

UPPSALA HEALTH SUMMIT

# Managing Antimicrobial Resistance Through Behavior Change, March 2021



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# SUMMIT PROGRAMME

Recordings from the sessions can be accessed via our website: [www.uppsalahealthsummit.se/summit-2021](http://www.uppsalahealthsummit.se/summit-2021)

## MONDAY, MARCH 15<sup>TH</sup> CONFERENCE OPENING

### Opening address

by Anders Hagfeldt, Vice-Chancellor, Uppsala universitet, Chair of the Uppsala Health Summit Steering Committee

### A welcome message

by H.R.H. Crown Princess Victoria of Sweden

### Plenary Session 1: Setting the Scene: Challenges and opportunities for tackling antimicrobial resistance

**Dr Otto Cars**, Professor, Uppsala University, Founder and Senior Advisor, ReAct, former member of the UN interagency group on Antimicrobial resistance

*“Antimicrobial resistance in the livestock sector: challenges and opportunities”*

**Dr Keith Sumption**, Chief Veterinary Officer, FAO,

**Dr Dame Sally Davies**, Professor, UK Special Envoy on Antimicrobial Resistance, Former Chief Medical Officer, U.K.

**Dr Eldar Shafir**, Professor in Behavioral Science and Public Policy; Professor of Psychology and Public Affairs, Princeton University, USA

### Plenary Session 2: Addressing AMR in a social, economic, and political context – approaches in research and action

*“Social and economic factors in the suboptimal use of medicine and access to care”*

**Dr Koen Peeters**, Professor, Dept. of Medical Anthropology, Institute of Tropical Medicine, Antwerp, the Netherlands

*“How to address the misuse and lack of access in low-income countries”*

**Dr Franck Cesar Berthe**, Senior Live Stock Specialist, The World Bank

**Lena Hallengren**, Minister for Health and Social Affairs, Government of Sweden

## TUESDAY, MARCH 16<sup>TH</sup>

### Plenary Session 3: The role of vaccines in drug resistance – addressing myths, misconceptions and opportunities for behaviour change

*“How to improve vaccination rates using behavioural science”*

**Dr Julie Leask**, Professor, Sydney Nursing School, Faculty of Medicine and Health Adjunct Professor, School of Public Health, University of Sydney, Australia

*“Behavioral obstacles to vaccinations in livestock – examples from Sub-Saharan Africa”*

**Dr Michel Dione**, Scientist, Animal and Human Health Program, International Livestock Research Institute

*What’s behind the antivaccine movement.*

A conversation with investigative journalists **Malin Olofsson** and **Anna Nordbeck** from Sveriges Television on the origins of the scepticism and how the anti-vaccine movement works to convince parents not to vaccinate their children

**Workshops in parallel; separate programme**

## WEDNESDAY, MARCH 17<sup>TH</sup>

### Plenary Session 4: Improving Communications for Antimicrobial Resistance

*“Reframing Resistance”*

**Sian Williams**, Policy & Advocacy Adviser, Drug-Resistant Infections, Wellcome Trust

*“A national monitoring tool to measure AMR knowledge among the general public”*

**Dr Hathairat Kosiyaporn**, International Health Policy Program, Ministry of Public Health, Thailand

*“Designing to make a difference”*

**Dr Sue Walker**, Professor, Department of Typography & Graphic Communication, University of Reading, U.K.

**Workshops in parallel; separate programme**

## THURSDAY, MARCH 18<sup>TH</sup>

### Plenary Session 5: Closing Session

*“The Feast Framework for Change”*

**Dr Cass R. Sunstein**, Founder and director of the Program on Behavioral Economics and Public Policy at Harvard Law School. Author of Nudge: Improving Decisions about Health, Wealth, and Happiness (with Richard H. Thaler, 2008)

### Report back from workshops

*Closing Remarks*

by **Dr Hanan Balkhy**, Assistant Director-General for Antimicrobial Resistance, WHO and **Dr Stefan Swartling Peterson**, Professor of Global Transformations, Karolinska Institutet; Global Health Uppsala universitet, and former Chief of Health, UNICEF

### End of summit

### Post-summit reflections

*A moderated discussion*

with **Cortney Price**, Global Behavioural Change and Communication Coordinator, Antimicrobial Resistance, FAO and **Catherine Will**, Reader in the Sociology of Science and Technology, University of Sussex, U.K.

## Managing Antimicrobial Resistance Through Behavior Change, March 2021

Antimicrobial resistance (AMR) is a silent, slow-moving pandemic in the shadows of Covid-19, with potentially devastating effects on global health and national economies. With drivers deeply embedded in our societies' financial, social and political structures, efforts to reduce the risks of the growing resistance require strong political will power, economic investments and collaboration across sectors and borders. In essence, it means limiting the spread of infection and changing the way we use our medicines for fair and timely access where they are needed.

However, changing behaviours and practices is intrinsically hard, especially given the complexity of AMR and the need for solutions at multiple levels. Further complicating matters are the differing motivations and possibilities for action of each stakeholder group, including their surrounding environment, their socio-economic and political realities, and a range of other factors that powerfully influence behaviours.

On March 15–18, 2021, over 600 representatives from research and policy institutions, industry and civil society from 72 countries convened for a digital summit on how to limit the development and emergence of AMR through behavioural change. The conference consisted of five plenary sessions and eight workshops focusing on different pieces of the complex AMR puzzle. The summit was organised by researchers from Uppsala University and the Swedish University of Agricultural Sciences along with six other not-for-profit partners with recognised expertise in multi-disciplinary research, practice and advocacy on AMR.

In workshops and in plenary sessions, veterinary and human medicine perspectives met with views from social sciences, including education, economics, behaviour sciences, anthropology and sociology. Practical experience of policy implementation at different levels and in different contexts were central to the discussions.

Drawing on vital lessons from the Covid-19 pandemic response, the dialogue centred around the **prevention of infections**, to reduce the need for antimicrobials, on the one hand, and **restrictive and responsible** use of antimicrobials based on strict medical rationales, on the other.

As the emergence of resistance connects the use of antimicrobials in the health sector to that in the livestock sector and to occurrence of antimicrobials in the environment, discussions were permeated by a **One-Health Approach**. This was reflected in the broad topics of the presentations in the plenary sessions as well as in the workshops, ranging from challenges in

getting livestock vaccinated among pastoralists communities in the Sahel to monitoring antimicrobial use and awareness within the human population in Thailand.

Speakers and participants emphasised the need for evidence-based, multi-component interventions to influence consumer behaviours, vaccine hesitancy and hygiene practices or other behaviours that relate to AMR. This family of interventions should be adapted to and firmly anchored in local settings and realities, and include regulations and incentives, communication for behavioural change and interventions based on behavioural insights, to help people make the right decisions.

The way we talk about, visualise and explain the complicated topic of AMR can make an important difference in public understanding, attitudes, and the actions that people are willing to take to help the situation. If people are empowered to act and public support for the issue is strengthened, this can lead to more action also among political leaders. Appropriate messaging regarding AMR to different target groups was discussed by speakers in plenary sessions and explored in greater depth in one of the workshop.

When designing interventions, there are some basic principles to bear in mind, principles that unite all humans regardless of where we live and who we are. This was touched on by Dr Cass Sunstein, co-author of the concept of Nudging and that of Choice Architecture, which entails organising the context in which people make decisions, to facilitate behavioural change. He gave a presentation on the last day of the summit, sharing the principles of a FEAST Framework for Change, according to which interventions should be **Fun, Easy, Attractive, Social, Timely** to have an effect.

In summary, the meeting was an opportunity for deep reflection and dialogue on how we should approach the antimicrobial resistance crisis with a greater focus on the social and behavioural factors that drive it. We are deeply grateful to all the speakers and participants who joined us to share their knowledge and perspectives. The discussions resulted in eight policy briefs that we hope will contribute to more efficient and thoughtful ways of managing AMR going forward.

### Ulf Magnusson

Professor, Swedish University of Agricultural Sciences,  
Chair of the Uppsala Health Summit Programme Committee

### Kerstin Stewart

Programme Coordinator, Uppsala Health Summit 2021



# Managing Antimicrobial Resistance Through Behavior Change, March 2021

## Why not practice knowledge?

Ulf Magnusson, Anni McLeod, Leif Östman,  
Sandra Nohrborg, Christina Greko, Birgitta Lytsy, Cortney Price

### Brief background

Prevention of infections and spreading of antibiotic-resistant bacteria is a key component in the containment of antibiotic resistance. Fewer infections in a population or sub-population means a reduced need for antibiotics. This is true in healthcare settings and in livestock production.

We know a great deal about what needs to be done to prevent infections and the spreading of resistant bacteria, but this knowledge is seldom translated into practice. Bringing together a range of different sectors – each with their own approaches, experiences and solutions – can lead to insights that help us move forward.

