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2023

Developing a competency-based approach to facilitate teaching and learning of antimicrobial stewardship as part of environmental sustainability in higher education

Presented by

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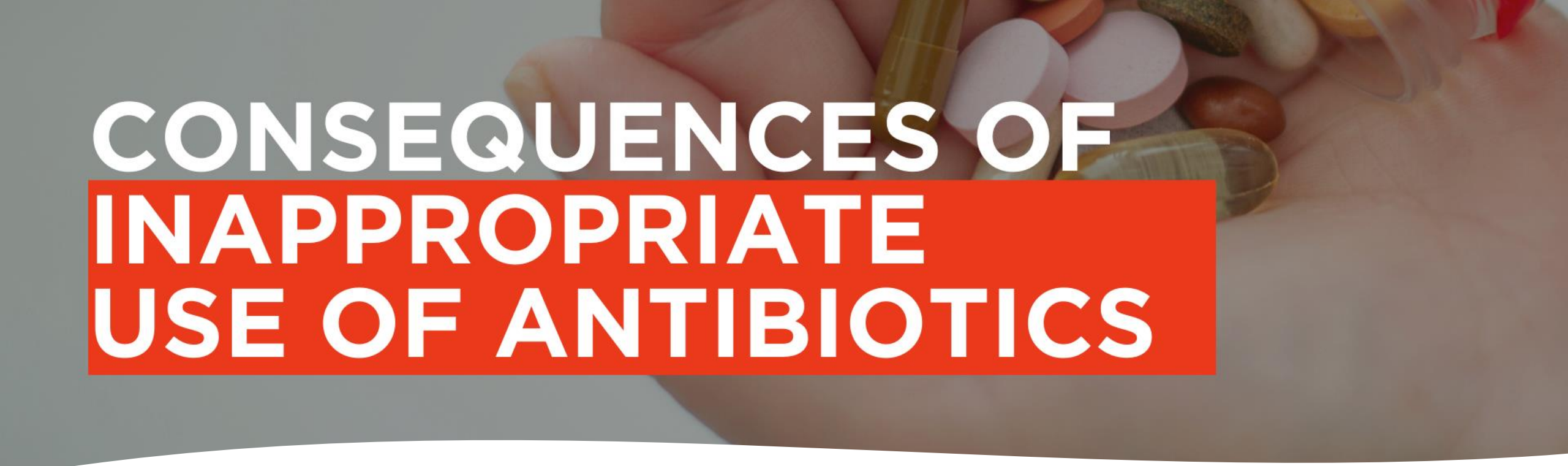
What constitutes inappropriate use of antimicrobials?

Within a community inappropriate use of antimicrobials includes:

- Antimicrobials prescribed by a healthcare professional when unnecessary (eg for viral infections such as sore throat)
- Use of antimicrobials for self-medication and/or medication of family members without prescription eg using leftover antimicrobials prescribed for another purpose
- Obtaining antimicrobials bought without a prescription overseas/online



CONSEQUENCES OF INAPPROPRIATE USE OF ANTIBIOTICS

Inappropriate use of antimicrobials is recognized by global organizations such as the WHO and the EU.
It may lead to among other things:

- Antimicrobial resistance (AMR) [potentially the most important in terms of impact]
- Excessive use of plastics when intravenous antimicrobials are administered unnecessarily
- Adverse environmental effects due to the manufacture and transport of antimicrobials or the inappropriate disposal of antimicrobials

