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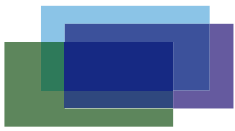
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## The European approach to antimicrobial resistance: success stories and challenges

Didier Wernli<sup>1</sup>, Thomas Haustein<sup>2</sup>, Stephan Harbarth<sup>2</sup>

### Antimicrobials – miracle drugs under threat

Antimicrobials are drugs that kill or inhibit the growth of micro-organisms including bacteria, viruses, fungi and parasites (see Box 1). The introduction of the first modern antimicrobials to clinical practice in the first half of the 20th century marked a revolution in the treatment of infectious diseases and contributed to the major gains in life expectancy during the second part of the last century. In the case of tuberculosis, the use of antibiotics has reduced mortality from 50 per cent to less than 1 per cent [1]. Thanks to the wide availability of antibiotics in the developed world, it became rare for a patient in those countries to die of an overwhelming infection with no curative options. These impressive results were followed by a period of optimism. In 1967, William H. Stewart, US Surgeon General at the time, famously suggested that it was “time to close the book on infectious diseases” and focus on chronic diseases.

While some people tried to draw attention to the fact that this optimism could be misplaced, due to the ability of micro-organisms to adapt to antimicrobials and become resistant to their action, the use of antimicrobials became widespread, not only in human medicine, but also – and to an even greater extent – in animal husbandry, veterinary medicine, agriculture and aquaculture. In addition, investment in the research and development of antimicrobials waned from the 1960s onwards. The reasons for this included the difficulty and cost of identifying

new molecules with superior antimicrobial activity, regulatory hurdles and a lack of interest from market actors – most antimicrobials are given for short periods of time, while drugs for chronic diseases are often prescribed for life and can, therefore, generate higher sales volumes. The uncontrolled use of antimicrobials and the decline in research created the conditions for antimicrobial resistance (AMR) to turn into a real clinical problem. From the 1980s onwards, it became increasingly clear that bacteria were taking advantage of the innovation gap in antimicrobial development and that new resistance mechanisms were spreading rapidly. Unfortunately,

#### Box 1

#### Antimicrobial or antibiotic: is there a difference?

Antimicrobial is the generic name for substances that kill or inhibit the growth of micro-organisms including bacteria, viruses, fungi and parasites, and that are used to treat or prevent infections. The term ‘antibiotic’ was originally coined to describe antimicrobial substances produced naturally by micro-organisms themselves. In everyday use, the word antibiotic refers to a subclass of antimicrobials that are active against bacteria. It is important to bear in mind that infectious diseases can also be caused by life forms other than bacteria, e.g., viruses and parasites. These pathogens are not normally affected by the antibiotics used to treat bacterial infections. Drugs that are used to treat viral infections are called antivirals.

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an underestimate of the threat posed by AMR and the enormous complexity of the problem resulted in a very limited response to these warning signals.

Today, although public health measures such as improved sanitation and immunization have dramatically reduced the threat that many infectious diseases pose to the general public in developed countries, contemporary medicine relies heavily on the availability of effective antibiotics. Intensive care medicine, cancer treatment, organ transplants and even routine surgical procedures would be impossible or, at least, highly risky without these drugs. Unfortunately, we are now increasingly being confronted with multi-resistant infections that are difficult or impossible to treat with available antibiotics. The impact of AMR is equivalent to losing an antibiotic. This may result in increased costs, more suffering and, in the worst case, premature deaths. A recent report estimates that the number of extra deaths caused by common resistant bacteria in Europe has already exceeded 25,000 per year [2]. In terms of costs, the same report extrapolates that added costs and productivity losses as a result of antibiotic resistance amount to 1.5 billion euros a year in the European Union – probably an underestimate [2]. Factors contributing to increased costs include the need for second- or third-line treatments – which can be more expensive in themselves or cause higher rates of adverse effects – additional treatments (e.g., surgical interventions) and prolonged hospital stays[3]. The impact of AMR is felt most severely in healthcare facilities, as this is where the sickest patients are cared for and where rates of AMR are higher due to the intensive use of antimicrobials. However, experience has shown that resistant micro-organisms also spread and become highly prevalent in the community. The effects of AMR outside hospital may, in many cases, be limited to an increased duration of symptoms in common infections such as urinary tract infections. However, in a significant minority of cases, AMR is also likely to have more serious consequences such as a higher rate of complications and an increase in hospital admissions.

