteratur.
- Fleming, Alexander 1945: Penicillin. Nobel Lecture, December 11 (1945), <https://www.nobelprize.org/uploads/2018/06/fleming-lecture.pdf> (accessed June 9, 2022).
- Frykman, Jonas & Orvar Löfgren 1987: *Culture Builders: A Historical Anthropology of Middle-class Life*. New Brunswick: Rutgers Univ. Press.
- Georgakopoulou, Alexandra 2006: The Other Side of the Story: Towards a Narrative Analysis of Narratives-in-interaction. *Discourse Studies* 8(2): 235–257. DOI: <https://doi.org/10.1177/1461445606061795>
- Glynos, Jason 2001: The Grip of Ideology: A Lacanian Approach to the Theory of Ideology. *Journal of Political Ideologies* 6(2): 191–214. DOI: <https://doi.org/10.1080/13569310120053858>
- Gripsrud, Jostein 2011: *Mediekultur, mediesamhälle* [Media culture, media society]. Göteborg: Daidalos.
- Hagström, Charlotte & Lena Marander-Eklund (eds.) 2005: *Frågelistan som källa och metod* [Questionnaire as source and method]. Lund: Studentlitteratur.
- Hansson, Kristofer 2005: Biopop: Biovetenskapens popularisering i medierna [Biopop: The popularization of bioscience in the media]. *ETN: Etnologisk skriftserie* 1(1): 107–117, <https://portal.research.lu.se/ws/files/4674354/4285569.pdf>
- Hansson, Kristofer 2019: Att oroa sig för antibiotikaresistens: Kulturella föreställningar kring ett läkemedel [Worrying about antibiotic resistance: Cultural notions about a drug]. *Socialmedicinsk tidskrift* 96(6): 851–858, <https://socialmedicinsktidskrift.se/index.php/smt/article/view/2039>

- Hansson, Kristofer 2021a: En levbar värld med bakterier: Hur vi berättar om framtid [A livable world with bacteria: How we narrate the future]. In: Kristofer Hansson, Cecilia Lenander & Henrik Loodin (eds.), *Att leva med bakterier: Möjligheter till ett levbart immunologiskt liv* [Living with bacteria: Opportunities for a liveable immunological life]. Lund: The Pufendorf IAS, Lund University. <http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A1529000&dswid=-489>
- Hansson, Kristofer 2021b: De smittsamma sjukdomarnas kultur: Hur vår uppmärksamhet har kommit att riktas mot vardagens mikroorganismer [The culture of infectious diseases: How our attention has come to focus on everyday microorganisms]. *Tidskriften Ikaros* 17(4): 47–50, https://issuu.com/ikaros_tidskrift/docs/ikaros_4_21_issuu/s/14591883
- Hansson, Kristofer & Rachel Irwin 2020: Movement of Knowledge: Introducing Medical Humanities Perspectives on Medicine, Science, and Experience. In: Kristofer Hansson & Rachel Irwin (eds.), *Movement of Knowledge: Medical Humanities Perspectives on Medicine, Science, and Experience*. Lund: Nordic Academic Press. DOI: <https://doi.org/10.21525/kriterium.24>
- Holbreich, Mark, Jon Genuneit, Juliane Weber, Charlotte Braun-Fahrländer, Marco Waser & Erika von Mutius 2012: Amish Children Living in Northern Indiana Have a Very Low Prevalence of Allergic Sensitization. *The Journal of Allergy and Clinical Immunology* 129(6): 1671–1673. DOI: <https://doi.org/10.1016/j.jaci.2012.03.016>
- Howarth, David 2010: Power, Discourse and Policy: Articulating a Hegemony Approach to Critical Policy Studies. *Critical Policy Studies* 3(3–4): 309–335. DOI: <https://doi.org/10.1080/19460171003619725>
- Hyvärinen, Matti 2012: Prototypes, Genres, and Concepts: Travelling with Narratives. *Narrative Works: Issues, Investigations and Interventions* 2(1): 10–32, <https://journals.lib.unb.ca/index.php/NW/article/view/19496>
- Irwin, Rachel 2020a: The “Dark Ages” – a Misused Metaphor for a Post-antibiotic Future. *Somatosphere*, <http://somatosphere.net/2020/dark-ages-misused-metaphor.html/> (accessed October 22, 2020).
- Irwin, Rachel 2020b: Imagining the Post-antibiotic Future: The Visual Culture of a Global Health Threat. *Medical Humanities* 48: 371–380. DOI: <https://doi.org/10.1136/medhum-2020-011884>
- Jansson, Hanna 2017: *Drömmen om äventyret: Långfärdsseglares reseberättelser på internet* [Dreams of adventure: Cruising sailors' online travel writing], <http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-136798>. Stockholm: Institutionen för etnologi, religionshistoria och genusvetenskap, Stockholms universitet.
- Jones, Kate E., Nikkita G. Patel, Marc A. Levy, Adam Storeygard, Deborah Balk, John L. Gittleman & Peter Daszak 2008: Global Trends in Emerging Infectious Diseases. *Nature* 451: 990–993. DOI: <https://doi.org/10.1038/nature06536>
- Kleinman, Arthur 1980: *Patients and Healers in the Context of Culture: An Exploration of the Borderland between Anthropology, Medicine and Psychiatry*. Berkeley: University of California Press. DOI: <https://doi.org/10.1525/9780520340848>
- Kleinman, Arthur 1988: *The Illness Narratives: Suffering, Healing, and the Human Condition*. New York: Basic Books.