The healthcare sector was chosen here, since it is ultimately responsible for delivering safe care to patients. The livestock sector was also chosen, as it is the farmer who is ultimately responsible for implementing biosecurity to protect his/her animals. The veterinarian can provide advice, but it is up to the farmer to decide if and how to increase disease prevention, including bearing additional costs of improvements made while waiting for their economic returns. There are several parallels between the two sectors concerning the importance of leadership, safety cultures, behaviour and individual motivation.

The focus of the workshop was to: i) debate and discuss what drives – or hinders – the practical implementation of infection prevention measures; and ii) explore how we can more effectively encourage behaviours that reduce infection risks and prevent antibiotic resistance.

### The Workshop – approach and highlights from the discussions

The workshop had some 35 registered participants from private companies, the health and livestock sectors, universities including students, international organisations, ministries and governmental agencies and began with three inspirational presentations, which are described briefly below in the order that they were presented.

Anni McLeod posed four questions to highlight issues worth considering when translating behavioural change theory into practical interventions and provided

examples for each. First, what is the context in which change needs to occur? (Is this an emergency or a long-term problem? What is the legal and political framework, which social norms and customs affect individual behaviour?) Second, who needs to change their behaviour? (Individuals may be differently exposed to risks and may need to change their behaviours in different ways.) Third, how easy is it to change the behaviour in question? (Changes that are difficult, costly or go against beliefs or traditions may be harder to introduce.) And lastly, how can behavioural change be supported and reinforced? (For instance by co-designing new processes, acknowledging possible trade-offs or combining a range of supporting measures?)

Leif Östman underlined that most of our behaviours are based on habit and that our habitual behaviours serve as an efficient way of coordinating with the physical and cultural world that we inhabit. Further, reflecting and learning occurs mainly when our habits are interrupted: when we cannot continue to act as we did before. This means that a ‘crisis’ is an opportunity for change. Notably, interventions focused on changing a person’s habitual way of acting require that we stage interruptions, forcing the person to become engaged. If the interruption is supposed to make big changes in a person’s habitual behaviour, we must take into account that such changes might be complex processes, involving issues of competence, moral and political values and frameworks, etc. Such processes often take time and require support to be successful. Many interruptions of habits give rise to feelings of frustration or curiosity, for instance. Sometimes, these feelings can be very strong and involve fear or antagonism. Any planning of interventions needs to take this into account in order to be successful.

Cortney Price challenged participants to consider the extent to which context determines behaviour. Whether it be supermarket sanitisation, hospital handwashing or livestock farm biosecurity; the environment around decisions has been shown to be a major impediment to people ‘doing the right thing’. Moreover, efforts to convince people to change are often undermined by contextual barriers, including situations where the desired behaviour is just too inconvenient, annoying

or costly for people to implement, despite their best intentions. These phenomena reveal how knowledge and practice often do not correlate. Fortunately, it is possible to reverse-engineer the context to change behaviour. To develop such ‘nudges’, behavioural insights must be available, which requires contextual analyses, dedicated community engagement and rigorous experimentation. When done right, changing the context by making desirable behaviours easier and undesirable behaviours harder can promote safer and more risk-reductive behaviours – even in the absence of knowledge or intention.

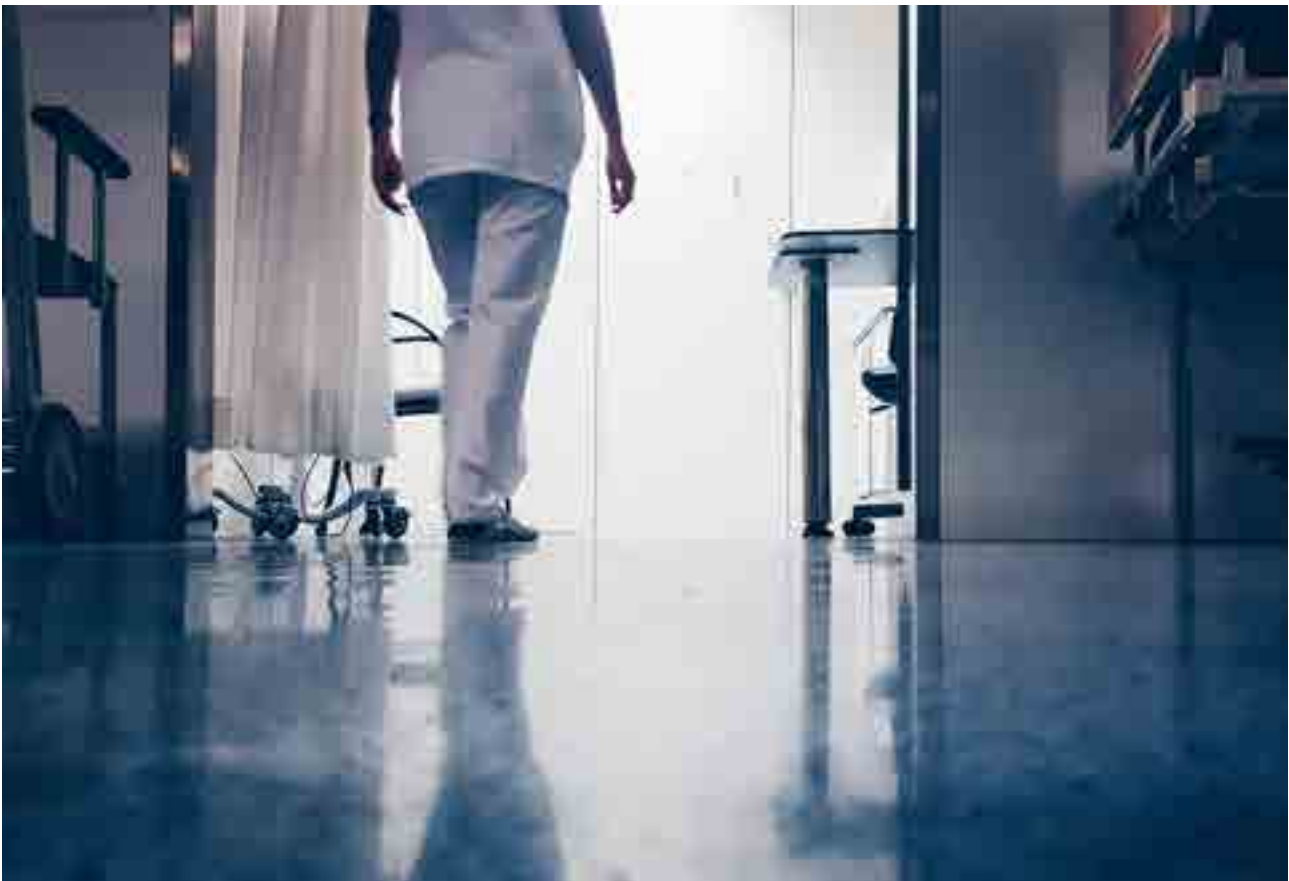
Next, the workshop participants discussed the following topics in four breakout groups: i) the most critical behaviours we need to promote in order to improve hygiene and biosecurity, ii) the main barriers to change, and iii) how can we best overcome such barriers and promote change.

The most critical area for behavioural change identified in the workshop was hygiene, with hospital hygiene being of particular importance in healthcare settings and farm hygiene and overall biosecurity being key in the livestock sector. Lack of knowledge about the importance of a practice, e.g., handwashing or hand disinfection, can in some cases be a barrier, but more often there are other barriers present, e.g., lack of time and stress, lack of enabling environment, or

inconvenient facilities and systems. A general barrier for all behavioural change is that it is difficult and takes time for people to change their habits. Some barriers may be general for several settings, while others can be context-specific.

To overcome barriers to behavioural change, we should make the right thing easy to do and the wrong thing more difficult to do. It was reemphasised that any intervention to overcome barriers must be tailored to the specific context in which the change needs to occur. Interventions must also be based on the characteristics of the individuals who need to change, e.g., knowledge, skills, values and culture. Some interventions that might promote behaviour in certain settings include visual reminders, monitoring, gamification, peer pressure and benchmarking. Such so-called ‘nudges’ can trigger subconscious reactions that make target behaviours more attractive or social; ideally, they should be combined with communication and education. It can be beneficial to raise awareness about the issue and to show what the individual gains from change are, in order for the change to happen ‘from within’, even if it is combined with external regulations.

All in all, we found that many challenges and possible approaches were very similar in the healthcare sector and the livestock sector.





## Recommendations

Based on the inspirational talks and the ensuing discussions in the workshop, we put forward the following five recommendations when planning for interventions that aim to mitigate the risk of not practicing existing knowledge:

- Make a thorough analysis of the context where you want to change behaviours (legal and political framework, culture, traditions, social norms and values, knowledge, financial resources, etc.).
- Consider the different risk perceptions, motivations and personal gains/benefits of the people you hope to influence.
- Do not be overly ambitious; be sure to consider how difficult your intervention might be to implement, given the above. Realise that your interventions may stir up emotions such as anger or fear, and be ready to empathise with people and prepared to adjust your approaches accordingly.
- Start with low-hanging fruit – it is better to aim for small changes that you are confident can happen than for overly ambitious ones that may never materialise or are difficult to sustain long-term.