## **Biological foundation of AMR and factors driving antibiotic (mis)use**

The spread of AMR is the result of ‘selective pressure’ and the ability of bacteria to acquire new genetic information. Bacteria can readily exchange genetic material among themselves – even when not closely related – and thereby acquire new resistance mechanisms. New resistance mechanisms can also arise through random genetic mutation. Mutations that are beneficial for a given bacterium are extremely rare. However, the unimaginably large number and short generation time of bacteria makes the improbable likely. It is the very use of antibiotics – any use, whether medically indicated or not – that promotes the emergence and spread of resistance. Imagine that a patient carries a mix of bacteria, most of which are susceptible and some of which are resistant to a given antibiotic. Exposure to the antibiotic will kill the susceptible bacteria. The resistant bacteria will survive and take advantage of the newly available space and nutrients to multiply – a process that is referred to as selection. Each time we use an antibiotic, we exert selective pressure on the bacteria. In simple terms, the more antibiotics we use, the more resistant bacteria we get, and the quicker we lose the efficacy of antibiotics. This observation has inspired the concept of antimicrobials as a non-renewable resource [4]. The more wisely we use antibiotics, the longer they will remain effective.

In view of the clear link between the amount of antibiotics used and the speed with which resistance develops and spreads, along with the difficulty of developing new antimicrobials, the only reasonable solution is to limit the use of antibiotics to the necessary minimum. Although this necessary minimum is difficult to define, many experts consider that global antimicrobial use can be greatly reduced and optimized. The World Health Organization (WHO) defines the appropriate use of antimicrobials as “the cost-effective use of antimicrobials which maximizes clinical therapeutic effect while minimizing both drug-related toxicity and the development of antimicrobial resistance” [5]. From the AMR perspective, misuse can therefore refer to antibiotics given in the wrong context (e.g., for diseases that are not caused by bacteria, or bacterial infections that would get better on their own), or at the wrong dose or for the wrong duration. Exposing infectious agents to subinhibitory or sublethal concentrations of a drug particularly favours the development of AMR. Factors contributing to the emergence of AMR are shown in Table 1. While the contribution of each factor is difficult to quantify, the overall link between the consumption of antibiotics and the prevalence of resistance across Europe and the rest of the world is undisputed.

Table 1

### Factors contributing to the non-rational use of antimicrobials at different levels (adapted from the WHO global strategy on antimicrobial resistance [5])

<b>Patient</b>	<ul style="list-style-type: none"> <li>• Self-medication (unnecessary use, inadequate dose, substandard drug quality)</li> <li>• Poor adherence to regimens (medication oversight, treatment interruption)</li> <li>• High need (poor underlying health, poor living conditions)</li> <li>• Misperception (over-reliance on antimicrobials, inappropriate belief, 'expensive is better' myth)</li> <li>• Poverty-associated under-treatment (inability to afford full course of treatment)</li> <li>• Response to direct-to-consumer advertising by pharmaceutical manufacturers and retailers</li> </ul>
<b>Prescribers and dispensers</b>	<ul style="list-style-type: none"> <li>• Lack of knowledge (inappropriate prescribing: indication, dose, route, duration)</li> <li>• Inadequate diagnosis tools (lack of accurate tests at point-of-care)</li> <li>• Prescriptions in response to patient pressure</li> <li>• Exaggerated fear of bad clinical outcomes (including fear of litigation)</li> <li>• Economic incentives</li> </ul>
<b>Governments and health systems</b>	<ul style="list-style-type: none"> <li>• Absence or lack of implementation of national policies to contain AMR (surveillance of AMR)</li> <li>• Ineffective regulatory mechanisms for drug licensing and selling (substandard drug, counterfeit)</li> <li>• Control of drug supply (distribution and sales not regulated, informal sector sales)</li> </ul>
<b>Hospitals</b>	<ul style="list-style-type: none"> <li>• Lack of hospital therapeutics committee (uncontrolled use of antimicrobials by clinicians)</li> <li>• Lack of antimicrobial policies not updated with surveillance data and/or poor information flow</li> <li>• Lack of infection control committees, procedures or guidelines (inadequate hygiene practices, e.g., hand hygiene)</li> <li>• Lack of sterile supplies (transmission of micro-organisms via non-sterile procedures)</li> </ul>
<b>Non-medical uses of anti-microbials</b>	<ul style="list-style-type: none"> <li>• Use of growth promoters in food animals</li> <li>• Use of antimicrobials for treatment and disease prevention (prophylaxis, metaphylaxis) in food animals, agriculture and aquaculture</li> </ul>
<b>Private industry</b>	<ul style="list-style-type: none"> <li>• Industry/wholesaler/retailer pressure to sell and/or over-promotion/misleading promotion</li> </ul>

