



# REDUCING ANTIMICROBIAL RESISTANCE

how health professionals can help

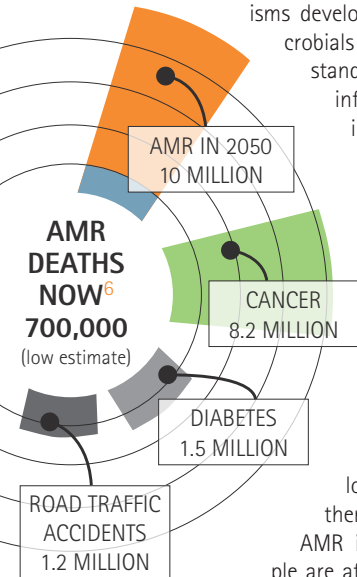


## THE IMPACT OF ANTIMICROBIAL RESISTANCE (AMR) ON OUR SOCIETY

The more antimicrobial agents are used, the less effective they become, as bacteria and other microorganisms develop ways to counteract antimicrobials and become resistant<sup>1</sup>. When standard treatments stop working, infections become harder or impossible to control, increasing the risk of the infection spreading to others. Illnesses and hospital stays can be prolonged, and the risk of death increased<sup>2</sup>.

Each year, antimicrobial-resistant infections lead to 25,000 deaths in the European Union, costing at least €1.5 billion per year in increased healthcare costs and loss of productivity<sup>3</sup>. Worldwide, there are 700,000 deaths from AMR infections<sup>4</sup>, and 480,000 people are affected by multi-drug resistant tuberculosis each year. The fight against HIV and malaria is also exacerbated by drug resistance<sup>5</sup>.

Furthermore, a lack of research and development (R&D) in the last thirty years or so means a potentially grim shortage of alternative antimicrobials in the future. Deaths caused by AMR are forecast to reach 10 million per year for 2050 unless there is significantly more investment in R&D, reductions in the quantities of antimicrobials used, and attention to the control of infectious diseases<sup>6</sup>.



**"[AMR] IS THE GREATEST SINGLE CHALLENGE IN INFECTIOUS DISEASES TODAY."**

Dr Keiji Fukuda, WHO's Assistant Director-General for Health Security<sup>7</sup>

## ENVIRONMENTAL POLLUTION - A PROBLEM WITH PRODUCTION

According to a 2013 report by the European Executive Agency for Health and Consumers, of all the risks from medicinal product residues in the environment, AMR poses the greatest risk to humans<sup>14</sup>.

The pharmaceutical industry plays an important role in environmental contamination by antimicrobials, which has been proven to contribute to the proliferation of resistant bacteria<sup>10,15,16</sup>. Many pharmaceutical producers have outsourced the problem outside of Europe, mostly to China and India, where active pharmaceutical ingredients (APIs) are produced and sold on to markets worldwide<sup>15,17</sup>. There is considerable concern, however, that low prices for pharmaceuticals can also mean low manufacturing standards, resulting in environmental pollution<sup>6</sup>.

## PHARMACEUTICAL DISPOSAL - AN UNRECOGNISED FACTOR OF AMR

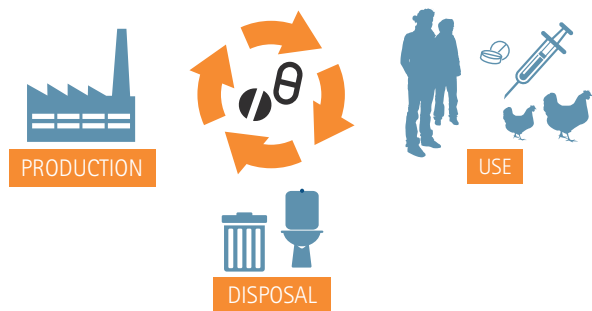
**THE INAPPROPRIATE DISPOSAL OF ANTIMICROBIALS, BY FLUSHING THEM DOWN THE TOILET OR THE SINK FOR EXAMPLE, RESULTS IN ENVIRONMENTAL POLLUTION<sup>13</sup>.**

AMR is caused primarily by the inappropriate use and overuse of antibiotics in humans and animals, but increasing evidence shows that pharmaceutical waste<sup>8</sup> from excretion and disposal (including wastes from the pharmaceutical manufacturing processes) is a real concern in the development of resistance<sup>9-11</sup>.

A significant factor is the deficient implementation of collection schemes for unused and expired medicines throughout Europe<sup>12</sup>.

Sewage treatment systems are inadequate for the complete removal of active pharmaceutical ingredients in waste water<sup>8</sup>, and this contributes to the spread of resistance.





Pharmaceuticals can enter the environment at all stages of their life-cycle.

## HOW DOES THE HEALTH SECTOR CONTRIBUTE TO THE AMR CRISIS?

The increasing use of antimicrobials is a very important factor in the spread of resistance, and reducing unnecessary use is regarded as a key strategy for tackling the problem<sup>6</sup>.