## Acknowledgements

This brief is one in a series of eight policy briefs produced as an outcome of the digital 2021 Uppsala Health Summit “Managing Antimicrobial Resistance Through Behavior Change.” Uppsala Health Summit is an international arena for dialogue, exploring possibilities and implementation challenges associated with advancements in medicine and public health. You can find the entire series of briefs and more information about Uppsala Health Summit at [www.uppsalahealthsummit.se](http://www.uppsalahealthsummit.se).

This brief was written by: Ulf Magnusson, Swedish University for Agricultural Sciences\*; Anni McLeod, freelance consultant; Leif Östman, Uppsala University; Courtney Price, FAO; Sandra Nohrborg, Swedish University for Agricultural Sciences; Christina Greko, National Veterinary Institute Sweden; Birgitta Lytsy, Uppsala University Hospital.

Contributions were made by Franck Berthe, The World Bank; Noura Braham, National Agency of Sanitary and Environmental Control of Products, Tunisia; Michel Dione, ILRI; Gunilla Eklund, Ministry of Enterprise and Innovation, Sweden; Ketevan Kandelaki, WHO; Johanna Lindahl, Uppsala University; Arshnee Moodley, ILRI; Kristina Osbjör, Swedish University for Agricultural Sciences; Sarah Paulin, WHO; Catarina Svensson, Swedish University for Agricultural Sciences; Cecilia Tilli, The Foundation to Prevent Antibiotic Resistance, Sweden; Saad Uakkas, University Mohamed V of Rabat, Morocco; Daniel Waruingi, Students against superbugs, Kenya. N.B this does not reflect the total participation in the workshop.

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# Managing Antimicrobial Resistance Through Behavior Change, March 2021

## Roadmap for guiding the implementation of incentives to stimulate antibiotics R&D

Enrico Baraldi, Alexandra Waluszewski, Olof Lindahl,  
Carl Kronlid, Simone Callegari, Carl Björvang

### Background

In 2001, when the World Health Organization recognised antimicrobial resistance (AMR) as a global health challenge and formulated a strategy to address it, the focus on the development of new drugs, among other things, evoked hope among actors engaged in combatting AMR. Today, we can see that the global response and the outcome thereof has been rather disappointing. Only three new classes of antibiotics have been launched in the last two decades, and all are outcomes of research advances made in the 1980s or earlier. Investing in the development of new antibiotics is still dubious from a commercial point of view, in addition to there being scientific challenges. The backdrop of stewardship interventions means that sales of any new drug targeting a new type of resistant bacteria need to be modest. Hence, there is a strong disconnect between the public health value of antibiotics and pharmaceutical firms' ability to get acceptable return on investments in antibiotic development.

### Approach of the workshop

The aim of this workshop was to investigate why there have mostly been, as the leader of the UK AMR Review's Lord Jim O'Neill put it, 'empty words' coming from global policymakers. The workshop focused on obstacles that have hindered the implementation of three types of well-known antibiotic development incentives: Market Entry Rewards (MERs), Milestone Prizes and Pipeline Coordinators. Hence, the aim of this workshop was not to evaluate the strengths and weaknesses of these incentives per se, but rather to identify the forces blocking their implementation. In short, MERs include financial payments to a developer or intellectual property right holder after the achievement of market authorisation of an antibiotic that meets pre-defined product criteria. Milestone Prizes are monetary rewards given to developers after

the achievement of clearly specified R&D goals, such as an approved Phase I trial, including addressing particular pathogens. A Pipeline Coordinator is a public/non-profit organisation that closely tracks the antibacterial pipeline and actively supports R&D related to priority pathogens, during the development process, deploying funding, advice, and a range of other support activities.

During the workshop, 31 participants – representing academia, global and national policy bodies, NGOs, start-ups, and the pharmaceutical industry – were asked to give their perspectives on the following issues:

- a) The current obstacles to introducing MERs and concrete ways to address these obstacles.
- b) The current obstacles to introducing Milestone Prizes and concrete ways to address these obstacles.
- c) The current obstacles to making Pipeline Coordinators permanent and concrete ways to address these obstacles.

If the identified obstacles can be characterised as varied, the suggested solutions can be characterised as 'variations on a theme': no obstacle can be resolved by any actor on its own. What is required is interactive, long-term engagement from multiple stakeholders, that is, measures coordinated across national, legal, and organisational borders. Below, we will present the identified obstacles related to each incentive, while the proposed solutions are presented in the section on recommendations.

### Market Entry Rewards

The current obstacles to introducing MERs which were mentioned in the workshop can be summarised as follows.

**Obstacles relating to Funds and Funders:** There is a lack of such international cooperation between countries and supranational bodies that would be



necessary to implement a MER of a size considered to be effective, that is, above USD 1 billion. Moreover, there are problems finding the money to pay for such an incentive on a sustainable basis. These two aspects (cooperation and money) are related and thus make up a set of obstacles which need to be addressed simultaneously.

**Obstacles relating to Design Uncertainties:** There are uncertainties regarding how to calculate the optimal size of the MER in terms of funds, how to set the conditions for receiving a MER, and how a MER would work when other mechanisms (e.g., grants) are used. These uncertainties make companies less interested in MERs, as the MER initiative is seen as overly complicated.

**Obstacles relating to Coordination and Priorities:** These obstacles refer to problems such as countries being hesitant to harmonise practices (e.g., setting prices or choosing reimbursement models for buying drugs). There is also an issue regarding who determines who gets a MER. Is this decided by the funders? Or is it done more objectively, based on where it is most needed? If so, what resistance threat should be addressed? Included in such difficulties in reaching agreement are potential conflicts of interest between funders, high-income countries, which are able to pay for the MERs, but might not need to use the newly approved antibiotics, and low- and middle-income countries, which would have problems paying for the MERs, but might have the greatest need to use the new antibiotics against local resistant strains.

## Milestone Prizes

The obstacles to introducing Milestone Prizes that were voiced in the workshop discussions can be summarised as follows.

**Obstacles relating to the perceived Cost/Benefit:** It was suggested to be hard to estimate the size of Milestone Prizes in terms of how much money developers should be given. Moreover, from the perspective of the payer, it was also seen as risky that the payer might not get value for money (e.g., if a subsidised project were not brought to completion) or that the incentive might allow low-quality products.

**Obstacles relating to Coordination:** In the discussions, the need for coordination between Milestone Prizes was seen as a particular obstacle to their implementation. Specifically, in the discussion participants saw a need to coordinate Milestone Prizes (i) across prizes, (ii) across different milestones (preclinical or clinical phases) as well as (iii) across countries.

**Obstacles relating to Agreement:** Echoing some of the obstacles to implementation of MERs, the implementation of Milestone Prizes was seen as

suffering from problems regarding where to get the money from, on the one hand, and how to prioritise needs in selecting which antibiotics to support, on the other.

## Pipeline Coordinators

The obstacles to making Pipeline Coordinators permanent that were brought up during the workshop can be summarised as follows.

**Obstacles relating to Lack of Political Stability of Priorities:** It was suggested that, in order for Pipeline Coordinators to be made permanent, the main issue would be how to fund them in the long term (more than 10–12 years). Such long-term funding was seen as difficult to achieve because continual changes in political priorities hinder longevity or permanence. It was emphasised that funding might well be prematurely withdrawn if signs of improvements appeared – or failed to appear – thus making long-term political commitment at risk from Pipeline Coordinators' successes and failures.

**Obstacles relating to Pipeline Coordinator Characteristics:** Discussions yielded views that Pipeline Coordinators might need to evolve to receive more permanent funding. For example, Pipeline Coordinators are currently primarily a form of 'push mechanism', being mostly concerned with selecting projects and providing grant-like funding, but there might be a need for them to become more of a 'pull mechanism' to make their work more needs-driven. Moreover, it was suggested that Pipeline Coordinators needed to have a global perspective and be more inclusive, as developers who are not supported by a Pipeline Coordinator are perceived by others in the industry as less attractive, leading to potentially greater difficulties in obtaining venture capital funding.

**Obstacles relating to Experimentation:** This related to the nature of the organisations being seen as experiments. In other words, they were seen as experimental ways of organising operations, and an important question is which type of governance is most efficient. This can only be found out by trying different kinds of Pipeline Coordinators before making any of them permanent.

## Recommendations

In order to deal with the identified obstacles related to the implementation of **Market Entry Rewards** and Milestone Prizes, and to making Pipeline Coordinators permanent, the following recommendations can be outlined:

- Regardless of type of incentive, **ensuring long-term financing is necessary**. That means

providing incentives with guaranteed financing over at least a decade, or even on a permanent basis.

