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BRIEFING PAPER

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Antimicrobial resistance

By Sarah Barber
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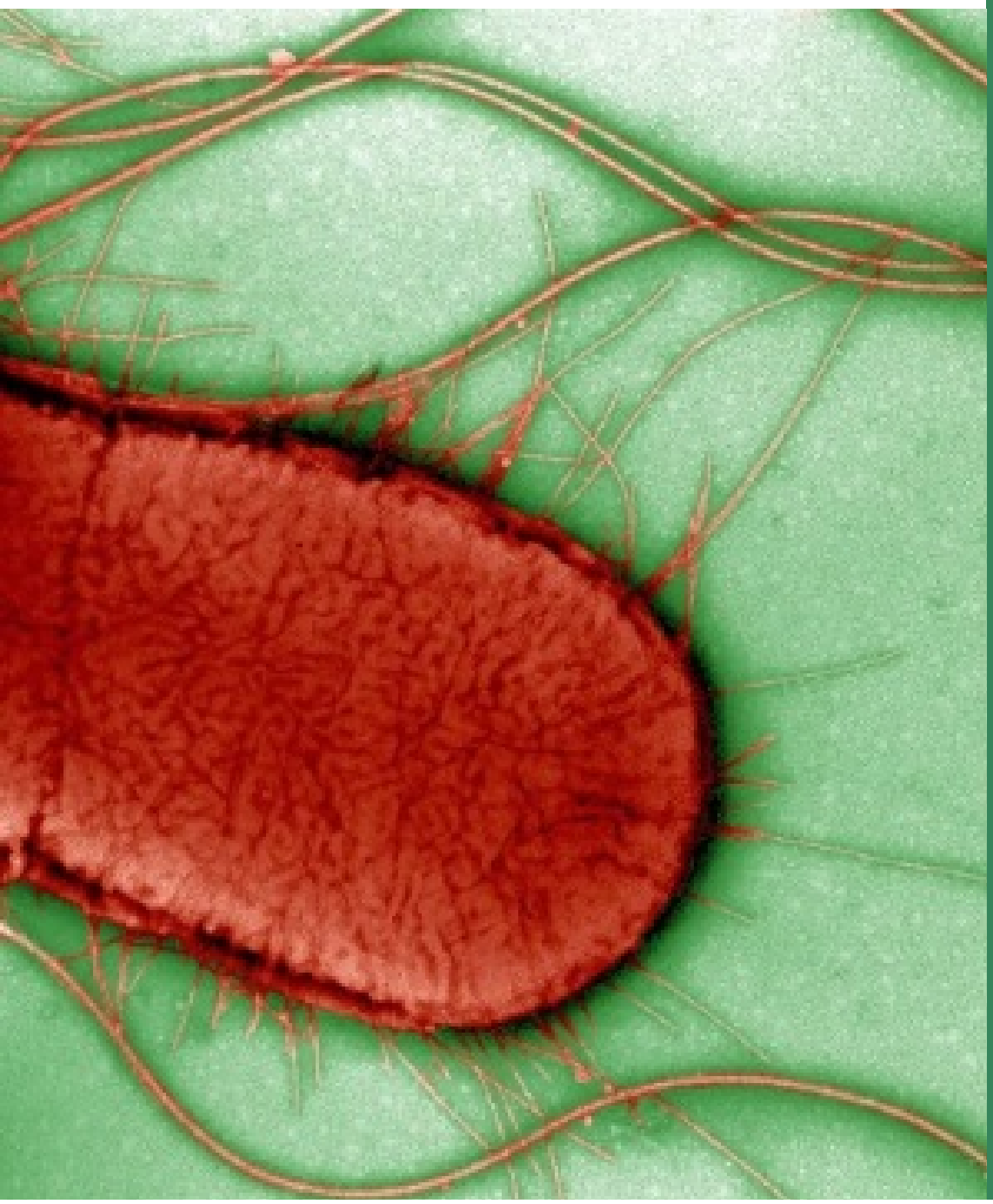

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Summary

Antimicrobial resistance (AMR) is a significant and increasing threat to public health globally. It is estimated that in the US and Europe alone, antimicrobial-resistant infections currently cause at least 50,000 deaths per year with hundreds of thousands more dying in other areas of the world.

If we are unable to slow the acceleration of AMR, future consequences could be worse still. It has been estimated that 10 million people a year could be dying as a result of AMR by 2050.[1] The Chief Medical Officer, Professor Dame Sally Davis has said that if we do not act, it is possible we will return to a time where 40 per cent of the population die prematurely from infections we cannot treat.[2]

There is action that can be taken to slow the progression of AMR. Examples of these include:

- Improving infection control;
- Ensuring appropriate prescribing and use of antibiotics in both humans and animals;
- Investing in research and development (R&D) for new drugs and diagnostic tools; and
- Ensuring adequate monitoring of prescribing and resistance on a national and international basis.

The independent review on antimicrobial resistance (the AMR review) was launched by the former Prime Minister, David Cameron in July 2014 and was led by the economist Lord O'Neill of Gatley.[3] The 2016 final report made ten recommendations, these included better surveillance of antimicrobial use and resistance, a global public awareness campaign, and the introduction of new approaches to funding medicine and diagnostics development. The Government response agreed with a need for improved investment in R&D, and said it would work to gain global support for the recommendations in the report.

Much of the work in the UK is within the multi stranded UK AMR Strategy 2013-18. A 2016 review of this strategy reported that progress has been made putting in place the building blocks for success, and early signs suggested good results with some initiatives but that there is yet to be unequivocal evidence that these measures are making a difference. The UK Government has also played a significant role in international work on AMR.

Surveillance figures on UK antimicrobial resistance levels and prescribing were published in October 2017. These show that for all infections the percentage of cases involving antibiotic resistance was higher in 2016

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1 The Review on Antimicrobial Resistance, Antimicrobial Resistance: Tackling a crisis for the health and wealth of nations, December 2014

2 Kings Fund, What if antibiotics were to stop working? (accessed 14 November 2017)

3 Department of Health and Prime Minister's Office, Prime Minister warns of global threat of antibiotic resistance, 2 July 2014

than 2012. However, the report set out that antibiotic use had reduced by 5% between 2012 and 2016 and in the same period, the number of prescriptions dispensed in primary care had decreased by 13%.

International work on antimicrobial resistance is led and coordinated by the World Health Organisation. A Global action plan on AMR was published in 2015, and the WHO also provides guidance for countries on the development of national action plans, and conduct international surveillance on AMR. Despite international commitment to address AMR, concerns have been expressed recently that action has been slow.

This briefing paper aims to provide an overview on antimicrobial resistance, its causes, and consequences. It provides a summary of some UK and international action in this area.

1. Background

1.1 What is antimicrobial resistance (AMR)?

Infections caused by microbes (bacteria, viruses, parasites or fungi) can usually be treated using antimicrobial drugs, which kill or limit the growth of microbes, thus controlling the infection. These drugs are also used to lower the risk of infection in relation to certain operations such as hip replacements.[4]

Antibiotic use has saved many lives - once life threatening infections can now be treated effectively and operations that would have been dangerous can be performed safely. It has been estimated that the use of antibiotics has extended our life expectancy by an average of 20 years.[5]

However, microbes can become resistant to the drugs that were once able to target them, rendering them ineffective; this process is called antimicrobial resistance (AMR).[6]

It is important to note that as well as bacteria, antimicrobial resistance also occurs in other infection-causing microbes, such as parasites (e.g. malaria), viruses (e.g. HIV) and fungi (e.g. Candida).[6]

The diagram below provides an example of antibiotic resistance – where bacteria that cause infections become resistant to antibiotics that were once effective.