## International spread of AMR

AMR is a truly global problem. Whenever people, animals or goods cross borders, microbes are carried with them. The expansion of international air traffic has accelerated these movements. Of the 2 billion people travelling by air each year, approximately half cross international borders [6]. The international spread of AMR is difficult to detect as most people carry resistant bacteria on their skin or within their gut without being ill (healthy carriers). The recent development of medical tourism (individuals travelling abroad for medical treatment) is another cause for concern, particularly with regard to the transmission of hospital-acquired infections [6]. In addition, resistant bacteria can also be carried through the trade of food items such as meat products, which doubled between 1995 and 2009 [7]. The problem of the international spread of AMR has been compounded by the absence of global mecha-

nisms to report and prevent the spread of resistant pathogens.

Although it is impossible to avoid the emergence of AMR (unless we renounce the use of antimicrobials altogether), we could significantly slow down and limit its spread and preserve antimicrobial efficacy by treating these drugs as a non-renewable resource. This means that we have to balance the obvious benefits of using antibiotics today with the drawbacks that we face from emerging and spreading resistance tomorrow [8]. Based on the factors that contribute to the emergence of AMR (see Table 1), there are several ways of reducing AMR. These include the reduction and better control of antimicrobials in human and veterinary medicine, and in agriculture, the provision of information both to healthcare workers and to the general public, and the provision of

safe healthcare (infection control, trained staff and a sufficient number of adequately motivated health-care workers).

The containment of antibiotic resistance fits the category of a public good “since it is impossible to exclude people from benefiting from containment, and one person who benefits does not stop another from benefiting, i.e. there is non-rivalry in consumption” [9]. As globalization increases the risk that highly resistant pathogens emerging in one country find their way into others, the containment of AMR is, therefore, a global public good. Generally speaking, “preventing the cross-border transmission of communicable disease requires a ‘weakest link’ approach to its provision, since the country contributing the least amount of effort towards the desired outcomes tends to set the level that is achievable for the collective as a whole” [10]. This holds true for AMR because it is particularly difficult for countries to effectively isolate themselves from the spread of AMR, especially when resistant pathogens are present in healthy carriers. Collective efforts to implement containment policies in several countries risk being undermined by the failure to do so in just one country. This clearly results in a lack of incentive to implement good practices at country level. The provision of this global public good therefore requires the commitment and participation of all countries.

## **Current policies to tackle AMR – the situation in Europe**

AMR control constitutes a priority for the WHO European Region. However, at national level, where responsibility for health predominantly remains, responses have been variable with some countries developing more initiatives and implementing more stringent policies than others. Discussions on the situation were echoed at a recent meeting of the WHO Regional Committee for Europe, where the European Commission and the WHO Regional Office for Europe released a joint declaration stating that: “the threats of antimicrobial resistance... call for a greater and better coordinated effort throughout the entire European Region and beyond” [11]. Indeed, a notable exception to the state-level approach, and an example of greater cooperation, is the common strategy on antibiotic resistance that has been developed by the EU since the end of the 1990s. This common EU policy represents an important step towards more international cooperation on the issue of AMR and needs critical examination (Table 2). The European strategy has been set in a resolution of the Council of the European Union, ‘A strategy against the microbial threat’, adopted in 1999, in