- Regardless of type of incentive, they all need to secure **long-term political support at both national and transnational levels.**
- Regardless of type of incentive, they all need to be realized through **transnational collaborations and agreements.**

The common message from the participants was thus that it is not enough to identify specific incentives or to mobilise individual stakeholders. In order to get a significant amount of MERs, Milestone Prizes, and Pipeline Coordinators in place, there is a need for solution-oriented interaction among stakeholders at a transnational level. Thus, agreements have to be achieved among both public and private stakeholders, with different rationalities and financial strengths, implying that a number of conflicting interests have to be managed. However, the contemporary transnational engagement concerning development and supply of vaccine and diagnostics related to COVID-19 has shown this is indeed possible.

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Authors and workshop organisers: Enrico Baraldi\*, Uppsala University; Alexandra Waluszewski, Uppsala University; Olof Lindahl. Rapporteurs: Carl Kronlid, Uppsala University; Simone Callegari, Uppsala University; Carl Björvang, Uppsala University.

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# Managing Antimicrobial Resistance Through Behavior Change, March 2021

## Consumer behaviour and antibiotic resistance

Mirko Ancillotti, Emma Oljans, Tazrin Hassan,  
Lotte Horikx, Anna-Carin Nordvall

### Background

The food we consume contributes greatly to antibiotic resistance. The World Health Organization (WHO) recommends an overall reduction in the use of antibiotics in food production, to preserve the effectiveness of these medications in human medicine. However, who is responsible for making the appropriate changes? The WHO's primary audience is policymakers and regulatory officials overseeing food production. Nonetheless, the WHO underlines the important role that consumers can play. Through their choices, consumers can act as a driving force in the market and have a strong influence on how foods are produced<sup>1</sup>.

While many people may agree in principle with more sustainable consumer behaviour, barriers of different kinds hinder them from engaging in such behaviour. For example, eating behaviour is a transdisciplinary concept, involving the complexities that food and meals entail for various groups and individuals in diverse contexts, and can be viewed from the perspectives of both natural and social sciences. Major efforts to try to change consumer behaviour have been made in relation to sustainability, but it seems that consumers need to be approached from multiple different directions. Punishments, rewards and regulations are the different methods that have typically been used to put pressure on consumers. A relatively underexplored direction involves the possibility of socially encouraging consumers to display correct antibiotic behaviours, which means putting social pressure on them, but also empowering them and making them feel responsible in acting sustainably in their food choices.

### Approach

The objective of the workshop was to explore ways of promoting – through a multi-stakeholder approach – more sustainable purchasing behaviour among consumers. The workshop was attended by 33 participants from different

parts of the globe, mainly from European and African countries, but also from the U.S., Thailand and Australia. Participants had diverse backgrounds and represented different interests, including behavioural research, pharmaceutical companies, food and drug authorities, retailers, patient safety organisations, ethics, etc.

The workshop structure encompassed two main parts. First, three invited speakers gave talks, each followed by time for questions and answers. Second, thematic discussions were held in breakout groups.

The talks were delivered by Dr Elin Nilsson from Umeå University, 'Consumer behaviour in the store – difficulty of choosing the "right" thing'; Prof. Erik Angner from Stockholm University, 'Norms and behaviour'; and Dr Alberto Giubilini from the University of Oxford, 'Taxing meat: taking responsibility for one's contribution to antibiotic resistance'.

After a short break, participants discussed the following themes in five groups: *Retailer's role* (groups 1–2), *Consumer behaviour* (groups 3–4), and *Consumer responsibility* (group 5). The authors of the present report facilitated the group discussions, one in each group. Group themes were designed by the organisers on the basis of participants' early feedback ahead of the workshop.

In the *Retailer's role* groups, the discussion was prompted by (but not limited to) the following questions: What is/should be the role of retailers in curbing antibiotic resistance? What could retailers do to nudge consumer behaviour towards antibiotic-smart purchases in-store/out-of-store? Antibiotics and food labels: dos and don'ts?

In the *Consumer behaviour* groups, the discussion was prompted by (but not limited to) the following questions: How can we promote sustainable consumption behaviour in relation to antibiotic resistance? Campaigns? Taxation? How can we overcome the mental barriers of consumers? Are we asking the right questions?

<sup>1</sup>WHO (2017). WHO guidelines on use of medically important antimicrobials in food-producing animals.



In the *Consumer responsibility* group, the discussion was prompted by (but not limited to) the following questions: Do consumers have any role to play? How should consumers conceive their responsibility for antibiotic resistance? Is there a responsibility to buy groceries that contribute as little as possible to antibiotic resistance?

Participants were assigned to the thematic groups based on their preferences.

## Recommendations

Consumers have a responsibility for the food they buy and consume. Such responsibility varies and depends on individual and local contexts. The continuous blame game among consumers, producers, retailers and authorities is not conducive to finding solutions, but highlights the interconnection and interdependence of the parties involved. The multiple ways to promote sustainable consumption behaviour regarding antibiotic resistance, such as campaigning, taxation, increasing awareness of the problem, etc., are not mutually exclusive and need to be tailored to local realities. Local actions need to be supported by a global commitment in areas such as conflict prevention, development financing and the climate crisis. Local actions through partnerships between the private sector and civil society, media, academia and others are required to make a difference in people's lives. Retailers could help consumers in their decision-making in several ways. They could promote antibiotic-smart goods or provide guidance, e.g., by having clearer information on products or simpler, more comprehensive labels, or by tailoring offerings in online shopping based on stated preferences (for example healthier or more animal-friendly), thereby decreasing stress levels in the consumer's decision-making process.

There is a need for:

- Applying available knowledge to promote action at the local and regional levels on issues related to antibiotic resistance. Highlighting how organisations can set goals in relation to antibiotic resistance and reduction strategies for continuous work.

- Significant and coordinated policy efforts to manage both consumer behavioural changes and to incentivise and manage structural change in the agri-food supply chain.
- Development and implementation of policies that include the entire chain of producers and a third-party reviewer, in order to create local regulations and follow-ups. This should include a one health approach to antibiotic resistance containment.
- Compilation and active dissemination of knowledge regarding the influence of food choices on antibiotic resistance to the general public (consumers), companies and social services.
- Clear and coherent labelling, possibly the creation of a single comprehensive 'sustainability' label encompassing information on several different local and global issues.
- Customisation of solutions in the local context, based on the priorities of the consumers, e.g., through subsidies on specific products. This can promote sustainable consumption behaviour.
- An emphasis on the important role that consumers have in their own lives, in their communities and globally.

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## Managing Antimicrobial Resistance Through Behavior Change, March 2021

### Antibiotics and antibiotic-resistant bacteria in the environment: How can behavioural change become part of the solution?

Cecilia Stålsby Lundborg, Andreas Mårtensson, Nada Hanna, Philip Mathew

#### Background

A significant proportion of antibiotics used in human and animal healthcare, agriculture and aquaculture end up in the environment after incomplete metabolism or after disposal. There is also evidence of serious antibiotic pollution from the facilities in which these medicines or their active pharmaceutical ingredients are produced. This spread of active substances is an important driver for emergence of antibiotic resistance (ABR) in the environment, by contributing to the antibiotic selection pressure on microorganisms.

The design most commonly used for wastewater treatment plants (WWTPs) is not fully effective in removing antibiotic residues and antibiotic resistance genes (ARGs). Instead, the effluent from WWTPs is rich in ARGs and antibiotic residues, and these pollutants eventually end up in the environment. Soil and water provide an ideal setting for the interaction of microorganisms, ARGs and antibiotic residues, which facilitates the emergence of ABR in the environment. This poses a significant risk to human, animal, and environmental health (One Health) and to global food security.

Although the Global Action Plan on Antimicrobial Resistance (GAP-AMR) advocates a One Health approach to contain ABR, the environmental dimension of ABR has largely been eclipsed by the human and animal/agricultural dimensions. However, in recent times, there has been renewed interest in addressing the issue of ABR in the environment, and there is an understanding that several behavioural change interventions can be effective in this domain. This workshop was aimed at evaluating various behavioural change actions, key actors in the space, strategies to incentivise positive changes in behaviour and bottlenecks associated therewith.

#### Approach

The interdisciplinary workshop, which had about 25 participants from all continents and from countries at all income levels, was structured to increase the

knowledge base and facilitate greater interaction among attendees. Lenore Manderson, Distinguished Professor of Public Health and Medical Anthropology from the School of Public Health at the University of the Witwatersrand in South Africa, spoke on how social, cultural, and institutional factors drive antibiotic consumption and disposal across the world, especially in low- and middle-income countries (LMICs). She gave examples of the ways in which we can leverage a robust understanding of these factors to design behavioural interventions. Suraj K Tripathy, Associate Professor from the School of Biotechnology at the Kalinga Institute of Industrial Technology in India, explained his work on novel wastewater treatment technologies which reduce ARGs and residues in wastewater. He explained the cost-effectiveness of various methods and their efficacy in different settings.