Background to Antimicrobial Resistance

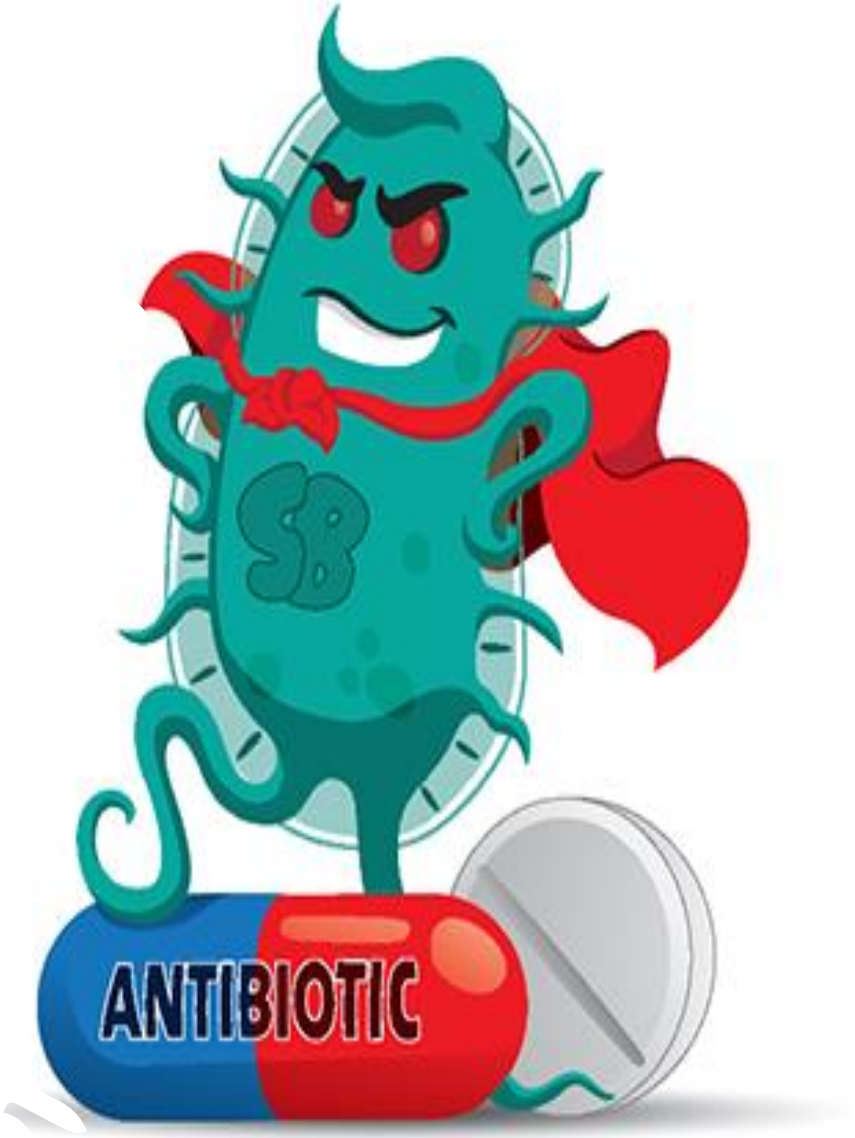
- The WHO defines antimicrobial resistance (AMR) as occurring

"***when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines making infections harder to treat and increasing the risk of disease spread, severe illness and death***."[1]

- Concern: AMR leads to diseases that are more difficult to treat, sometimes being resistant to more than one antimicrobial (superbugs)