which it is considered that “an effective reduction and prevention of micro-organisms becoming resistant... cannot be achieved by national initiatives alone, but require a common strategy and coordinated action at Community and international level”. In 2001, the European Commission proposed a European Community strategy based on four key areas of action: surveillance, prevention, research and product development, and international cooperation [12]. Furthermore, the Council of the European Union adopted a recommendation on the prudent use of antimicrobial agents in human medicine in 2001 [13]. EU member states and European Economic Area (EEA) countries were encouraged to implement national-specific strategies for the prudent use of antimicrobial drugs in order to improve the containment of AMR. These strategies include the surveillance of AMR and antibiotic consumption, strengthened actions to control and prevent AMR, as well as more education, training and research on this challenge [13].

Within the context of this strategy, the EU – in particular, the European Commission – has funded several rounds of molecular, clinical and epidemiological projects through its multi-year funding schemes for scientific research (Framework Programme), related to antibiotic resistance totalling more than 200 million euros since 1999 [14]. This includes the surveillance of AMR (European Antimicrobial Resistance Surveillance System, EARSS) and of antibiotic consumption (European Surveillance of Antimicrobial Consumption, ESAC), with both projects now integrated into the activities of the recently created European Centre for Disease Prevention and Control (ECDC). Indeed, ECDC now coordinates many of the EU’s activities relating to AMR and has become the mainstay of AMR control in the European Community. Finally, one should also mention the establishment of an annual European Antibiotic Awareness Day on 18 November, which aims to raise awareness about the threat to public health posed by AMR and prudent antibiotic use.

In addition to these policies that are aimed at containing antibiotic resistance, providing incentives to the pharmaceutical industry to develop new drugs has been identified by some as an important objective. This issue was recently granted attention in EU policy circles. This includes the creation of a transatlantic task force on urgent antimicrobial resistance issues (TATFAR) “focused on appropriate therapeutic use of antimicrobial drugs in the medical and veterinary communities, prevention of both healthcare- and community-associated drug-resistant infections, and strategies for improving the pipeline of new antimicrobial drugs” [23]. This was an outcome of the 2009 EU–US summit between the

Table 2

## Selected steps in the European Union's common approach to AMR since 1999

Year	Policies	Key message
1999	Opinion of the Scientific Steering Committee (SSC) of the European Commission on antimicrobial resistance	The evaluation of the SSC revealed that "action needs to be taken promptly to reduce the overall use of antimicrobials in a balanced way in all areas: human medicine, veterinary medicine, animal production and plant protection" [15].
1999	Council of the European Union Resolution on antibiotic resistance 'A strategy against the microbial threat'	The resolution advocates a "common strategy and coordinated action at [European] Community and international level" [16].
2001	European Community strategy against antimicrobial resistance	The strategy consists of 15 priority actions in 4 key areas: surveillance, prevention, research and product development, and international cooperation [12].
2001	Council of the European Union recommendation on the prudent use of antimicrobial agents in human medicine (2002/77/EC)	"The council recommends that Member States implement national strategies to contain antimicrobial resistance and charges the Commission with a number of tasks to support Members particularly through the Community Network on the epidemiological surveillance and control of communicable diseases" [13].
2003	Regulation 1831/2003 of the European Parliament and of the Council of the European Union on additives for use in animal nutrition	The regulation plans the phasing out of the use of antibiotics as growth promoters in farm animals (i.e., the ban of antibiotics as growth promoters except for four substances) [17].
2005	Report from the European Commission to the Council of the European Union on the basis of EU member states' reports on the implementation of the Council recommendation on the prudent use of antimicrobial agents in human medicine	"Most Member States have taken a variety of actions as requested by the Recommendation. However, there remain numerous areas of the Recommendation where only limited action has been undertaken" [18].
2006	Regulation 1831/2003 of the European Parliament and of the Council of the European Union on additives for use in animal nutrition	An EU-wide total ban on the use of antibiotics as growth promoters in animal feed came into force on 1 January 2006 [19].
2008	Council of the European Union conclusions on antimicrobial resistance	The Council document calls on member states to pursue the implementation of the Council recommendation on the prudent use of antimicrobial agents in human medicine [20].
2009	Council of the European Union Recommendation on patient safety, including the prevention and control of healthcare-associated infections	The document recommends to member states the adoption of strategies and measures to reduce healthcare-associated infections that play a major role in the spread of AMR [21].
2010	Second report from the European Commission to the Council of the European Union on the basis of member states' reports on the implementation of the Council recommendation on the prudent use of antimicrobial agents in human medicine	Significant progress achieved since the publication of the first report (2005). "However, there are still numerous areas of the Recommendation where only limited improvement has been attained" [22].
2010	European Commission and WHO Regional Office for Europe Joint Declaration	The declaration states that "the threats of antimicrobial resistance... call for a greater and better coordinated effort throughout the entire European Region and beyond" [11].