The workshop participants were then divided into five breakout groups and each group deliberated on the identification of actions and innovations to change behaviour in relation to antibiotics and antibiotic-resistant bacteria in the environment. Breakout discussions lasted for one hour and findings were presented in the main session, in a pre-determined template. The summary of the workshop and the call to action outlining the recommendations were crystallised through an open discussion.

#### Recommendations

The workshop participants deliberated on possible entry points for reducing antibiotic residues and ABR in the environment. The scope of the discussion went beyond behavioural change interventions, as there was a consensus that the relevant fields of actions are part of a broader continuum. A multi-stakeholder, multi-modal strategy is required to contain the issue of antibiotic residues and ABR in the environment. A call to action on the environmental dimensions of ABR may include the following prioritised interventions and encompass the following range of stakeholders:



Potential routes of creation of antibiotic residues in the environment and transmission to and from the environment of antibiotic residues, antibiotic resistant bacteria, and antibiotic resistance genes.

## Prioritised interventions

**Production and formulation of antibiotics:** Reduce antibiotic pollution at source. Incentivise treatment of effluent in pharmaceutical plants and penalise defaulters, e.g., through differentiated taxes. Increase access to technologies for treating effluents from production facilities. Set up a global fund to incentivise sustainability measures in antibiotic production. Ensure transparency and oversight of antibiotic supply chains and systems to track the international movement of antibiotics.

**Human antibiotic use:** Prevent infections and encourage responsible antibiotic use – when antibiotics are needed – without compromising access to essential antibiotics in healthcare systems of poorer countries. Implement country-level measures to reduce incorrect prescription of antibiotics, including over-the-counter antibiotic sales. Improve prescribing competencies through access to relevant prescribing guidelines/ algorithms and regulatory and enforcement capacity in countries, especially LMICs. Focus energy/resources to improve infection prevention and control, and water, sanitation and hygiene in potential hotspots for resistance generation, such as intensive care units in hospitals, healthcare facilities in general and homes of immune-compromised patients. Improve on-site wastewater treatment in hotspots like hospitals or ensure treatment in municipal wastewater treatment plants.

**Farming, i.e., animal agriculture/aquaculture antibiotic use:** Encourage rational antibiotic use by banning use of antibiotics for growth promotion and unnecessary disease prophylaxis. Increase the capacity

of farmers to adopt biosecurity measures for infection prevention. Ban the use in farming of highest-priority critically important antibiotics for human health (as per the WHO list). Encourage sustainable models of farming and food production that ensure responsible antibiotic use.

**Consumer campaigns:** Engage consumer groups and build greater awareness among consumers regarding antibiotic use in humans and in farming. Design globally acceptable labelling and certification systems for antibiotic residues in food. Advocate for a system to better compensate farmers who use sustainable production methods. Encourage systems for consumers to choose products/antibiotics with less environmental impact.

**Disposal of antibiotics or waste containing antibiotics:** Institutionalise and incentivise waste collection and safe disposal at every possible opportunity and for every stakeholder and penalise systematic defaulters. Encourage and ensure the availability of antibiotic take-back systems in all countries for consumers and healthcare facilities. Introduce incentives for industries and/or farmers to achieve circular economy models to reduce antibiotic residue and ABR burden. Encourage treatment of all farm and hospital waste before it is discharged into the environment. Ensure availability of safe municipal waste treatment.

**Antibiotic residues and antibiotic resistance in wastewater:** Cut at source and create wastewater treatment facilities. Implement monitoring/surveillance programmes for antibiotic residues and ABR in sewage. Encourage research on cost-effective methods to remove/reduce antibiotic residues and ABR organisms

## Call to Action

By GlobeLife environment-focused workshop at Uppsala Health Summit 2021.  
For reduction of antibiotic residues and antibiotic-resistant bacteria in the environment.

Here, we present interventions that countries or organisations can use to prioritise actions to reduce antibiotic residues and antibiotic-resistant bacteria and resistance genes in the environment. The entities mainly involved in the mentioned interventions are the pharmaceutical industry, healthcare professionals and farmers. Other key stakeholders include legislators, policymakers, governmental agencies, international agencies, communication experts, academia and civil society, whose actions are essential to decrease antibiotic residues and resistance in the environment.

### INTERVENTIONS

**Production and formulation of antibiotics:** Cut at source; incentivise treatment of effluent and penalise defaulters. Increase access to technologies for treating effluents from production facilities. Set up a global fund to incentivise sustainability measures in antibiotic quality production. Ensure transparency of antibiotic supply chains and systems to track the international movement of antibiotics.

**Human antibiotic use:** Prevent infections and encourage responsible antibiotic use – when antibiotics are needed – without compromising access to essential antibiotics in healthcare systems of poorer countries. Implement country-level measures to reduce incorrect prescription of antibiotics, including over-the-counter antibiotic sales. Improve prescribing competencies through access to relevant prescribing guidelines/algorithms. Focus regulatory capacity in countries, especially in low- and middle-income countries (LMICs). Focus energy/resources on improving infection prevention and control/water, sanitation and hygiene facilities in potential hotspots for resistance generation, such as intensive care units in hospitals and other healthcare facilities. Improve on-site wastewater treatment in hotspots like hospitals or ensure treatment in municipal wastewater treatment plants.

**Farming, i.e., animal/agriculture/aquaculture antibiotic use:** Encourage rational antibiotic use by banning use of antibiotics for growth promotion and unnecessary disease prophylaxis. Increase the capacity of farmers to adopt biosecurity measures for infection prevention. Ban the use in farming of highest-priority critically important antibiotics for human health. Encourage sustainable models of farming and food production that ensure responsible antibiotic use.

**Consumer campaigns:** Engage consumer groups and build greater awareness among consumers regarding infection prevention and antibiotic use in humans and in farming. Design globally acceptable labelling and certification systems for antibiotic residues in food.

**Disposal of antibiotics or waste containing antibiotics:** Institutionalise and incentivise waste collection and safe disposal at every possible opportunity and for every stakeholder, penalise systematic defaulters. Encourage the availability of antibiotic take-back systems from consumers and healthcare facilities in all countries. Introduce incentives for industries and/or farmers to achieve circular economy models to reduce antibiotic residue burden. All farm and hospital waste should be treated before it is discharged into the environment.

**Antibiotic residues and antibiotic resistance in wastewater:** Cut at source, create wastewater treatment facilities. Implement monitoring/surveillance programmes for bacterial resistance in sewage. Encourage research on cost-effective methods to remove antibiotic residues from wastewater. Improve access to safe sanitation facilities in LMICs. Ensure pre-treatment of waste generated in hospitals and healthcare facilities.

**Antibiotic residues and antibiotic resistance in other waters:** Build wastewater treatment facilities and monitoring/surveillance programmes for bacterial resistance in natural water bodies, especially near healthcare facilities and pharmaceutical manufacturing plants. Formulate realistic antibiotic residue guidelines for receiving waters. Facilitate universal and equitable access to safe drinking water.

### STAKEHOLDERS

In addition to the stakeholders mainly involved in the aforementioned prioritised interventions – the pharmaceutical industry, healthcare professionals and farmers – the following are key stakeholders whose actions are essential to decrease antibiotic residues and antibiotic resistance in the environment. Listed are also suggested actions for them to take.

**Legislators/policymakers/governmental agencies/international agencies:** Mobilise public opinion around the issue of antibiotic residues and bacterial resistance in environment. Improve the visibility of the issue in policy circles. Encourage commitments from international groupings like OECD/G20/G7 and pharmaceutical industry bodies. Develop templates for Smart Regulation of antibiotic use in various sectors. Frame sustainability criteria for public procurement of antibiotics. Launch an international surveillance system for antibiotic residues and bacterial resistance in the environment.

**Communication experts:** Create a coordinated strategy to develop communication materials which approach antibiotic residues and bacterial resistance as an environmental and ecological issue. Increase science communication capacity in LMICs. Develop policy briefs ahead of important international meetings on health or environment. Mainstream conversations on taboo subjects like human excreta and waste, which are important vehicles for resistance and residues.

**Academia:** Take the lead in development and piloting of technologies for removing antibiotic residues, resistant bacteria and resistance genes from water and effluents, including hybrid water treatment technologies. Develop innovative methods and strategies for source separation and source concentration to reduce antibiotics in effluents. Advocate for best practices and create an evidence base for policy action. Perform comprehensive analyses of evidence on antibiotic residues and bacterial resistance in the environment and validity/feasibility of various interventions.

**Civil society:** Improve the dialogue between the industry, governments and the public. Set up sustainability norms for pharmaceutical producers and advocate to ensure adherence. Perform advocacy regarding prioritisation of decreasing antibiotic residues and bacterial resistance in environment. Increase awareness of the potential impact on the environment of antibiotic residues and encourage pro-environment behaviours.



and ARGs from wastewater. Improve access to safe sanitation facilities in LMICs. Ensure pre-treatment of waste generated in hospitals and healthcare facilities.