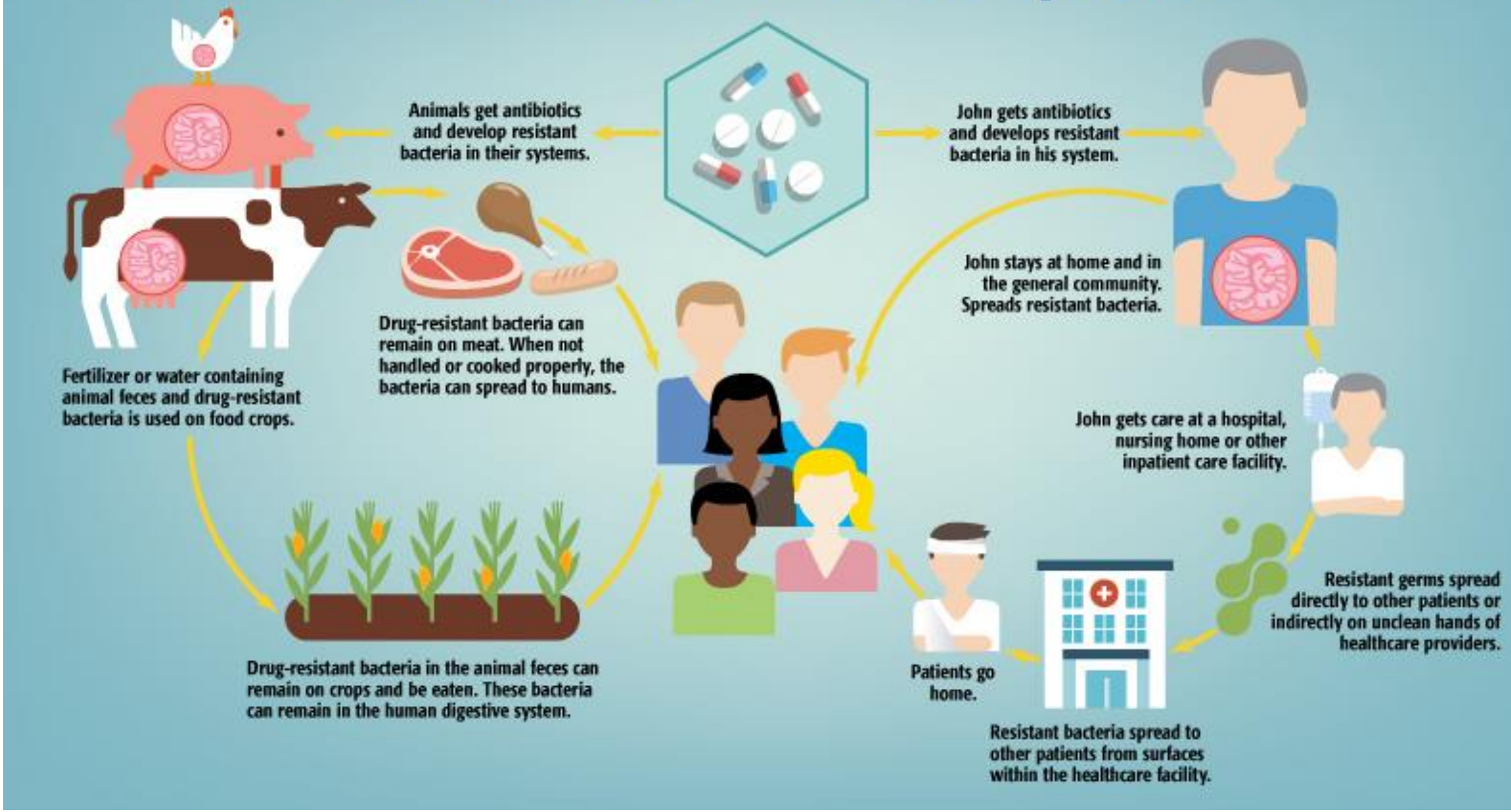
- Examples of those that are in our headlines include *C difficile* infection and MRSA (Meticillin resistant *Staphylcoccus aureus*)

- AMR and climate change are interconnected since climate change is leading to a spread of vectors for disease



[1] https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

How Antibiotic Resistance Spreads



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The social dilemmas of climate change and antibiotic resistance: an analytic comparison and discussion of policy implications

Niklas Harring [1,3]✉ & Eva M. Krockow[2,3]

Climate change and antimicrobial resistance are two of humanity's most imminent problems. Reducing the use of fossil fuels and antibiotics is essential for managing the threats, and theory-based policies are required to stimulate urgently needed behaviour change. This article analyses climate change and antimicrobial resistance within the context of game theory. Previous literature has identified these problems as Commons tragedies, where inherent incentive structures encourage selfish overuse of existing resources. While the game theoretical models provide a helpful conceptual basis, the present analysis suggests discrepancies between some of the theoretical assumptions and the practical realities of climate change and antimicrobial resistance. These include complex networks of decision makers, non-binary choice contexts complicated by temporal and spatial distance between choices and outcomes, and different ethical implications of resource overuse. Policy implications are discussed, highlighting the need of global agreements for coordinating local initiatives for both dilemmas. However, different target groups may be necessary to address the existence of gate keepers (e.g., medical prescribers) in antibiotic use. Additionally, while certain policies types (e.g., information policies) apply to both dilemmas, more nuanced ethical considerations mean that some economic policies (e.g., punitive policies) may be limited to managing climate change.

The authors here describe climate change and antimicrobial resistance as two of the most "imminent problems" that are ethically very difficult to address and manage. They go on to say that "incentive structures encourage the selfish overuse of existing resources."

How can we combat AMR?

Complex !… but one strategy is through antimicrobial stewardship (AMS) defined by the WHO as:

"A coherent set of actions which promote the responsible use of antimicrobials. This definition can be applied to actions at the individual level as well as the national and global level, and across human health, animal health and the environment."[1]

[1] https://apps.who.int/iris/bitstream/handle/10665/329404/9789241515481-eng.pdf

Competency-based education approach

- Imperative to embed AMS into the curricula of all healthcare professionals
- AMS is a key activity that all healthcare professionals need to master, both for patient benefit, and to ensure environmental sustainability through sustainable prescribing
- A UK wide set of AMS competencies for undergraduate healthcare professional education was published in 2018
- Competency based education is the better pedagogic approach here since it is not just about knowledge but also about having the skills and behaviours to apply this knowledge effectively

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Development of consensus-based national antimicrobial stewardship competencies for UK undergraduate healthcare professional education

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What is the aim of this project?