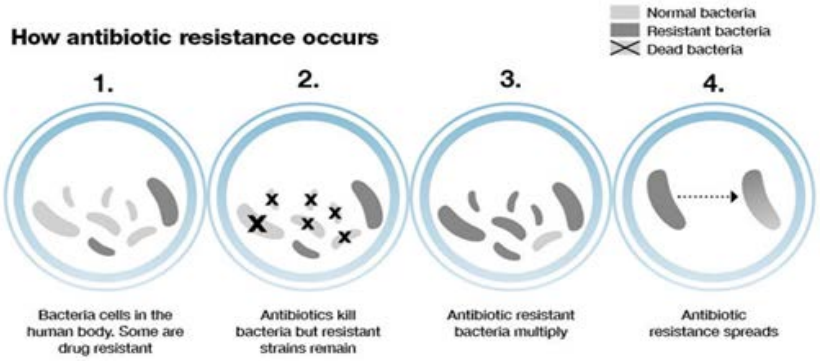

Figure 1: Antibiotic Resistance (Public Health England)

AMR is a natural process but it is accelerated by a number of actions, these include inappropriate prescribing, poor infection control practices and the use of antimicrobials in agriculture.

Antimicrobial resistance is a natural process but it is accelerated by a number of actions, such as inappropriate prescribing, poor infection control practices and the use of antimicrobials in agriculture.

[4] The Review on Antimicrobial Resistance, Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations, December 2014

[5] Kings Fund, What if antibiotics were to stop working? (accessed 14 November 2017)

[6] World Health Organisation, Antimicrobial Resistance, April 2015

Antimicrobial resistance is currently seen across the world in a significant number of common and serious infections, such as urinary tract infections, sexually transmitted infections, tuberculosis and malaria. The World Health Organisation provides further information about current international levels of drug resistance in some common bacteria:

> Resistance in *Klebsiella pneumoniae* – common intestinal bacteria that can cause life-threatening infections – to a last resort treatment (carbapenem antibiotics) has spread to all regions of the world. *K. pneumoniae* is a major cause of hospital-acquired infections such as pneumonia, bloodstream infections, and infections in newborns and intensive-care unit patients. In some countries, because of resistance, carbapenem antibiotics do not work in more than half of people treated for *K. pneumoniae* infections.
>
> Resistance in *E. coli* to one of the most widely used medicines for the treatment of urinary tract infections (fluoroquinolone antibiotics) is very widespread. There are countries in many parts of the world where this treatment is now ineffective in more than half of patients.
>
> Treatment failure to the last resort of medicine for gonorrhoea (third generation cephalosporin antibiotics) has been confirmed in at least 10 countries (Australia, Austria, Canada, France, Japan, Norway, Slovenia, South Africa, Sweden and the United Kingdom of Great Britain and Northern Ireland).
>
> WHO recently updated the treatment guidelines for gonorrhoea to address emerging resistance. The new WHO guidelines do not recommend quinolones (a class of antibiotic) for the treatment of gonorrhoea due to widespread high levels of resistance. In addition, treatment guidelines for chlamydial infections and syphilis were also updated.
>
> Resistance to first-line drugs to treat infections caused by *Staphylococcus aureus*—a common cause of severe infections in health facilities and the community—is widespread. People with MRSA (methicillin-resistant *Staphylococcus aureus*) are estimated to be 64% more likely to die than people with a non-resistant form of the infection.
>
> Colistin is the last resort treatment for life-threatening infections caused by Enterobacteriaceae which are resistant to carbapenems. Resistance to colistin has recently been detected in several countries and regions, making infections caused by such bacteria untreatable.[7]

[7] WHO, Factsheet: Antimicrobial resistance, updated November 2017

1.2 The consequences of AMR

The consequences of antimicrobial resistance are often portrayed as being a future threat but the World Health Organisation is clear that antimicrobial resistance has already been detected in all parts of the world, it reports that "*it is one of the greatest challenges to global public health today, and the problem is increasing.*"[8]

The consequences of AMR include:

- reducing our ability to treat common infectious diseases, resulting in prolonged illness and a greater risk of complications;
- patients remaining infectious for longer due to ineffective treatments, making them more likely to pass infections on to others;
- compromising advances in modern medicine (such as organ transplantation, cancer chemotherapy, and major surgery) due to risk of infection; and
- increasing economic burden on health care systems, families, and societies.

The threat of AMR has been recognised by Governments and medical organisations for a number of years. The UK Chief Medical Officer (CMO), Professor Dame Sally Davies, has described AMR as a 'catastrophic threat' that could, within 20 years, make routine operations life-threatening due to infection risk:

> Antimicrobial resistance poses a catastrophic threat. If we don't act now, any one of us could go into hospital in 20 years for minor surgery and die because of an ordinary infection that can't be treated by antibiotics. And routine operations like hip replacements or organ transplants could be deadly because of the risk of infection. [9]

She reiterated these concerns an October 2017 call to action event on AMR in Berlin warning of a future "post-antibiotic apocalypse" and that AMR could mean "the end of modern medicine."[10]

In July 2014 the Prime Minister called for global action against antibiotic resistance, and announced an independent review into AMR led by the economist, Lord O'Neill of Gatley.[11] The review board aimed to understand the global implications of AMR and proposed international solutions for addressing it. The first report looked at the implications of AMR on global health and the economy.[12] This estimated that in the US and Europe alone, antimicrobial-resistant infections currently cause at

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8 WHO, Factsheet: Antimicrobial resistance, updated November 2017

9 Department of Health, Antimicrobial resistance poses 'catastrophic threat', says Chief Medical Officer, 12 March 2013

10 Antibiotic Research UK, Chief Medical Officer calls for new action on antibiotic resistance, 27 October 2017

11 Department of Health and Prime Minister's Office, Prime Minister warns of global threat of antibiotic resistance, 2 July 2014

12 The Review on Antimicrobial Resistance, Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations, December 2014

least 50,000 deaths per year with many more hundreds of thousands elsewhere in the world.

Independent studies, commissioned by the review, estimated that, by 2050, 10 million people could die due to AMR infections each year (more than cancer and diabetes currently combined). The map below provides a pictorial representation of predicted annual deaths attributable to AMR in different continents by 2050:

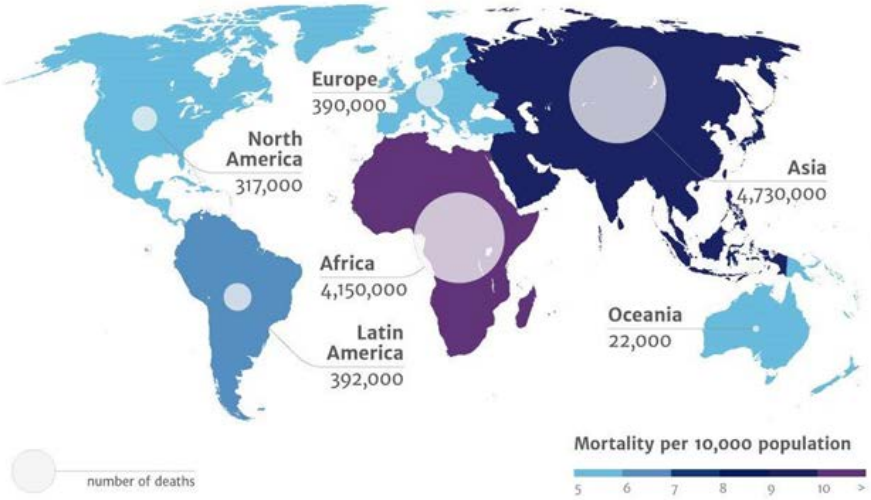

Figure 2 Annual deaths attributable to AMR by 2050 (*Review on Antimicrobial Resistance 2014)*