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## Stakeholders

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**Academia:** Take the lead in developing and piloting of technologies for removing antibiotic residues and ARGs from water and effluents, including hybrid water treatment technologies. Develop innovative methods and strategies for source separation and source concentration to reduce antibiotics in effluents. Advocate for best practices and create an evidence base for policy action. Perform comprehensive analyses of evidence regarding ABR in the environment and validity/feasibility of various interventions. Develop and evaluate risk evaluation and risk assessment methods with a One Health approach.

**Civil society:** Improve the dialogue between the industry, governments and the public. Set up sustainability norms for pharmaceutical producers/formulators and advocate to ensure adherence. Increase advocacy regarding prioritisation of decreasing antibiotic residues and ABR in environment. Increase awareness of the potential impact on the environment of antibiotic residues and ABR and encourage pro-environment behaviours.

## Acknowledgements

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# Managing Antimicrobial Resistance Through Behavior Change, March 2021

## Making sense of antibiotic resistance: Communicate for change

Eva Garmendia, Linus Sandegren, Maria Pr nting, Alexandra Hoegberg

### Background

Although the looming crisis of antibiotic resistance is well understood scientifically, the response thus far has not been proportionated to the scale of the problem. This is partly due to a failure in communication stemming from challenges that are inherent to this issue. First, antibiotic resistance is perceived as a slowly growing threat. Bacteria are developing resistance to existing antibiotics and people are dying as a result of resistant infections. However, the rate of this development is slower than that of a fast-moving pandemic, such as COVID-19, and its extent is not well-documented. Second, managing antibiotic resistance requires lasting behavioural change, on the part of both individuals and communities – something that is intrinsically difficult. The need for systemic changes paired with a lack of simple solutions and actionable messages makes it difficult to prioritise this matter, and might make each individual feel that they cannot contribute. Third, the difficulty of communicating for behavioural change is further compounded by the complexity of the problem, the need for solutions at multiple levels, and the differing motivations and possibilities for action of each stakeholder group.

Today, communication, messaging and media coverage on antibiotic resistance commonly relies on the use of scare tactics and war metaphors. This attracts attention, but is known to be inefficient from a behavioural change perspective, as it easily wears out the recipient, causing the public to feel powerless and unable to have any significant impact. Moreover, it is problematic from the perspective of creating an often misplaced fear of microbes.

Some of the components of the problem preventing effective communication include the use of very technical medical language; the number of different terms used interchangeably such as “antibiotic resistance” and “antimicrobial resistance”; mixing messages about the various ways in which antibiotic resistance impacts health and society; the variable and limited media coverage; and the lack of a mainstream conversation on the topic. Based on these current

shortcomings, work on effective messages and tactics for specific target groups is urgently needed.

### Approach

The aim of this workshop was to encourage interactions between different disciplines and professional groups, and to discuss effective communication tactics and messaging concerning antibiotic resistance. The workshop brought together more than 30 experts in sociology, behavioural change, communications, microbiology, global health, sustainability and antibiotic resistance, to explore how communication can support changes in habits and attitudes. Drawing on principles of behavioural change communication, we looked into creating new narratives and tailoring messages. This was done through a panel discussion with three inspirational speakers: Sian Williams, Policy and Advocacy Adviser at the Wellcome Trust; Catherine Will, Reader in the Sociology of Science and Technology at the University of Sussex; and Philip Mathew, Public Health Consultant for ReAct Asia Pacific. Furthermore, the theme of the workshop was discussed in five breakout groups.

The groups were given two tasks:

1. to individually rank a series of statements and frames on antibiotic resistance in regard to their usefulness in communication, and then discuss their results; and
2. to explore ways to communicate the fact that antibiotics are lifesaving, but their use is also part of the problem and is associated with risks for the individual users, as well as for society at large. The groups were presented with a short piece of background information, and worked collaboratively to define a target group, possible messages, and channels or methods to reach the target group.

### Highlights from the discussions

The panel discussion highlighted a number of points to consider for promoting behavioural change when communicating antibiotic resistance:

- Good communication can be influential and can promote change, but is only one part of the solution. Structures that allow people to take the necessary actions must also be in place.
- A broad understanding of the complexity of antibiotic resistance among the public is not necessary, but emphasis must be placed on explaining why changing certain behaviours is important.
- It is important to narrow down the message, but take care not to exclude relevant groups or individuals. It is helpful to tailor communication to groups united by, for example, geographical area, lifestyle or experience with the healthcare system.
- When communicating with the general public, it is important to focus on actionable steps they can engage with. Advocating messages on antibiotic resistance in their communities or talking to decisionmakers are examples of actions they can easily engage with.
- When working with specific communities, it is important to involve the key actors in the process. For example, communicating with small-scale farmers in low- and middle-income settings, actively involving them in the process towards more biosecurity-oriented farming and training them in infection prevention and control practices can empower them to take action. Incentives to support such changes in practice are also needed.
- When communicating with policymakers, we need to provide them with information that is persuasive and share arguments that they can use in their work and that align with the issues they care about politically. Data and evidence-based information are crucial here.
- Communication practices and efforts should aim for specific results, aligning the objectives with the audience and the specific messaging.

Based on the background information provided, the different breakout groups decided to focus on the following target groups: community health workers, healthcare professionals, parents, mothers, and food consumers. The in-depth group work brought forward a number of ideas and themes that could be considered for communicating antibiotic resistance and promoting change when possible:

- Community health workers offer a channel for reaching people in lower-resource settings with relevant messages at the right time – when they seek care or advice – leveraging their care for the communities they serve.
- Collaboration with other trusted community and patient groups could have the same result as working with community health workers. Mothers’ groups, for example, can have a strong influence on families and communities. Likewise, staff at schools and kindergartens make up a trusted group.
- Consumers still have misconceptions about antibiotic use in food production. Rather than focusing on busting myths, presenting alternative motivations to achieve the goal of reduced use could be more effective. Aim to make sustainably produced food aspirational, and involve supermarkets as key influencers.
- Providing tools can promote action from the audience. Graphic flowcharts, data charts, communication platforms or games that aid in making the connection between knowledge and action could serve as tools that facilitate communication to and within the targeted groups.
- The messaging will depend on the context and available channels. For example, promoting a healthy microbiota could be relevant in certain groups (for instance among mothers), while it may be too complex to introduce in general messaging.





- Statements and communication that describe the current situation using relatable numbers are easier to understand than those using more abstract ones. The same applies for statements that feel close to home and are personalised, as opposed to more general ones.
- Consider how terms and ideas that have been popularised during the COVID-19 pandemic may help people understand and act on the issue. Examples include the importance of hand hygiene and infection prevention.

## Final reflections

The challenges of communicating effectively regarding antibiotic resistance – and the failure to do so – have been discussed in several fora over the past decades, but progress has been slow. Although many reasons underlying ineffective communication on antibiotic resistance have been known for a long time, there is still a lack of understanding and research into what messages and channels are most effective to reach different target groups in different contexts, and how to link communication efforts to behavioural change insights. It is important to empathise with the audiences and analyse what motivates them.

In 2019, the ad hoc Inter-Agency Coordination Group (IACG) on Antimicrobial Resistance provided concrete recommendations in a number of areas, also highlighting the need to support behavioural change through effective awareness raising, communication and appropriate incentives. In 2018, the IACG developed discussion papers in six thematic areas – including public

awareness, behavioural change, and communication – where some possible pathways and good practice examples were laid out.

As new global governance structures are established in response to the IACG recommendations, there is an opportunity to address these aspects more systematically. Such work should take past experiences from other fields into account, and build upon ongoing research and behavioural insights. Likewise, as work to implement national action plans progresses, involving behavioural change and communication experts could facilitate more efficient implementation of said plans.

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## Managing Antimicrobial Resistance Through Behavior Change, March 2021

### Children and the wild: Potential benefits and perils in human-animal encounters

Martin Mickelsson, Tanja Strand, Inga Maulina

For thousands of years, interactions between humans and animals have been a very important part of development, mostly for humans. It has helped us maintain connections within our human society and – through the animals – to maintain connections with the wildlife on this planet. As a result, humans are able to see this planet more as one organism – not just as a place of resources from a consumerism perspective. This relational perspective has helped us raise children with an understanding of the value of every living organism sharing this planet and allowed for the development of more a respectful and sustainable human society, seen as one part of the bigger picture on this planet.

The importance of introducing children to a range of experiences is often reiterated and provides them with opportunities to reflect on said experiences. Doing this engenders broader perspectives among the children as they grow up. In many parts of the world where big cities are becoming more and more dominant, people have fewer encounters with nature and wildlife. Still, many children have close connections with animals in various ways, from living on small private farms with just one or a few animals or in close interaction with nature and wild animals to visiting farms, going for excursions in forests and nature or simply spending time in local parks or green areas.