Every year, millions of inappropriate antibiotic prescriptions are written, adding to the development of resistance<sup>18</sup>.

Inappropriate prescribing can occur in a number of circumstances. A doctor may prescribe a drug that proves to be inefficient because of a resistant infection, antibiotics may be prescribed to a patient suffering from a viral infection due to a lack of information, and second or third-line antibiotics may be prescribed when a first-line antibiotic would work<sup>6</sup>.

Due to the lack of rapid diagnostic tests, doctors still prescribe antibiotics based on immediate assessment of a patient's symptoms. In many cases, antibiotics are prescribed prophylactically because they are cheaper in comparison with the available diagnostic tests<sup>6</sup>.

In spite of a European Union Council recommendation to ensure that antibiotics are being used as prescription-only medicines in the Member States<sup>19</sup>, it is believed that in some areas of Southern and Eastern Europe 20 to 30% of antibiotics consumed are without prescription<sup>6,20</sup>.

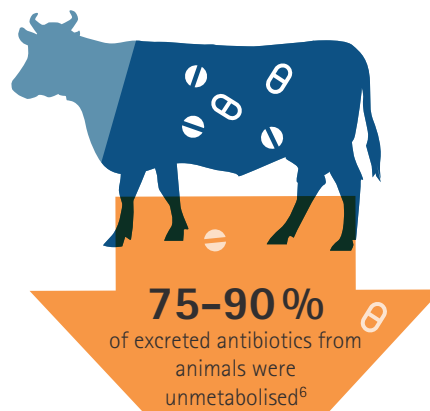
In addition, antibiotics and antibiotic-resistant bacteria are present in both hospital and municipal sewage systems<sup>21</sup>. For example, studies have shown that significant concentrations of antibiotics exist in hospital effluents in countries such as Germany<sup>22</sup>.

## ANTIMICROBIALS IN FOOD PRODUCTION CONTRIBUTE TO THE SPREAD OF AMR

Data regarding the exact quantity of antimicrobials used in food production worldwide is lacking, but it is known that in some regions antimicrobials are used more in animals than in humans. Antimicrobials are often administered to healthy animals rather than just used to treat diseases. In the US, more than 70% (by weight) of the antibiotics considered medically important for human health are used in livestock<sup>23</sup>.

Last-resort antibiotics may be given when an infection has not responded to other drugs. The frequent use of last-resort antibiotics in livestock can increase the threat of AMR, as antibiotics lose their efficacy in humans when they are routinely absorbed in low levels through the food chain. Colistin is not widely used in humans because it can cause kidney failure, but it remains an important last-resort antibiotic<sup>6</sup>. However its widespread use in animals has led to resistance in animal pathogens with worrying implications for human health. A recent scientific paper reports the discovery of transferable colistin resistance in bacteria in humans and animals in China<sup>24</sup>.

But not only animal-based products may be contaminated with antimicrobial resistant bacteria and/or antimicrobial resistance genes. Other ingredients intentionally added during food processing (such as starter cultures, probiotics, bioconserving microorganisms, and bacteriophages), can spread antimicrobial resistant bacteria. Such bacteria can also be spread through cross-contamination (for example when raw food is mixed with other ingredients). While cooking processes often kill resistant bacteria, raw food products pose a substantial risk of transferring antimicrobial resistance to humans through consumption<sup>25</sup>.



## HOW DOES AMR DEVELOP?

The development of resistance is a normal evolutionary process for all species, including microorganisms such as bacteria, viruses, parasites and fungi. It is an example of natural selection, where the bacteria that are resistant have more chances to survive, reproduce and pass on their genes, while weaker bacteria are killed.



## POLICY ACTIONS TO ADDRESS AMR

### GLOBAL ACTION PLAN

In May 2015 the WHO adopted a global action plan on antimicrobial resistance<sup>1</sup>, urging countries to adapt this plan as a basis for their own national priorities and specific contexts, and to have national plans in place by May 2017.

### INTERNATIONAL RECOGNITIONS

Recent G7 statements<sup>26,27</sup> recognised the urgent need for national efforts to share best practices and promote the prudent use of antimicrobials<sup>28</sup>.

A political declaration to combat the global threats posed by AMR was adopted in 2016 at the 71st United Nations General Assembly demanding that countries should develop multi-sectoral national action plans on AMR, which must be in line with the WHO Global Action Plan<sup>29</sup>.

### INTERNATIONAL COLLABORATIONS

Through the Transatlantic Task Force on Antimicrobial Resistance (TATFAR), established in 2009, the EU collaborates closely with the USA, Canada, and Norway to address AMR<sup>30</sup>.

The European Commission also collaborates with the Organisation for Economic Co-operation and Development (OECD), to assess the economic impact of AMR<sup>31,32</sup>.