The studies also estimated the more imminent impacts of AMR:

> […] 300 million people are expected to die prematurely because of drug resistance over the next 35 years and the world's GDP will be 2 to 3.5% lower than it otherwise would be in 2050. This means that between now and 2050 the world can expect to lose between 60 and 100 trillion USD worth of economic output if antimicrobial drug resistance is not tackled. This is equivalent to the loss of around one year's total global output over the period, and will create significant and widespread human suffering. Furthermore, in the nearer term we expect the world's GDP to be 0.5% smaller by 2020 and 1.4% smaller by 2030 with more than 100 million people having died prematurely. (p7)[13]

In the EU, it is estimated that AMR currently costs €1.5 billion a year in healthcare costs and productivity losses. Earlier in 2017, the World Bank predicted that if AMR continues to increase, the annual costs

[13] The Review on Antimicrobial Resistance, Antimicrobial Resistance: Tackling a Crisis for the Health and Wealth of Nations, December 2014

could be as large as those of the global financial crisis that started in 2008.[14]

1.3 Causes of AMR

AMR is a natural phenomenon that occurs when microbes evolve in response to antimicrobial drugs to become resistant to them.[15] The AMR review group provide a more detailed description of the processes underlying AMR:

> Antimicrobial resistance is a natural process whereby microbes evolve to be able to resist the action of drugs, making them ineffective. Resistance arises from the selection pressure that antimicrobials put on populations of microbes; essentially selecting or allowing those microbes to survive and proliferate, typically through genetic changes. This leads to antibiotics becoming less effective over time and in many extreme cases, ultimately useless.[16]

Although a natural process, AMR has been increased and accelerated by human actions such as:

1. Inappropriate use of antimicrobial drugs in healthcare;
2. Poor infection prevention and control practices;
3. Use of antimicrobial drugs in agriculture; and
4. Accelerated spread of AMR infections through global trade and travel.

Another concern is that there are limited numbers of new drugs available to replace those that have become ineffective (particularly antibiotics). Factors cited as contributing to a lack of commercial appeal for antibiotic development in particular, include the unpredictable nature of emerging resistance, shorter courses of use (compared with for example, a medication to treat high blood pressure), and conservation measures that cause new drugs to be used primarily only after other treatments have not worked. By the time a new antibiotic becomes a first line treatment, it may be near or beyond the end of its patent life.[17]

Inappropriate use of antimicrobial drugs in healthcare

In healthcare settings, inappropriate prescribing can mean that microbes are exposed to a larger number and greater concentration of antimicrobials, which increases the risk of developing resistance. Inappropriate prescribing has been linked to a number of factors that are described briefly below.

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14 The World Bank, Drug-Resistant Infections: A Threat to Our Economic Future, March 2017

15 World Health Organisation, *Antimicrobial Resistance*, April 2015

16 Review on Antimicrobial Resistance, *Background*, [accessed 13 November 2017]

17 Review on Antimicrobial Resistance, *Securing New drugs for future generations: The pipeline of antibiotics*, May 2015

Patient perception and use

There remains a lack of public awareness and understanding on AMR, and this can impact on use of antimicrobials.

Work conducted by both the World Health Organisation[18] and the Wellcome Trust[19] has shown that there is significant gaps in public understanding of AMR. In the 2015 WHO survey, two thirds of people reported knowing that antibiotic resistance is an issue but didn't understand how it could affect them or how to address it. 64% of survey respondents believed that antibiotics can be used to treat colds and flu.

Other common misconceptions included that the majority of respondents think that the body, rather than the bacteria becomes resistant to the antibiotic, and nearly half of people thought that antibiotic resistance was only a problem for people who take antibiotics regularly.[20]

However, our awareness of this issue does seem to be linked to our behaviour and use of antibiotics. Evidence collected by the EU Eurobarometer survey in 2016 shows that consumption of antibiotics decreases with knowledge of AMR, and this knowledge increases amongst those who are given the information on antibiotics.[21]

Clinicians report feeling under pressure to prescribe antibiotics when they may not be needed because a patient incorrectly believes they need them (For example, the patient may have a viral infection).[22] In 2015, the National Institute of Health and Care Excellence (NICE) reported that 9 out of 10 GP said they feel pressured to prescribe antibiotics and 97% of patients asking for antibiotics were prescribed them. [23]

AMR can be accelerated when patients do not complete a course of antimicrobial drugs and use them inappropriately. This includes skipping doses of antibiotics, and sharing them with others. [24]

Poor diagnostic certainty

Clinicians may need to rely on incomplete information to diagnose an illness, leading them to prescribe antimicrobial drugs either when they are not needed, or a broad-spectrum antimicrobial rather than one that targets the specific microbe. These practices contribute to the development of more resistant microbes and accelerate AMR.[25]

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18 WHO, WHO multi-country survey reveals widespread public misunderstanding about antibiotic resistance, November 2015
19 Wellcome Trust, Understanding of antibiotics, May 2016
20 Ibid.
21 European Centre for Disease Prevention and Control, New Eurobarometer results show that large numbers of Europeans are still unaware that antibiotics are ineffective against viruses and against colds and flu, June 2016
22 National Institute of Allergy and Infectious Diseases, *Antimicrobial (Drug) Resistance Causes*, 21 December 2011
23 NICE, *Fighting infection: NICE tackles overuse of antibiotics*, 17 August 2015
24 NHS Choices, The Antibiotic Awareness Campaign, 26 October 2015
25 National Institute of Allergy and Infectious Diseases, *Antimicrobial (Drug) Resistance*, 21 December 2011

In November 2017 it was reported that the results of survey showed that 76% of GPs are prescribing antibiotics where there is uncertainty about whether the infection is bacterial.[26]

Inadequate infection control practices

Poor infection control practices, inadequate sanitary conditions and inappropriate food-handling exacerbate AMR by enabling any resistant infections to spread. For example, in its March 2016 report on limiting the development and spread of drug resistance, the Antimicrobial Resistance Review Board estimated that improved water and sanitation in middle-income countries could reduce the volume of antibiotics used to treat diarrhoea by at least 60 percent:

> Today, however, the availability of antimicrobials has shifted the focus from prevention towards treatment. Many countries have skimped on investment in basic sanitation infrastructure, to the direct detriment of the health of their populations, and with the secondary effect of contributing to the rise of antibiotic-resistant diseases.
>
> [...]
>
> We also commissioned analysis that estimates that across four middle-income countries (Brazil, Indonesia, India and Nigeria), at least 494 million cases of diarrhoea are treated each year with antibiotics. But with universal access to improved water and sanitation in these four countries, the volume of antibiotics consumed to treat cases of diarrhoea caused by inadequate water supplies and sanitation could be reduced by at least 60 percent.[27]

In the UK, and other developed countries, the focus is on hospitals, where between 7 and 10% of patients will develop a healthcare-associated infection. The AMR review states that infection prevention and control needs to be prioritised across all parts of healthcare, and important but often simple techniques such as handwashing should be promoted.

Use of antimicrobial drugs in agriculture

The inappropriate use of antibiotics in agriculture drives antibiotic resistance in the same way that it does in humans. And in certain parts of the world, there is far more use in animals than in humans, for example, in the US, animals consume 70%, and humans 30% of the medically important antibiotics.[28]

Antibiotics are used in agriculture for three reasons:

- to treat unwell animals;
- to prevent infection; and
- for growth promotion.