- To facilitate the development of a UK-wide AMS competency framework tailored for student pharmacists
- To ensure that the principles of AMS are embedded within the undergraduate curriculum to prepare future pharmacists to ensure antimicrobials are prescribed sustainably in future employment
- Having UK-wide competencies ensures a standardized approach to curricula boosting AMS education and future applicability in clinical practice

How is this being approached?

- September 2022: National AMS Pharmacy Education Group (NAPEG) set up.
- Membership comprises: academics with interest in AMS, teacher practitioners, antimicrobial specialist pharmacists, pharmacists involved in national policy, students (through the British Pharmaceutical Student Association) and a pharmacy professional body (Royal Pharmaceutical Society).
- Representation from all four nations of the UK
- Collaborative approach of the different member backgrounds ensure that the competencies being drawn up are deliverable from an academic perspective and are “fit for purpose” from a clinical practice perspective ensuring that the future graduates gain the competencies necessary
- Student involvement ensures that the student voice is included particularly with aspects such as ways in which students learn specifically relating to this topic

What is the indicative curriculum and how does it link in with environmental sustainability?

- Adapted from published frameworks including those for undergraduate medical students
- Comprises six main domains each with a detailed competency statement together with associated descriptors
- The descriptors are aimed to support curriculum content and guide Schools of Pharmacy on what should be included in AMS curricula to ensure student pharmacists are graduate ready

Some examples of Domains, Competencies and Descriptors and how these are linked to Environmental Sustainability and the UN Goals for Environmental Sustainability

If no action is taken in addressing AMR, the global economic cost by 2050 will be US$ 100 trillion, impacting low-middle countries the most, widening the inequity gap. (1)

Misuse of veterinarian medicine in animals leads to additional use of other medicines, accumulating in ground water, land, humans, and back into animals. However, as agricultural pathogens become more resistant, we will not be able to ensure food security for our exponentially growing population. Taxation of antibiotics can push farmers to seek alternatives to their current practices. (1, 2, 3)

By 2050, 300 million individuals will die of AMR. Today, it is estimated that more than 30,000 women giving birth and 200,000 newborns die each year because of severe infections that are resistant to available drugs. Moreover, AMR is a huge threat to cancer treatment as antibiotics may no longer be effective. In the EU alone annually, it is estimated that AMR costs €1.5 billion a year in health care costs and productivity losses. (1)

Unless AMR is introduced in all school curricula, particularly for health care professionals to promote sustainable development, the rapidly growing number of people dying of AMR will not be reduced. (4)

Pharmaceutical and microbial hazard waste can reach and contaminate groundwater, drinking-water, soils, food crops and sediments. These potentially have serious environmental effects, including toxicity to wildlife and the generation of antibiotic-resistant bacteria. (1, 5)

The cost of drug-resistant infections is estimated to cause a decrease in economic output of US$ 1-3 trillion. (1)

Current authorization guidelines, such as those in the EU, tend to favour existing products, such as antibiotics or chemical pesticides. They at the same time create significant barriers for the development of alternatives in human health, meat production and agriculture. This obstructs SMEs to innovate and compete on a global market dominated by the antibiotic producing and distributing pharmaceutical industry. (6, 7, 8)

AMR affects all countries, but the burden is disproportionately higher in LMICs. Inadequate access to safe water and sanitation adds to the emergence and spread of drug resistance and is a key challenge for LMICs. Therefore, most of the direct and indirect impact of AMR will fall on LMICs if clinicians and veterinarians do not prescribe antibiotics when they are not needed. (9)

The cheap production of APIs (active pharmaceutical ingredients) particularly in China and India, contaminates local communities' natural resources. Importation of such APIs, in for instance the EU, robs the EU of drug independence and puts populations in emerging economies at serious risk. (10)

Global consumption of antimicrobials in food and animal production is estimated to rise by 70% by 2030. Instead of reduction, the use of antibiotics in agriculture is expected to rise by 67% according to the World Bank, due to the increasing demand for meat. (1, 11)