- Labov, William 1972: *Language in the Inner City: Studies in the Black English Vernacular*. Philadelphia: University of Pennsylvania Press.
- Lundgren, Britta 2015: The Common Cold, Influenza, and Immunity in Post-pandemic Times: Lay Representations of Self and Other among Older People in Sweden. *Health, Culture and Society* 8(2): 46–59. DOI: <https://doi.org/10.5195/HCS.2015.200>
- Martin, Emily 1990: Toward an Anthropology of Immunology: The Body as Nation State. *Medical Anthropology Quarterly* 4(4): 410–426. DOI: <https://doi.org/10.1525/maq.1990.4.4.02a00030>
- Martin, Emily 1994: *Flexible Bodies: Tracking Immunity in American Culture from the Days of Polio to the Age of AIDS*. Boston: Beacon Press.
- Pinder, Richard, Anna Sallis, Dan Berry & Tim Chadborn 2017: *Behaviour Change and Antibiotic Prescribing in Healthcare Settings: Literature Review and Behavioural Analysis*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/405031/Behaviour_Change_for_Antibiotic_Prescribing_-_FINAL.pdf (accessed November 20, 2020). London: Public Health England & Department of Health.
- Public Health Agency of Sweden 2014: *Swedish Work on Containment of Antibiotic Resistance: Tools, Methods and Experiences*. Stockholm: Public Health Agency of Sweden, <https://www.folkhalsomyndigheten.se/contentassets/dae82c7afd424a57b57ec81818793346/swedish-work-on-containment-of-antibiotic-resistance.pdf> (accessed November 20, 2020).
- Public Health Agency of Sweden 2020: *Antibiotics and Antimicrobial Resistance*, <https://www.folkhalsomyndigheten.se/the-public-health-agency-of-sweden/communicable-disease-control/antibiotics-and-antimicrobial-resistance/> (accessed December 22, 2020).
- Rappaport, Roy A. 1979: On Cognized Models. In: *Ecology, Meaning, and Religion*. Richmond, CA: North Atlantic Books.
- Rappaport, Roy A. 1996: Risk and the Human Environment. *The ANNALS of the American Academy of Political and Social Science* 545(1): 64–74. DOI: <https://doi.org/10.1177/0002716296545001007>
- Rose, Nikolas S. 2007: *The Politics of Life Itself: Biomedicine, Power, and Subjectivity in the Twenty-first Century*. Princeton: Princeton University Press. DOI: <https://doi.org/10.1515/9781400827503>
- Satcher, David 1995: Emerging Infections: Getting ahead of the Curve. *Emerging Infectious Diseases* 1(1): 1–6. DOI: <https://doi.org/10.3201/eid0101.950101>
- Schmeller, Dirk S., Franck Courchamp & Gerry Killeen 2020: Biodiversity Loss, Emerging Pathogens and Human Health Risks. *Biodivers Conserv* 29: 3095–3102. DOI: <https://doi.org/10.1007/s10531-020-02021-6>
- Shuman, Amy 1986: *Storytelling Rights: The Uses of Oral and Written Texts by Urban Adolescents*. Cambridge: Cambridge Univ. Press. DOI: <https://doi.org/10.1017/CBO9780511983252>
- Washer, Peter 2004: Representations of SARS in the UK newspapers. *Social Science and Medicine* 59(12): 2561–2571. DOI: <https://doi.org/10.1016/j.socscimed.2004.03.038>
- Washer, Peter 2010: *Emerging Infectious Diseases and Society*. Basingstoke: Palgrave Macmillan. DOI: <https://doi.org/10.1057/9780230277182>

Wemrell, Maria 2021: Krig och skogsvård: Bilder av mikrober och människor i antibiotikaresistensens tid [War and forest management: Images of microbes and humans in the age of antibiotic resistance]. In: Kristofer Hansson, Cecilia Lenander & Henrik Loodin (eds.), *Att leva med bakterier: Möjligheter till ett levbart immunologiskt liv* [Living with bacteria: Opportunities for a liveable immunological life]. Lund: The Pufendorf IAS, Lund University.

Whitehead, Anne & Angela Woods 2016: Introduction. In: Anne Whitehead & Angela Woods (eds.), *The Edinburgh Companion to the Critical Medical Humanities*. Edinburgh: Edinburgh University Press. DOI: <https://doi.org/10.1515/9781474400053-003>

Winroth, AnnCristin 2004: *Boteberättelser: En etnologisk studie av boteprocesser och det omprövande patientskapet* [Healing narratives: A study in ethnology about processes of healing and the reconsidering of patienthood], <http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-360>. Umeå: Umeå University.

Kristofer Hansson is a lecturer at the Department of Social Work, Malmö University and holds an Associate Professorship in Ethnology. His research focuses on children and young people living with long-term sickness and disability, as well as on medical praxis in health care and emerging new biomedical technologies.

(kristofer.hansson@mau.se)

Rachel Irwin is a researcher at the Department of Arts and Cultural Sciences, Lund University. Her research focuses on ethnographic approaches to analysing health policy, particularly at a global level, as well as the history of global health.

(rachel.irwin@kultur.lu.se)