There is concern that extensive use of antimicrobial drugs in agriculture presents risks to human health through transmission of resistant

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[26] Three quarters of doctors take a guess on antibiotics, The Times, 14 November 2017

[27] AMR review, *Infection Prevention, control and Surveillance: limiting the development and spread of drug resistance*, March 2016

[28] AMR review, *Antimicrobials in Agriculture and the Environment: reducing unnecessary use and waste*, December 2015

microbes from animals to humans, as well as to the environment. A useful summary of how this might occur is provided in the December 2015 report by the AMR Review Board:

> The risks associated with the high use of antimicrobials are threefold. Firstly, it presents the risk that drug-resistant strains are passed on through direct contact between humans and animals (notably farmers). Secondly, these drug-resistant strains have the potential to be passed onto humans more generally through the food chain, i.e. when consumers prepare or eat the meat itself. Finally, there is a further indirect threat to human health as result of animal excretion. Both resistant bacteria, as well as significant volumes of antibiotics consumed, are then excreted by animals (with most of the active ingredient unmetabolised). This both releases resistant bacteria into the environment as well as causing the environment to be tainted with antibiotics, providing further opportunities for exposure to bacteria and creating additional selective pressure that leads to the development of drug resistance.[29]

Whilst some still dispute that there is strong enough evidence to show a link between antibiotic use in animals and human resistance, a systematic review of academic studies by the AMR review showed that 72% of the papers found evidence of this link.[30]

Other concerns include that last resort antibiotics for humans are being increasingly used in agriculture.

Spread of AMR infections through global trade and travel

Due to the advent of international trade and travel, AMR infections can spread from regions where they are frequent (i.e. countries with poor infection control and heavy antimicrobial drug use) to those where the infection is not present. In addition, this provides more opportunity for different microbe strains to mix, share genetic material with each other, and therefore accelerate the development of new resistant strains.

AMR in the environment

There is evidence that overuse of antibiotics in humans and animals has led to increased resistance in the environment via human and animal waste, and antibiotic waste products. For example, since the widespread manufacture of antibiotics, resistance has been observed in terrestrial and aquatic environments, as well as in UK wildlife.[31]

The AMR review noted the issues associated with antibiotics in the environment. They highlight the example of nearby rivers near an active pharmaceutical ingredient (API) manufacturer in India:

> For example, an important study by Swedish researchers in 2007 examined a wastewater treatment plant in India that received effluent from 90 bulk API manufacturers. It revealed that shocking levels of APIs were being discharged into a nearby river. It also showed that the concentration of ciprofloxacin, a commonly used antibiotic, exceeded levels toxic to some bacteria by 1000-fold – a

29 Ibid.
30 Ibid.
31 POSTnote, *Antibiotic resistance in the environment*, October 2013

far higher concentration of the antibiotic than would routinely be found in the blood of a patient taking the drug.[32]

[32] Review on Antimicrobial Resistance, *Tackling drug-resistant infections globally: Final report and recommendations*, May 2016

2. The Review on Antimicrobial Resistance

The independent review board for global action against AMR (the review) was launched by the then Prime Minister, David Cameron, in July 2014 and was led by the economist Lord O'Neill of Gatley.[33] The review board aimed to understand the global implications of AMR and propose international solutions for addressing it.[34]

The review has produced a number of publications (available at https://amr-review.org/Publications.html) and presented their final report to the then Prime Minister with recommendations for global solutions in 2016. The review aimed to explore five themes within its reports:

1 the impact of AMR on the world economy if it is not tackled;

2 changing how antimicrobial drugs are used in order to reduce the rise of resistance (informed by advances in genetics, genomics and computer science);

3 how to facilitate the development of new antimicrobial drugs;

4 the potential of alternative therapies to disrupt the rise in resistance; and

5 the need for international action on drug regulation and drug use across humans, animals and the environment.[35]

2.1 Final report

The AMR review's final report was published in May 2016 and made 10 recommendations on tackling AMR globally:

A global public awareness campaign on AMR with the aim of reducing demand for antimicrobials from patients and agriculture. The AMR review estimated that this awareness campaign could cost between $40 and $100 million and this can be provided by public health programmes, support for programmes in middle and low income countries, and corporate sponsorship for events.

Improved hygiene and sanitation to reduce the number of infections. The report claims that all countries will need to act in this respect – developing countries may need to focus on ensuring access to clean water and sanitation, whereas developed countries should look to reducing infections in healthcare settings.

Reduce the unnecessary use of antimicrobials in agriculture for infection prevention, or growth promotion. The review recommended three steps to tackle this issue:

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33 Department of Health and Prime Minister's Office, Prime Minister warns of global threat of antibiotic resistance, 2 July 2014

34 Review on antimicrobial resistance, *Infection prevention control and surveillance: limiting the development and spread of drug resistance*, May 2016

35 Review on Antimicrobial Resistance, *Antimicrobial resistance: Tackling a crisis for the health and wealth of nations*, December 2014

1. 10 year targets for antibiotic reduction. This will require Government support and improved surveillance

2. Restrictions on the use of antibiotics that are last-resort human treatments; and

3. Transparency in the food market should be increased. Consumers should be able to make informed choices about the meat they buy

Improved global surveillance of antimicrobial resistance in humans and animals is required to monitor use of antimicrobials, and the levels of resistance. This will require action from individual Governments with oversight from WHO.

Diagnostic technology needs to be improved to ensure antimicrobials are used appropriately. The Chair of the Review board called on the governments of rich countries to ensure that by 2020, all prescriptions for antibiotics will be on the basis of surveillance information and a rapid diagnostic test where one is available. The review recommended a diagnostic market stimulus to support the diagnostic technology market.

"Rapid diagnostics could transform the way we use antimicrobials in humans and animals: reducing unnecessary use, slowing AMR and so making existing drugs last longer." AMR Review Final report (2016)

Vaccines and other alternative treatments should be promoted. Vaccines have an important role in preventing infection, which can reduce the need for antimicrobials, and slow the development of antimicrobial resistance. The Review suggest the following actions in this area:

1) Use existing vaccines and alternatives more widely in humans and animals;

2) Renew impetus for early-stage research; and

3) Sustain a viable market for vaccines and alternatives.[36]

Increase the numbers working in infectious disease, and improve pay and recognition. The review reports that in the US, infectious disease doctors are the lowest paid of medical specialties, and there are similar findings across other healthcare workers and researchers in this field.

A Global Innovation Fund is needed for early stage and non-commercial research. The review proposes a global fund of up to US$2 billion. It proposes that this be used to fund early stage "blue sky" research and that which is unlikely to receive commercial support.

Incentives for the development of new treatments will increase production of much needed innovative antimicrobials. The review calls for Government to find new ways to make the production of new antimicrobial medicines attractive to the pharmaceutical industry:

The total market for antibiotics is relatively large: about 40 billion USD of sales a year, but with only about 4.7 billion USD of this total from sales of patented antibiotics (that is about the same as yearly sales for *one* top-selling cancer drug). So it is no wonder that firms are not investing in antibiotics despite the very high medical needs. This will not change until we align better the

[36] Review on Antimicrobial resistance, *Tackling drug-resistant infections globally: Final report and recommendations*, May 2016

> public health needs with the commercial incentives. Governments must change this at the national level by considering possible changes to their purchase and distribution systems for antibiotics, to find ways to support better rewards for innovation while helping to avoid over-use of a new product. This can be partly achieved through adjustments to national purchasing and distribution systems, to reflect the diversity of health systems around the world. At the same time, for the drugs that are most needed globally and for which global stewardship and global access are important, we need new ways to reward innovation while reducing the link between profit and volume of sales and ensuring that developers give access and promote stewardship globally.[37]

"We call on the G20 and the UN to focus on this issue in 2016 and to take action on both the supply and demand of antimicrobials, sparking a step-change in the fight against AMR." AMR Review Final report (2016)

The review suggest the introduction of incentives (market entry awards) for the development or new antibiotics or alternative treatments.