Swedish prime minister, Fredrik Reinfeldt, and President Barack Obama [24]. Such political attention at such a high level is unusual and shows a growing awareness of the problem of AMR. Two reports were publicly released on this occasion. The first, *Policies and incentives for promoting innovation in antibiotic research*, is a comprehensive report on incentives to boost research and development, and was written by Professor Elias Mossialos and his team at the London School of Economics and Political Science (LSE) [25]. The second report, *The bacterial challenge: time to react – A call to narrow the gap between multidrug-resistant bacteria in the EU and the development of new antibacterial agents*, was jointly written by the ECDC and the European Medicines Agency (EMA) [2].

## Is the current European approach to AMR sufficient?

The European Community has made great progress in tackling AMR over the last ten years, although differences between countries remain. For instance, the prevalence of MRSA has decreased in several European countries (UK, France, Belgium, Denmark, Finland, Cyprus, Slovenia and Austria). This indicates that a diverse group of European countries with a varying baseline prevalence of MRSA can reverse the worrisome trend of increasing MRSA rates, thereby avoiding the extreme peak levels observed in other parts of the world. For example, data from the European Antimicrobial Resistance Surveillance Network (EARS-net) show a decrease in the proportion of MRSA in *S. aureus* from blood cultures from France, from 33.4 per cent in 2001 to 22.8 per cent in 2009. These experiences from EU countries suggest that it is possible to turn the tide of AMR through the prudent use of antibiotics and better infection control practices. Despite this progress in some countries (mainly in the European Community), the geographic, economic and cultural differences between the 53 states of the WHO European Region continue to be reflected in their political and practical approaches to AMR, and in huge differences in AMR prevalence. For example, multidrug-resistant and extensively drug-resistant tuberculosis is far more common in the former Soviet republics than in Western Europe. For many other bacteria, there is a North–South gradient with, generally, higher rates of resistance in Mediterranean countries than in Scandinavian ones. Resistance to carbapenems, a class of broad-spectrum antibiotics, has recently received increasing media and political attention. This type of resistance poses a particular threat as it concerns antibiotics that currently represent our last line of broad-spectrum defence against infections caused by *Enterobacteriaceae*, a family of

Gram-negative bacteria including *E. coli*, which are part of our normal gut flora and, at the same time, a common cause of serious infections (see Box 2).

### Box 2 Bacterial pathogens

Bacteria are not only among the oldest life forms on earth, but, in view of their ubiquitous presence in nature, they can also be considered the most successful. A relatively small proportion of these bacteria are able to interact with humans, through colonization or infection. Colonization means that bacteria are present in or on our bodies without causing harm. The bacteria making up the normal bacterial flora in our gut, upper respiratory tract and parts of the genito-urinary tract outnumber our own cells that constitute our bodies by a factor of 10, and they play an important role in maintaining our health. Some bacteria are able – under specific circumstances – to cause disease (pathogenicity) through the invasion of our cells or through the production of toxins. One very basic technique to visualize and classify bacteria is the Gram stain that divides bacteria into those that are Gram-positive and those that are Gram-negative. This classification allows doctors to quickly determine which types of antibiotics should be used to combat an infection without the need for laboratory tests to provide a full identification and AMR profile of the disease-causing bacteria.