Research has indicated that human-animal encounters can promote learning among adults and children – whether the encounters take the form of everyday practices when living with and tending animals at home, or are planned educational activities involving visiting animals on farms. Meanwhile, such encounters may also involve the perils of exposure to infection and the transmission of resistant genes between humans and animals, which is an increasing problem, especially when encounters occur in factory farming and intensified agriculture settings. Depending on the conditions, such situations can trigger the development of zoonoses and antimicrobial resistance (AMR). These processes highlights our limited ability to control every aspect of human-animal encounters, especially when it comes to the microbe level. To realise the great learning benefits of human-animal encounters, there is a need to understand

microbial processes and promote encounters that consider such processes rather than avoid encounters altogether.

#### Objective of the workshop

The workshop aimed to draw on participants' experiences to explore how to address both the benefits and the perils of human-animal encounters, especially for children, creating new perspectives on how to approach such encounters in a more efficient way. The twenty-seven participants included members from the Swedish Blue Star, 4H of Sweden, the National Veterinary Institute, and universities in Sweden and abroad. During the workshop, two very inspirational talks were held. Kristina Osbjer, from the Swedish University of Agricultural Sciences, gave the first lecture on the topic 'Animal raising and child health in low- and middle-income countries', followed by discussions in breakout rooms. Caleb Mandikonza from the Wits University in South Africa was the second speaker, with the presentation 'Unravelling patterns in nature: experiential teaching and learning through animals', followed by discussions in breakout rooms.

**Figure.** The 'wheel' of behavioural change discussed throughout the workshop.





## Outcomes of the workshop discussions

- Encounters with animals are important, as they hold many benefits for humans. The risk of AMR and the need for behaviour change should be addressed in ways that do not generate fear of encounters with animals, especially among children.
- Human-animal encounters offer benefits to health and development, including nutrition, mental health, value development and the empowerment of disenfranchised groups in society through animal care and husbandry. Furthermore, positive human-animal interactions are more crucial than ever during the current period, when many well-established routines are changing or disappearing. To counteract the risk of infection and AMR, the challenge lies not in the human-animal encounters as such but in the forms these encounters take and where they occur. Rather than change behaviours to avoid encounters with animals due to the risk of AMR, efforts should focus on adapting behaviours depending on the type of encounter, how and where the encounter occurs, who is involved, and under what conditions.
- Encounters between humans and animals can involve different perils, depending on the place and situation in which they occur. Human-animal encounters do not take place in a vacuum, and when organising, planning and evaluating encounters, the conditions of, for example urban versus rural life should be taken into consideration.
- Discussing microbes in isolation might be difficult, but efforts for behaviour change can focus on the fact that microbes are part of every situation involving humans and animals. Microbes and AMR should be discussed in a holistic way, meaning that microbes are an inevitable part of our planet, with a specific niche and a role in all life processes. Interactions between living organisms always involve a form of balance. Such balance is of particular importance in the case of intensified agriculture, e.g., in food production.
- Developing positive relationships with animals based on care and respect both for ourselves as humans and for other animals can counteract the more fraught relationships that drive AMR. Detailed research

- should be performed on agriculture that risks increasing AMR, and the results communicated to the people who influence the processes most.
- We must learn to sustain behavioural change – not only make the change but stick to it for decades or centuries. Many participants had experiences of working with behavioural change related to health and AMR and had seen short-term change as the result of an intervention or effort, but that people often reverted to old habits over time. Questions were raised regarding the time scales of the interventions and the need to focus on behavioural change coupled to value change to create forces for monitoring and sustaining behaviour – both external (information and educational efforts) and internal (values, habits).
  - In many situations, solving other problems in society, like decreasing poverty and gender inequality or increasing the welfare of families with children, and simultaneously guiding the development of particular ethical and moral values in society would automatically decrease AMR in some aspects. Therefore, efforts should be made to support solutions to such problems as well.

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## Managing Antimicrobial Resistance Through Behavior Change, March 2021

### Where are our antibiotics? Three possible solutions to address antibiotic shortages and improve global antibiotic supply

Enrico Baraldi, Therese Fagerqvist, Sofia Wagrell,  
Ines Khadri, Carl Kronlid, Simone Callegari

Antibiotics are a cornerstone of modern medicine – and yet, access to established antibiotics is a major problem across the globe. There is sometimes a shortage of established old generic products, locally or even globally. Some antibiotics may suddenly be withdrawn from markets, if considered economically unattractive. When antibiotics become unavailable, patients are exposed to unnecessary suffering, health-care costs surge and antibiotic resistance accelerates because suboptimal antibiotics have to be used to substitute them.

The COVID-19 epidemic has brought to the fore the key problem of drug shortages, as demand for medicines such as painkillers, anaesthetics and some classes of antibiotics peaked while supply was disrupted globally. Some countries even introduced export restrictions on active pharmaceutical ingredients (APIs) and final products.<sup>1</sup> However, drug and especially antibiotic shortages are not a new phenomenon – rather they have slowly been increasing over the last 10 years.<sup>2</sup> In modern healthcare systems, an antibiotic shortage typically causes additional costs for replacements, whereas the consequences are more extreme in low-income countries, often causing increased mortality. Assessing the costs of shortages is extremely complex, but some estimates point to costs of USD 20–30 million per antibiotic shortage.<sup>3</sup>

There are several reasons why shortages occur, such as a sudden surge in demand which cannot be met with timely orders, disasters or accidents, discontinued production or quality problems in production, with the latter accounting for over 60% of shortage events.<sup>4,2</sup> However, there are a set of complex *root causes* at play behind these reasons for single events of antibiotic shortages; most of them concern financial and profitability issues related to the entire antibiotic field, from API supply sectors all the way to end markets.<sup>3,4</sup> The general problem of low profitability for the various actors in this field can be broken down into several specific causes that in turn generate multiple effects

which further aggravate the problem. Key problems include the absence of volume commitment through long-term contracts and strong fluctuations in local demand,<sup>5</sup> which cause both *low profit per unit and uncertainty about volumes*. On the *manufacturing side*, the rigid production systems cause problems in that they are not flexible enough to cope with the aforementioned uncertainty, because of both regulatory constraints (e.g., on moving manufacturing of established products from one plant to another) and technical constraints. Furthermore, many facilities require modernisation and upgrading in the face of stricter environmental requirements, among other things. However – when it comes to antibiotics – this can be a problematic investment, given the low profitability. Also, existing plants are usually already operating at close to full capacity and the costs for building a new plant can exceed USD 100 million.<sup>4</sup>

#### Objective of the workshop

The objective of the workshop was to discuss potential solutions and ways forward to address the root causes of antibiotic shortages. Since the problem is complex and potentially contains an endless number of issues to be discussed, the workshop was focused around the following three main themes and their potential solutions and their respective pros and cons:

1. Enhancing transparency in antibiotic supply chains.
2. Improving profitability for antibiotic suppliers.
3. Upgrading production systems.

These topics were discussed one after the other in three parallel breakout rooms, after which the discussions were summarised in a plenary session. The participants represented several different academic fields (ranging from medicine to management science), the industry, NGOs, and governmental and transnational agencies. About 30 people participated in the workshop.



## Outcome of workshop discussions

The outcome of the discussions can be summarised in four main areas with suggestions for ways forward:

### 1. Creating incentives for the industry to keep providing antibiotics

Getting the industry to keep providing antibiotics, despite low sales volumes and low profitability, is key to preserving a continuous supply in the future. The discussion settled on two focus areas to be addressed:

- a) *Enhancing the predictability in production.*
- b) *Creating financial incentives for producing antibiotics.*

An enhanced predictability could be achieved through changes in procurement and contracting systems. If procured volumes were predetermined for a specific period of time, the planning of production would be easier for the suppliers. Today, a supplying company can win a procurement contract to deliver a specific antibiotic, often without any guaranteed volumes, but with a requirement to supply a given volume if needed. The predicted sales are based on estimates from previous periods, but volumes can never be guaranteed. A complementary solution would be to extend the contract periods, which could also aid in enhancing predictability for companies and make it easier to plan production and thus reduce uncertainty. Another central precondition to enhanced predictability is transparency: more available information about the actual needs in the healthcare system would help producers plan and estimate production more accurately and better meet fluctuations in demand and handle single events causing stockouts.

Financial incentives were identified as one core aspect to ensure that specific antibiotics stay on the markets and to prevent stockouts. The workshop concluded that there is a call for new economic mechanisms that can cater for the specific requirements that underlie antibiotics, considering that their availability is conditioned by a 'reversed market logic': antibiotic use has to be kept as low as possible, at the same time as healthcare requires a broad arsenal of dosage forms and a large variety of different types of antibiotics, which are necessary to curb the escalating situation of antibiotic resistance. Hence, supplying companies need to provide a broad array of antibiotic products to be used (sold) as little as possible, implying that the market function is 'out of play' and other mechanisms have to be implemented to ensure the availability of antibiotics. A suggestion is to give the supplying companies an annual fixed compensation for providing a critical and low-volume antibiotic to a specific market.