The establishment of a global coalition on AMR. The review emphasises that action on AMR must be on a global basis in order to be successful. It calls on the UN and the G20 to lead on this issue.

The cost of global action on AMR

The review's final report estimates that global action on AMR over a 10 year would be US$40 billion, including:

- US$16 billion to promote the development of new treatments, and invest in better use of existing treatments (including new market rewards);
- US$2 billion for the AMR Global Innovation Fund over five years; and;
- US$1-2 billion to support innovation in the development of new diagnostics and vaccines.

Further work would be required to look at the costs of reducing antibiotic use in agriculture, and improving hygiene and sanitation.

The Review concluded that the *"cost of action is tiny in comparison to the cost of inaction"*:

> So in total, we estimate that the world can avert the worst of AMR by investing three to four billion USD a year to take global action. This is tiny in comparison to the cost of inaction. It is also a very small fraction of what the G20 countries spend on healthcare today: about 0.05 percent.[38]

2.2 Government response

The Government published its response to the AMR review recommendations in September 2016. It agreed with the recommendations regarding a need for investment in R&D. It reported that it would work to gain global support for the proposals and that it had already committed £50 million over the next five years to establish a Global AMR Innovation Fund. It reported that it hoped this would

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37 Review on Antimicrobial resistance, *Tackling drug-resistant infections globally: Final report and recommendations*, May 2016

38 Ibid

encourage investment from other Governments, third sector and industry.[39]

The response also highlighted the importance of choosing antimicrobials appropriately, and therefore the development of cost-effective and rapid diagnostic tools.

The Government committed to

- reducing healthcare associated Gram-negative infections (such as E-coli) by 50% in England by 2020 through producing guidance and data, and supporting local teams to control these infections;
- Reducing inappropriate prescribing of antibiotics by 50% by 2020;
- Delivering high quality diagnostics in the NHS;
- Reducing the use of antibiotics in livestock and fish farmed for food;
- To run a campaign to look at the best ways to communicate AMR and drive behaviour change; and
- working internationally with other countries and organisations to tackle AMR.

In response to a Westminster hall debate in March 2017, the then Public Health Minister, Nicola Blackwood, stated that the UK Government had used the response to the AMR review and the UK antimicrobial strategy to "drive change at home and abroad."[40] She reported that the challenge from AMR was a global one and required global leadership:

> The UN declaration was the start of a longer process to make sure that all countries develop and implement a national action plan, and it is essential that the follow-up process, which was agreed in the declaration, is put in place as soon as possible, to ensure that no time is lost in getting to where we want to be before we go back to the UN General Assembly in 2018. Within that timeframe, we will continue to support other countries to tackle antimicrobial resistance, including providing help to build capability and capacity to develop good surveillance systems in low and middle-income countries, through our £265 million Fleming fund and our £1 billion Ross fund, exactly as the hon.[41]

2.3 Stakeholder response

The Association of the British Pharmaceutical Industry, along with other representatives of the international pharmaceutical industry, welcomed the recommendations in the report. It reported that the industry is already leading action to tackle antimicrobial resistance, and highlighted the Davos declaration in January 2016, where over 100 pharmaceutical companies, and others signed up to three commitments on antimicrobial resistance:

- Reduce the development of AMR;

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39 Department of Health, Antimicrobial resistance review: government response, 18 September 2016

40 HC Deb 7 March 2017, c267WH

41 Ibid.

- Invest in R&D to meet public health needs; and
- Improve access to antimicrobials and vaccines for all.[42]

The Royal College of General Practitioners (RCGP) agreed with recommendations in the final report regarding investment in the R&D of new drugs. The then Chair of the RCGP, Dr Maureen Baker, also reported that doctors take warnings about inappropriate prescribing very seriously. However, to reduce pressure on doctors to prescribe antibiotics, more needed to be done to improve public awareness of antimicrobial resistance:

> "Growing resistance to antibiotics continues to be a global threat, yet astonishingly, there hasn't been a new class of antibiotics produced in over 25 years.
>
> "We agree with Lord O'Neill that more investment in the research and development of new drugs to tackle emerging diseases is desperately needed, and if offering incentives to pharmaceutical companies helps facilitate this, then it should be encouraged.
>
> "Healthcare professionals across the UK are taking warnings about inappropriate antibiotics prescribing very seriously, with recent figures revealing that antibiotics prescribing rates are at their lowest in five years.
>
> "But it is not only the healthcare sector that needs to play its part in reducing antibiotics prescribing - change needs to take place in agriculture and to tackle the overuse of drugs in farming.
>
> "GPs also come under enormous pressure from patients to prescribe antibiotics, so we need to do more as a society to make the public realise that prescribing antibiotics is not always the answer to treating minor, self-limiting illness and that the inappropriate prescribing of antibiotics will only serve to do more harm than good.[43]

The Responsible Use of Medicines in Agriculture Alliance (RUMA), whose members include the British Veterinary Association, the National Farmers Union and the Royal Society for the Prevention of Cruelty to Animals (RSPCA), stated that it supported the main findings of the report and acknowledged that tackling AMR required global action across human and animal health. However, the Secretary General of RUMA, John Fitzgerald stated that whilst long term targets on antibiotic use can be useful, "*inappropriate targets can also be counterproductive and even lead to increased risk of resistance*". The organisation announced the establishment of a task force to look at targets that would work for the sector, and protect animal health.[44]

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42 ABPI, *ABPI, EFPIA, IFPMA and JPMA issue joint statement following publication of the final report by the Review on AMR*, May 2016

43 RCGP, RCGP response to Lord O'Neill's review of antibiotics resistance, May 2016

44 RUMA, *RUMA welcomes O'Neill findings with announcement of targets 'task force'*, 19 May 2016

3. UK action on AMR

The UK Government has played a significant role in the ongoing international work on antimicrobial resistance. This has included initiating the AMR review,

National work on this issue is primarily set out in the 5 year AMR strategy (outlined below). Beyond this, both Government departments and agencies, as well as organisations such as the Wellcome Trust, medical royal colleges and animal health organisations all play an important role in encouraging antimicrobial stewardship, supporting research into new diagnostics and treatments, and promoting awareness of AMR.

This section will provide an overview of the five AMR strategy and some examples of policy in specific areas.

3.1 UK 5 Year Antimicrobial Resistance Strategy 2013 to 2018

The Government launched its 5 Year Antimicrobial Resistance Strategy in September 2013. [45] This document set out actions to tackle antimicrobial resistance, following the case for action in the 2013 Chief Medical officer report.

The strategy identified antibiotic resistance as the greatest concern but aimed to slow the spread and development of AMR as a whole via 3 strategic aims:

1 Improved knowledge and understanding of AMR;

2 Ensuring existing treatments stay effective; and

3 New therapies

The strategy takes a 'one health' approach: addressing AMR in humans, animals and the environment. A number of Government departments and agencies are involved in the strategy, which is led by Public Health England (PHE), the Department of Health (DH), and the Department for Environment, Food and Rural Affairs (Defra).

A high level steering group that includes NHS England, the National Institute for Health and Care Excellence (NICE) and the Medicines and Healthcare Products Regulatory Agency (MHRA) is responsible for leading on the strategy. In addition, the Advisory Committee on Antimicrobial Prescribing, Resistance and Healthcare Associated Infection (ARHAI) provides scientific advice to support delivery of the AMR strategy.