The Food and Agriculture Organisation of the United Nations (FAO), and the World Organisation for Animal Health (OIE), all collaborate in sharing responsibilities in tackling AMR<sup>33</sup>. There is also international cooperation among countries through an Intergovernmental Task Force on Antimicrobial Resistance<sup>34</sup>, which reports to the Codex Alimentarius Commission.

### ACTIONS TAKEN AT THE EU LEVEL

At the European level, the European Commission's Action Plan on AMR<sup>35</sup> outlined the main actions for its implementation amongst Member States, and identified the areas where measures are most needed. The European Commission is due to develop a new action plan in 2017.

Currently, the European Commission is working on a new regulation for veterinary medicines, which will propose new policy measures to tackle AMR by ensuring proper use of antimicrobial drugs in farming practices.

## A GERMAN ENVIRONMENT AGENCY DATABASE SHOWS THE GLOBAL DISTRIBUTION OF ANTIMICROBIALS IN THE ENVIRONMENT

In 2016, the German Environment Agency developed a database on pharmaceuticals in the environment, collected through a comprehensive literature review of 1,016 original publications and 150 review articles. Worldwide data on the environmental concentrations of human and veterinary pharmaceutical substances in surface water, groundwater, tap/drinking water, manure, soil, and other environmental matrices, were compiled systematically into a database. The database contains over 120,000 entries, a third of which relate to antimicrobials. Users, including health professionals, are able to search for data pertaining to a particular region, antimicrobial substance, or other pharmaceutical substance of interest.

For more information, visit: [www.umweltbundesamt.de/en/database-pharmaceuticals-in-the-environment-0](http://www.umweltbundesamt.de/en/database-pharmaceuticals-in-the-environment-0)

## HOW CAN HEALTH PROFESSIONALS HELP REDUCE PHARMACEUTICAL POLLUTION THAT LEADS TO AMR?

### SIMPLE PRACTICES CAN HELP REDUCE UNNECESSARY USE OF ANTIMICROBIALS:

- Optimise prescription practices to ensure antibiotics are prescribed and dispensed prudently
- Further develop and make use of the rapid point-of-care diagnostics in primary and secondary care whenever available to support the clinical decision
- Advise on and make use of alternative approaches (e.g., vaccination) to prevent infection



### PRACTICES TO TACKLE THE SPREAD OF ANTIMICROBIAL RESISTANCE:

- As major buyers of antibiotics, hospitals should include environmental criteria in their procurement decisions
- Advocate policy changes at hospital administrative level to prioritise the purchase of meat raised without the use of routine antibiotics
- Improve sanitation infrastructure in hospitals to prevent healthcare associated infections
- Improve waste management practices to increase the removal efficiency of pharmaceutical and microbes



## HOW CAN HEALTH PROFESSIONALS LEAD THE CHANGE BY INFLUENCING PATIENT'S PURCHASING DECISIONS?

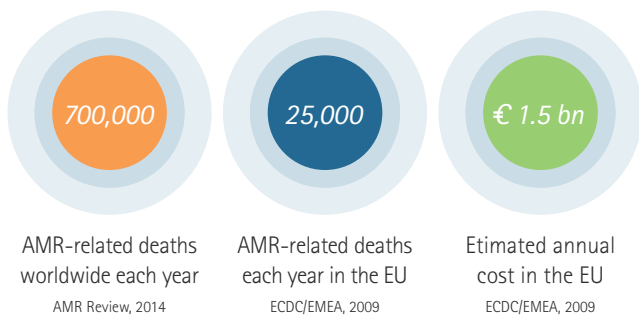
Health professionals can influence patients' use of antimicrobials, and should be actively involved in reducing the misuse and overuse of these valuable drugs.

### SIMPLE REMINDERS TO PATIENTS CAN REDUCE THEIR DEMAND FOR ANTIMICROBIAL DRUGS AND IMPROVE THEIR DISPOSAL BEHAVIOUR:

- Demanding unnecessary antibiotic therapies from health professionals or buying antibiotics over-the-counter can contribute to AMR and be harmful both for patients and society
- Advise patients about the risks associated with antimicrobial therapy and the use of preventative measures to avoid this type of therapy
- Never dispose of unused antimicrobials in the toilet or sink
- Advise patients on the safe, recommended methods for disposing or returning unused antimicrobial drugs

## EDUCATING PATIENTS CAN ALSO:

- Help patients be more informed about the antimicrobial drugs they consume and the risks associated with the antimicrobial therapy
- Reduce the accumulation of unused antimicrobials
- Improve public awareness of pharmaceutical pollution and waste that leads to antimicrobial resistance
- Reduce incidences of abuse and occurrence of resistant infections



## BENEFITS OF REDUCING UNNECESSARY USE OF ANTIMICROBIAL DRUGS:

- Reduced healthcare costs associated with treating resistant infections
- Reduced incidence of resistant infections, the length of hospital stays, and the death toll associated with AMR occurrence
- Optimised use of healthcare resources
- Preserved efficacy of current antimicrobials

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