The overuse of antibiotics in fish farming results in the presence of many infectious drug-resistant pathogens. For instance, experiments on aquaculture found that farmed fish pathogens are resistant to up to 15 drugs. (12)

The EU Commission's Scientific Steering Committee in 1999 advised the immediate reduction in production and distribution of antibiotics, in order to prevent a future AMR catastrophe. No body heeded that advice, leading to then-WHO DG Margaret Chan to warn in 2012 about the rapidly dawning post-antibiotic era, which would disable curing of infections and disallow surgical operations. New partnerships are required to ensure the development and production of new antibiotics while securing limited use only. (13, 14, 15)

Domain

- Infection Control and Prevention

Competency

- All newly qualified pharmacists must understand core knowledge underpinning infection prevention and control and use this knowledge appropriately to prevent the spread of infection by applying the principles of the national infection prevention and control guidelines.

Link to environmental sustainability

- A thorough understanding of infection control and prevention ensures that micro organisms are not transferred from one person to another. This limits infection transmission with less people being unwell (including those of multidrug resistant organisms) and the likelihood of requiring an antimicrobial therefore reducing the overall antimicrobials dispensed.

Domain

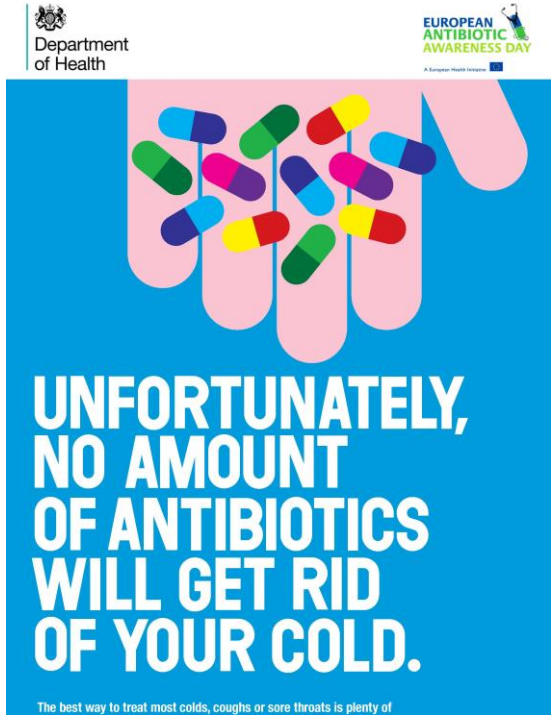
- Person-centred care

Descriptors

- Discuss patient/carers expectations or demands of antimicrobials and the need to use antimicrobials appropriately, including the risks and benefits of antimicrobial therapy
- Counsel patients/carers about the risks of obtaining antimicrobials without a prescription including the risks of sharing antimicrobials prescribed for others or prescribed for animals
- Demonstrate awareness of and support for AMR public health campaigns such as World Antimicrobial Awareness Week, Keep Antibiotics Working, Antibiotic Guardian and e-Bug

Link to environmental sustainability

- By educating the patients (for example through public health campaigns or individually when patients seek advice in community pharmacies) pharmacists are reducing patient expectations for antimicrobials and consequently patients do not put undue pressure on prescribers to prescribe antimicrobials for viral infections such as the common cold. This reduces the amount of antimicrobials prescribed and patients benefit since they are not exposed to side effects from antimicrobials unnecessarily.



Domain

- Antimicrobial prescribing and stewardship

Descriptor

- Understand the importance of timely intravenous-to-oral switch and demonstrate the application of appropriate criteria to identify patients eligible for switch

Link to environmental sustainability

- When switching from intravenous to oral antimicrobials, less equipment and supplies are required making oral administration more environmentally sustainable by reducing the carbon footprint without any detriment to the patient.

Where next?

NAPEG is currently exploring ways of endorsing this indicative curriculum to “mandate” embedding within all undergraduate pharmacy curricula in the UK

(33 Schools of Pharmacy in UK)

Discussion points

Aspects of environmental sustainability are likely to already be embedded within a curriculum

- How do we take this further?
- How do we make students aware that topics already covered are in fact linked to sustainability?
- What is the most effective way of doing this – implicitly or explicitly?
- Arguments for implicit – any action to improve patient care will indirectly affect sustainability
- Arguments for explicit – students are then more aware of links between healthcare and sustainability, potentially more employable in that when interviewed they are more likely to remember the links if these have been covered explicitly

On behalf of …

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Thank You