The strategy proposes to achieve its strategic aims via 7 key areas for future action:

[45] Department of Health and Department for Environment Food and Rural Affairs, UK five year antimicrobial resistance strategy 2013 to 2018, September 2013

1 Improve infection prevention and control practices in human and animal health

2 Optimise prescribing practices

3 Improve professional education, training, and public engagement

4 Develop new drugs, treatments and diagnostics

5 Better access to and use of surveillance data

6 Better identification and prioritisation of AMR research needs

7 Strengthen international collaboration

Further information on the strategy is available on the Antimicrobial Resistance (AMR) Collection webpage.[46]

UK progress

The most recent progress report to the UK AMR strategy was published in September 2016. A full list of the key work and achievement in the 2015 period is provided in an annex to the report.

In human health, the Government reported that whilst the level of resistance in the five microorganisms monitored had generally remained stable, the incidence of some resistant infections is increasing.

In animal health, with reference to a list of infections and the drugs which can be used to treat them- it was reported that the UK has the lowest level of resistance for six of the treatment combinations and was in the lower level of resistance for all combinations.

The Government report that its strategy is focused on three pillars, prevent, protect and promote. The summary of the report provides an overview of activity in 2015. It reported that progress has been made putting in place the building blocks for success, and early signs suggested good results with some initiatives but that there is yet to be unequivocal evidence that these measures are making a difference.

The summary also sets out the international work undertaken by the UK Government:

> Internationally we will build on what has been achieved in 2015 by reinforcing the importance of AMR as a global economic and social threat, to secure wider international political support for tackling AMR. In particular, we are working with international partners to achieve a successful high level declaration or resolution on AMR at the United Nations General Assembly in 2016.

3.2 UK surveillance of AMR

Surveillance of antimicrobial prescribing and the epidemiology of bacterial infections was highlighted in the AMR strategy as being essential for to provide an evidence base to inform decisions to tackle AMR. It stated that improved sharing of information would enable

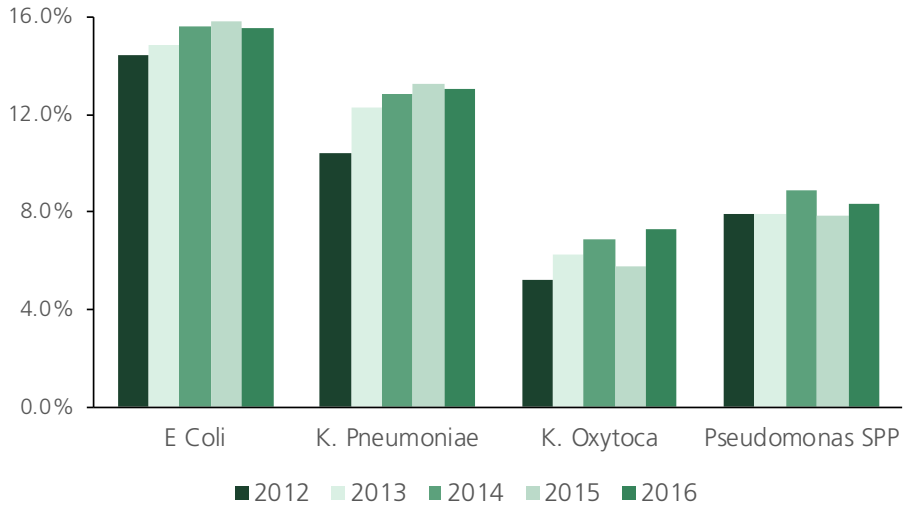
[46] DH, PHE, Defra, and Veterinary Medicines Directorate, Antimicrobial Resistance (AMR), 14 August 2014

better early warning system and therefore containment of resistant organism.

As part of the AMR strategy, PHE launched the English surveillance programme for antimicrobial utilisation and resistance (ESPAUR) report in 2013.[47] The ESPAUR report is published annually and includes national data on antibiotic prescribing, resistance, and hospital antimicrobial stewardship implementation.

The most recent ESPAUR report was published in October 2017.[48] This showed that for all infections the percentage of cases involving antibiotic resistance was higher in 2016 than 2012. The chart below shows a brief time series of the proportion of reported cases involving antibiotic resistance for four main infections: E coli, K.Pneumonia, K. Oxytoca and Pseudomonas SPP:

PERCENTAGE OF REPORTED CASES THAT ARE RESISTANT TO ANTIBIOTICS
England



This report also noted that AMR was common in the more than 1 million UTIs caused by bacteria identified in NHS laboratories in 2016.

However, the report sets out that antibiotic use had reduced by 5% between 2012 and 2016[49] and in the same period, the number of prescriptions dispensed in primary care had decreased by 13%:

> The number of prescriptions dispensed in the GP setting decreased by 13% between 2012 and 2016 (-2% from 2015 to 2016), largely driven by reductions in use of penicillins. Dental practices dispensed 1 in 5 fewer prescriptions in 2016 compared to 2012 and more than 99% of prescribed antibiotics were in accordance with dental treatment guidelines. Secondary care, despite some progress observed in 2015, has not had a sustained reduction in total antibiotic prescribing. However, from 2015 to 2016 hospitals reduced their use of the ultra-broad spectrum antibiotics piperacillin/tazobactam and carbapenems (both -4%).

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47 Public Health England, English surveillance programme for antimicrobial utilisation and resistance (ESPAUR): Report 2014, September 2014

48 Public Health England, English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) Report 2017, October 2017

49 When measured as defined daily doses per 1000 inhabitants per day

> This is the first step in reducing antibiotic use in hospitals and focussing on using these antibiotics appropriately is key to preventing the emergence and spread of carbapenem-resistant Gram-negative bacteria.[50]

AMR in animals surveillance

The Veterinary Medicines Directorate also collects information on sales of antimicrobials and data on antimicrobial resistance in the Veterinary Antimicrobial Resistance and Sales Surveillance (UK VARRS).

The most recent VARRS report was published in November 2017, and reported on the following milestones in animal antibiotic use and sales:

- The Government commitment to reduce antibiotic use in livestock and fish farmed for food to a multi-species average of 50 mg/kg by 2018, from 62 mg/kg in 2014, has been achieved two years early. Antibiotic use in food-producing animal species decreased by 27% to 45 mg/kg.
- The lowest UK veterinary antibiotic total sales figure recorded (337 tonnes) since regular UK antibiotic sales reporting began in 1993.
- Reductions across sales of all highest-priority critically important antibiotics (HP-CIAs), including an 83% reduction in sales of colistin use for food producing animals, from an already very low level.
- The report contains expanded data on antibiotic usage for a number of sectors and highlights the reductions achieved in 2016 by the pig and poultry sectors, with overall reductions of 34% in pigs, 37% in chickens, 57% in turkeys and 60% in ducks.
- As well as reductions in overall use, the pig and meat poultry sectors also achieved reductions in use of HP-CIAs by 73% and 78% respectively.[51]

However, the Veterinary Medicines Directorate note that submission of data on usage of antibiotics is voluntary and the figures will therefore not be fully representative. For example, the coverage of pig farms is currently only 33% but this is due to increase. There is an obligation for pharmaceutical companies to report on antibiotic sales, but this does not account for unused or imported/exported drugs.[52]

3.3 Key policies in specific areas

This is not an exhaustive list of all UK policies in these areas but it provides some examples.