### 2. Creating awareness of the problem in its full complexity

Antibiotic shortage is a societal problem. It is interconnected to existing structures in healthcare, procurement systems, massive negative consequences in the treatment of patients, environmental issues, global trade and production structures. Since it has both

economic and medical consequences, antibiotic shortage is in essence a political issue, where policymakers have the utmost power to act and make necessary changes happen. Activities not only have to be pushed in the 'right direction', but also coordinated, since they are overlapping and interdependent.

Thus far, the problem has often been addressed from each single actor's perspective, but these perspectives are seldom coordinated or put together to unveil the larger picture and the totality of the consequences. It seems that the research community and other involved actors have failed to clearly communicate the impending severity of the problem of antibiotic shortages and what we are facing. The consequences of today's lax attitude have to be clearly communicated to policymakers, *in their full complexity*, so as to ensure that the right kinds of actions are taken. One way to do this would be to create more precise and comprehensive financial calculations of the total societal costs caused by antibiotic shortages, include how they aggravate the larger crisis of antibiotic resistance.

### 3. Transparency

Transparency was identified as key to solving many of the problems surrounding antibiotic shortages. Transparency is often mentioned in relation to supply chains that are hard to map due to sub-suppliers being spread across the globe and often being unknown, even if they are few in number. One central aspect that was discussed during this workshop was that we also need more *transparency on the demand side*. Today, countries do not cooperate or pool their demands for antibiotics, even for products, formulations or strengths that are rare or used at a small scale. One suggestion identified during this workshop was to pool demand for narrow-spectrum antibiotics that are sold in low volume and are at risk of being withdrawn from one or several markets. Such measures of cooperation could also be beneficial for the industry, since they could enhance predictability in demand.

### 4. Collaboration

The perhaps most central ingredient in addressing the availability of antibiotics is collaboration. It was concluded that collaboration has to take place at multiple levels and among a range of actors. It is first and foremost a matter of creating purposeful platforms where collaboration between different types of stakeholders can take place, so as to pave the way for joint actions that embrace a multi-actor perspective. These actors include academia, industry, healthcare providers and authorities. Second, there is a need for countries to collaborate, for example by pooling their demand for low-volume antibiotics, so as to ensure they are still provided, despite low profitability. To solve an escalating problem, in the face of high complexity and – not least – interdependencies on a global scale, countries will need to work together and *in the same direction*.



At the same time, the structure of the problem of antibiotic shortages varies between countries, since they are subject to different regulatory contexts and healthcare systems. Therefore, it was suggested that each country should perform a root cause analysis similar to that performed in Sweden by the collaboration platform PLATINEA, so as to fully understand the structure of the underlying problems in that specific context. Such analyses would also make it easier to coordinate activities over country borders.

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## Managing Antimicrobial Resistance Through Behavior Change, March 2021

### Teaching antimicrobial resistance. Educating young people to be change agents

Malena Lidar, Eva Lundqvist, Cecilia Eriksson, Malin Hjertson, Ida Solum, Leif Östman

#### Brief background

International organisations are acknowledging education as crucial for creating awareness of antimicrobial resistance (AMR) and for development of responsible habits relating to AMR. The UN does so in the Sustainable Development Goals, as does the WHO in the Action Plan for Antimicrobial Resistance. Young people spend much of the day in school, and given that habits are established early in life, schools have an important role to play in promoting better understanding, awareness and action competencies in matters related to AMR.

Responsible habits are a prerequisite to shaping sustainable behaviours concerning for example health issues and food consumption. The (re)creation of habits includes not only learning the facts about AMR, but also learning different values and priorities connected to the issue, and the skills to translate and transform the knowledge, values and ethical considerations into new priorities. These aspects must be addressed in school.

In this workshop, we discussed challenges and opportunities related to teaching on the topic of AMR and how we can work in formal education to ensure that the next generation is prepared with both relevant knowledge concerning the emergence and spread of AMR and decision-making processes for managing questions related to AMR. The education system needs to find means to address AMR that will ensure this generation is committed and engaged to make a difference in handling this issue. This requires that we make available and concrete teaching that promotes pupils' confidence in their own ability to make changes in their personal life, as well as in shaping society, now and in the future.

#### Approach

The workshop was initiated to increase knowledge on and discuss how schools can be a part in supporting the next generation of citizens to be competent and willing to act in matters related to AMR. The overarching aim of the workshop was to address questions regarding what education should include to help pupils act competently in relation to AMR issues, and how such competence is best taught in the context of a formal education system.

The workshop discussions were guided by the following questions:

- What does teaching need to address, including both facts and values, to educate students and ensure their competence and willingness to act in relation to AMR issues?
- How can we work to enable teachers to feel confident about teaching highly complex issues, encompassing multiple perspectives and, at times, conflicting interests and needs?
- How is it possible to teach a topic that may have very severe consequences, without making students scared or disillusioned about the future?
- How can we work to accumulate, sustain and disseminate experiences of teaching related to AMR and build a knowledge base around this topic?

The workshop gathered 30 participants from around the world, many from Sweden and Europe, but also from countries in Africa, Asia and Central America. The participants had diverse professional backgrounds, e.g., educators, educational researchers, curriculum experts, policymakers and health experts. Bjarne Bruun Jensen, Professor in Health Promotion in Denmark, and Tracie Muraya, Policy Officer at ReAct Africa, each gave an inspirational talk. Jensen highlighted, among other things, that we need to provide students with action experiences and strategies to make changes already in school. Central to Muraya's talk was the importance of using life in the family and matters relevant to the local community as starting points for education.

#### Recommendations

As stated above, we need for young people to have knowledge and competence to act in relation to AMR issues. The conclusion from the discussions at the Uppsala Health Summit was that to make this possible, there is a need to rethink modes of teaching, moving away from simply transferring an established set of facts about an issue. Teaching in schools has to be interesting, meaningful and engaging for pupils to motivate them

to learn and develop responsible habits. One way to achieve motivation is to work with authentic problems. This offers pupils a possibility to gain knowledge and skills that are part of concrete problem-solving activities. Any problem-solving activity must involve learning basic facts about the problem and its causes. Furthermore, as Jensen highlighted in his talk, it is important that pupils can take part in developing visions for the future and learning about different strategies to work towards these visions, in their own life as well as in the local community. When trying to solve problems, pupils will experience the complexity and the conflicting interests involved, which requires them to learn the difficult art of creating good arguments for priorities and decisions. Problem-solving activities also require that pupils learn how to transform visions, knowledge and prioritisations into concrete actions and activities.

A strategy for teaching can be to let pupils work with challenges from their own lives, where they can take the lead and develop their own ‘actions plans’ for changing everyday behaviours. With this mode of teaching, motivation can be turned into commitment and (re)creation of habits. When pupils truly engage in a problem-solving activity, they get emotionally involved and can gain a sense of ownership of the solutions. Muraya pointed out that real-life examples with positive outcomes that can put a face on AMR may contribute to giving students hope for the future. Notably, the contextual differences for teaching AMR in different parts of the world are huge. In some parts of the world, young people live with the consequences of lack of access to functional drugs for infections. Letting these pupils cooperate with local stakeholders in trying to solve a problem may introduce them to new knowledge as well as to the understanding that there are different points of views about the issues that must be acknowledged in the search for solutions. In other parts of the world, it can be a challenge to make pupils acknowledge that AMR is something that concerns them, since the problems are not visible in their everyday context. Here, we might need to introduce stories or scenarios in order to touch upon their feelings and create commitment and a willingness to (re)create habits.

New perspectives might mean that we need to interrupt teachers’ habitual ways of teaching and

introduce new ones. For a teacher, it can be challenging to address an issue like AMR in teaching, as there is not necessarily a solution or a correct answer and multiple disciplinary perspectives and conflicting interests are present. To support confidence in this matter, it could be beneficial to ensure tailored teacher education, continued professional development and expanded collaborations between different disciplines or school subjects, to enable the highlighting of different aspects of AMR.

Schools could make a vast contribution in teaching the next generation about AMR, if their structural barriers to action, such as lack of time and curricular space, are avoided. The AMR topic must be purposefully incorporated in school curricula – not only in life sciences, but also in subjects such as social sciences and home economics. This would require continuous capacity building for teachers on the AMR topic and that school leaders work to facilitate this process. Teachers need to have opportunities to engage in multisectoral collaborations. There is also a need to share and make public functional teaching tools and experiences, in order to further accumulate our capabilities to perform teaching that makes a difference on sustainability issues in society.

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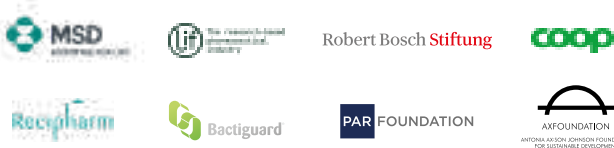
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