For further information on actions addressing different areas the following links may be useful:

- Collection: Antimicrobial resistance, Gov.uk

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50 Public Health England, English Surveillance Programme for Antimicrobial Utilisation and Resistance (ESPAUR) Report 2017, October 2017

51 Veterinary Medicines Directorate, Veterinary Antimicrobial Resistance and Sales Surveillance 2016, October 2017

52 Ibid.

- DH UK 5 Year Antimicrobial Resistance (AMR) Strategy 2013-1018 – see Annex A for summary of key work and achievements in 2015
- The Public Health England Antimicrobial Resistance: resource handbook provides a list and links to all national antimicrobial resistance, (AMR), antimicrobial stewardship (AMS) and infection prevention and control (IPC) resources (aimed primarily at healthcare professionals).
- Public Health England, Health matters: preventing infections and reducing antimicrobial resistance, 13 November 2017

3.4 Infection control

In England, changes to the code of practice relating to prevention and control of infection have strengthened rules for healthcare providers in both primary and secondary care. The CQC can also now assess providers against this code of Practice.[53]

Box 1: Preventing Gram-negative infections

Drug resistant Gram-negative bacteria (described as such because the bacteria's cell envelope does not retain staining dye) such as E.coli are a particular problem in the UK. Gram-negative bacterial infections are increasing, PHE report that E.coli blood stream infections have increased by 6.1% between 2015 and 2016, and it is very difficult to develop new treatments to target them.

The Department of Health have reported that E.coli infections killed more than 5,500 NHS patients in 2015 and are estimated to cost the NHS £2.3 billion by 2018.

In November 2016, the Secretary of State for Health, Jeremy Hunt announced a new target of reducing gram-negative bloodstream infections by 2020.[54] The plans included the following actions:

- more money for hospitals making the most progress in reducing infection rates with a new £45 million quality premium
- independent Care Quality Commission (CQC) inspections focusing on infection prevention based on E. coli rates in hospitals and in the community, and taking action against poor performers
- the NHS publishing staff hand hygiene indicators for the first time
- displaying E. coli rates on wards, making them visible to patients and visitors in the same way that MRSA and C. difficule are currently
- improving training and information sharing so NHS staff can learn from the best in cutting infection rates
- appointing a new national infection lead, Dr Ruth May[55]

The Department report that action in infection control since 2010 has resulted in a 57% reduction in MRSA and a 45% reduction in C.difficile infections.[56]

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53 DH UK 5 Year Antimicrobial Resistance (AMR) Strategy 2013-1018

54 Department of Health, News story: Reducing infections in the NHS, 10 November 2016

55 Ibid

56 Ibid.

3.5 Antimicrobial stewardship

A number of organisations have produced clinical guidelines for prescribers on the appropriate prescribing of antibiotics and antimicrobial stewardship.

The National institute of Health and care Excellence has worked on a number of new guidelines on antimicrobial stewardship, these include:

- Antimicrobial stewardship: systems and processes for effective antimicrobial medicine use, August 2015
- Antimicrobial stewardship - changing risk-related behaviours in the general population, January 2017
- Quality Standard: Antimicrobial Stewardship, April 2016

NICE also produces infection specific guidance on antimicrobials for healthcare professionals, and announced in July 2017 that it was developing 30 new guidelines on when to give antibiotics in common infections.[57]

Other medical organizations have also published guidance documents promoting responsible prescribing:

- Start Smart then Focus: antimicrobial stewardship toolkit for English Hospitals, Department of Health, March 2015
- TARGET Antibiotics Toolkit, Royal College of General Practitioners
- Cochrane Evidence, Improving how physicians working in hospital settings prescribe antibiotics, February 2017

3.6 Improving public awareness

In October 2017 the Department of Health launched a new campaign, Keep Antibiotics working. The campaign will support the government's ambition to halve inappropriate prescribing of antibiotics in the UK by 2020 and includes a new television advert, leaflets and posters to be displayed in GP surgeries.

Antibiotic Guardian is a Public Health England initiative which encourages the public, healthcare professionals and teachers and students to make a pledge and sign up to be an antibiotic guardian. More information about becoming an antibiotic guardian is provided on the initiative's website.

PHE also run a health education programme for children called e-bug. This provides information and games for children about microbes.

The promotion of awareness and knowledge of AMR is also the focus of the following international dates:

- European Antibiotics Awareness Day
- World Antibiotic Awareness week

[57] NICE, New NICE advice about when to give antibiotics for common infections, July 2017

3.7 Supporting research and development

The AMR review highlighted the need for research into new treatments for infections and new diagnostics. This included the establishment of a Global Innovation fund for early stage and non-commercial R&D and incentives to promote investments in new drugs.

In March 2017, the Under-Secretary of State for the Department of Health reported that the Government had invested £369 million in international AMR surveillance and research in the last two years. This includes through the Fleming Fund, Research Council grants and the Global AMR innovation fund.[58]

A Parliamentary Question response in November 2017, from the Under-Secretary of State for Health, Lord O'Shaughnessy, set out the UK Government's international cooperation on the development of new antibiotics:

> The United Kingdom Government considers international inter-governmental co-operation to be essential in the development of new antibiotics.
>
> Through international forums, in particular the G20, the UK Government is advocating tangible actions that will incentivise pharmaceutical companies to produce effective, accessible and affordable new antibiotics. The Government is also investing internationally in early-stage research and development to address antimicrobial resistance, in partnership with other countries and organisations, through projects such as the Global Anti-Microbial Resistance Innovation Fund.[59]

The Global Antimicrobial Resistance Innovation Fund (GAMRIF) was established by the UK and Chinese Governments in 2015. A November 2016 press release provides more information about the fund:

> The GAMRIF will help to invest in:
>
> - high quality research and development and stimulate innovation to tackle antimicrobial resistance (AMR) to promote the welfare of people in low and middle income countries
> - neglected areas which may currently lack commercial or academic interest, for example for research that aspires to prolong the shelf life of existing antibiotics
> - areas of research and development around new therapeutics, alternative therapies, preventative measures and diagnostics[60]

The CMO has appointed an expert advisory group to provide advice on the scope and objectives of the fund. In October 2017, the Under-Secretary of State for Health, Steve Brine, reported that the Government expected the bilateral UK-China partnership £10 million fund to go live in early 2018.[61]

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58 PQ HL5759 [on Antibiotics], 15 March 2017
59 HL Written Question HL2220, 1 November 2017
60 Department of Health, Expert advisory board to support the Global AMR Innovation Fund, November 2016
61 HC Deb 10 October 2017 c162

The Longitude prize is a £10 million fund offered for a diagnostic test to help address antibiotic resistance. Applications are open for ideas for cheap, rapid and easy to use diagnostic kits for bacterial infections.

In July 2016, the Wellcome Trust announced that it had become part of the transatlantic partnership, Combating Antibiotic Resistant Bacteria Biopharmaceutical Accelerator (CARB-X). This aims to provide hundreds of millions of pounds over five years to encourage the development of new antimicrobial drugs.[62] In October 2017, the Wellcome Trust also announced that it was investing £2.4 million in an international project to collect information about antimicrobial resistance.[63]

3.8 Use of antibiotics in animals

The Government reported in their 2016 progress report on the AMR strategy that they are supporting the development of responsible biosecurity and animal husbandry practices, and that the Red Tractor assurance scheme ensures certain standards in this area:

> Through compliance with the Red Tractor assurance scheme standards on biosecurity, animal health and welfare (including segregation pens for sick animals) and responsible use of medicines, more than 85% of the poultry meat industry, 95% of dairy farms and 92% of pork production are working to implement biosecurity and husbandry practices that minimise disease occurrence and transmission. All Red Tractor farms are assessed regularly to ensure compliance with the standards. However, there are still a small percentage of farms that have not signed up to work to Red Tractor standards, that are not regularly assessed and where improvements may be required to meet the Red Tractor standards.

In 2014, the Veterinary Medicines Directorate published guidelines on the responsible use of use of animal medicines.[64] This states that whilst animal medicines play an important role in prevention and treatment of disease, they should be sued responsibly. Antibiotics are not a substitute for good animal husbandry.[65]

A taskforce, established by the organisation, Responsible use of Medicines in Agriculture Alliance (RUMA) has published industry developed guidelines on antibiotic use in agriculture in October 2017. More information is provided in a RUMA press release:

> The Targets Task Force comprises a leading veterinary surgeon and farmer from each of the beef, dairy, egg, fish, gamebird, pig, poultry meat and sheep sectors, who have been consulting with key organisations in their respective industries. The group also includes observers from regulators Food Standards Agency and Veterinary Medicines Directorate (VMD).
>
> While the targets each sector has set vary according to the availability of data and scope in their sector, the targets as a

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62 Wellcome Trust, New US-UK partnership to tackle antibiotic resistance, July 2016
63 Wellcome Trust, Global pledges to speed up action on superbugs, 13 October 2017
64 Veterinary Medicines Directorate, Responsible use of animal medicines on the farm, 2014
65 Veterinary Medicines Directorate, Responsible use of animal medicines on the farm, 2014

whole have been described as 'positive and proactive' by the VMD.

Furthermore, the regulator has welcomed the voluntary sharing of usage data by the different farm livestock sectors, saying it has been 'sincerely impressed by the way different sectors have risen, or are rising to the challenge'.

The headline targets for the eight sectors include a reduction in use of antibiotics in pigs by over 60% between 2015 and 2020, with minimal use of highest priority Critically Important Antibiotics (CIAs). Data released earlier in the day indicate a good start has been made, with usage in the pig sector falling by around 35% between 2015 and 2016.[66]

[66] RUMA, Industry task force announces new farm antibiotic targets, 27 October 2017

4. International action

There has been widespread acknowledgement that action to tackle AMR has to progress on an international basis. This was reiterated in the AMR review final report that calls for the establishment of a global coalition on AMR.

Despite international commitment to address AMR, concerns have been expressed that not enough progress is being made. An international Call to Action event in Berlin, organised by the Wellcome Trust and the UK Government, in October 2017 highlighted the need for the coordination of initiatives and to address gaps in action. Speaking at the event, the Chief Medical Officer, Professor Dame Sally Davies said that whilst progress has been made, tangible action has been slow:

> Drug-resistant superbugs are already killing hundreds of thousands of people around the world, and this problem is only getting worse. The world is taking notice, and huge strides have been made recently – but tangible action has been far too slow to follow. We need to up the ante." She added: "If we are to target our efforts effectively, we need to know where the problems are so it does not undermine global progress. New approaches to convene global experts are crucial and provide some much-needed direction.[67]

4.1 World Health Organisation Global action plan

The World Health Organisation (WHO) has led the international work to acknowledge, monitor and address the progress of AMR. Detailed information on activity is provide on the WHO website.

In 2014, the WHO published the first global surveillance report on AMR. The WHO express concern about the findings of the report- noting that resistance to even to 'last resort' antibiotics was happening globally.[68]

The World Health Assembly endorsed a Global Action Plan on AMR in May 2015. This plan was developed in co-ordination with the Food and Agriculture Organisation (FAO) and the World Organisation for Animal health (OIE)

The goal of the plan is to keep effective prevention and treatment of infectious diseases available to all for as long as possible. There are five strategic aims within the plan:

- to improve awareness and understanding of antimicrobial resistance;
- to strengthen knowledge through surveillance and research;
- to reduce the incidence of infection;

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67 Antibiotic Research UK, Chief Medical Officer calls for new action on antibiotic resistance, 27 October 2017

68 WHO, *WHO's first global report on antibiotic resistance reveals serious, worldwide threat to public health*, April 2014

- to optimize the use of antimicrobial agents; and
- develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions.[69]

An important action within the Global Action Plan is the monitoring of actions to address AMR in countries around the world. The WHO website provides information about national action plans, and provides guidance for the setting up of national actions plans.

The Organisation for Animal Health provides further information about its role in tackling antimicrobial resistance on its website, including intergovernmental standards on monitoring antimicrobial agent use, and guidelines on prescribing in animals.

United Nations High-Level meeting

On 21 September 2016, world leaders met at the United Nations in New York. Member States adopted a Political declaration acknowledging the global problem of antimicrobial resistance, and a consensus about the actions required to tackle it.

Commitments were made to develop national action plans in co-ordination with the WHO global action plan. The WHO, FAO and OIE were asked to work with other stake holders to co-ordinate planning and actions and report back to the UN Assembly.

Following on from the High Level meeting, in March 2017 the Secretary-General of the UN announced the establishment of an ad hoc Interagency Coordination Group on Antimicrobial Resistance (IACG). The group will provide practical advice on global approaches to addressing AMR.

The IACG includes representatives of UN agencies and international organisations, and experts across different sectors. The Chief Medical Officer, Professor Dame Sally Davies is a member of this group.

More information about the group, and its meetings is provided on the WHO website.

4.2 European Union work on AMR

The European Commission adopted a new EU One Health Action plan against AMR in June 2017. This replaces and continues the work of the 2011 plan. The plan includes measures on a range of issues, including supporting research, improving monitoring and surveillance and offering support to Member States to coordinate action. The key objectives of the plan are

> Its overarching goal is to preserve the possibility of effective treatment of infections in humans and animals. It provides a framework for continued, more extensive action to reduce the emergence and spread of AMR and to increase the development and availability of new effective antimicrobials inside and outside the EU

69 WHO, *Global action plan on antimicrobial resistance*

> The key objectives of this new plan are built on three main pillars:
>
> 1. making the EU a best practice region: as the evaluation of the 2011 action plan highlighted, this will require better evidence, EU action will focus on key areas and help Member States in establishing, implementing and monitoring their own national One Health action plans on AMR, which they agreed to develop at the 2015 World Health Assembly20;
>
> 2. boosting research, development and innovation by closing current knowledge gaps, providing novel solutions and tools to prevent and treat infectious diseases, and improving diagnosis in order to control the spread of AMR;
>
> 3. intensifying EU efforts worldwide to shape the global agenda on AMR and the related risks in an increasingly interconnected world.[70]

In an October 2017 speech, the European Commissioner for Health and food safety, Vytenis Andriukaitis, outlined recent EU action in this area, highlighting proposed new regulations on veterinary medicines:

> Working closely with Member States, the European Commission has made significant progress in the fight against AMR. We have:
>
> - Banned antibiotics for growth promotion in the EU;
> - Strengthened surveillance of consumption at EU level;
> - Introduced regulatory proposals on veterinary medicines and medicated feed;
> - Introduced guidelines on the prudent use of antimicrobials in veterinary medicine and human health;
>
> By seeking to strengthen the EU action against AMR, the proposed Regulations on veterinary medicines and medicated feed deliver a significant One Health dimension.
>
> They contain a comprehensive package of measures, including:
>
> - data collection on the sale and use of antimicrobials;
> - incentives for developing new antimicrobials;
> - strengthened prescription requirements;
> - the possibility of reserving certain antimicrobials for humans only;[71]

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70 European Commission, *A European One Health Action Plan against Antimicrobial Resistance (AMR)*, June 2017

71 European Commission, Speech: "One Health AMR Multi-sectoral call to action" reception, Berlin, 12 October 2017

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