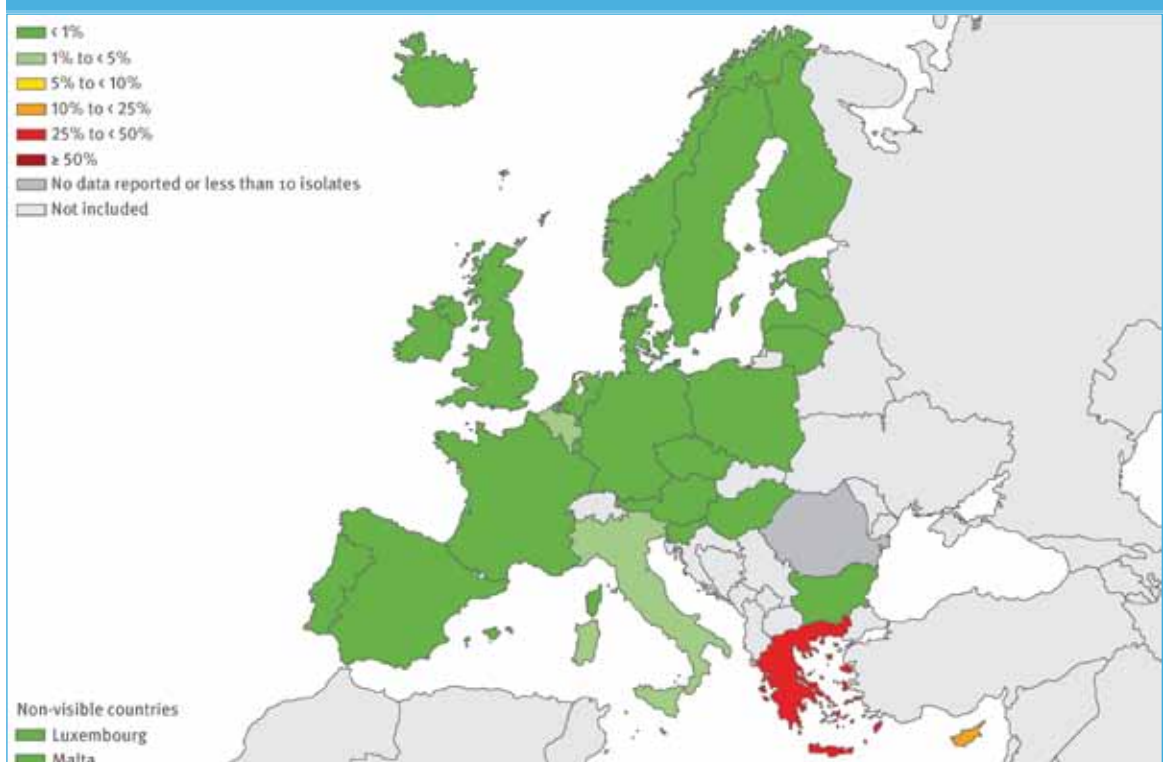
Even within the EU, and despite huge progress in some of the areas highlighted above, the current common approach may lack efficacy due to the failure of some states to implement agreed policies. In 2005, a first report on the implementation of the Council Recommendation pointed out that member states had taken a variety of steps but that there were “numerous areas of the Recommendation where only limited action ha[d] been undertaken” [18]. A more recent report from 2010, while highlighting improvements in several areas, continues to support the view that implementation might be a major problem for some countries [22]. One example concerns the recommendation to restrict systemic antibacterial agents to prescription-only use. Eighteen countries have adopted measures to comply with this recommendation and have reported that this practice was not a significant problem with regard to the misuse of antibiotics (i.e., there is no sale without prescription or it represents less than 1 per cent of sales). By contrast, eight countries have rates of between 1 and 10 per cent and in one country, Greece, the percentage of antibiotics sold without prescription exceeds 15 per cent. Indeed, in Greece, the rates may actually be even higher. A study conducted in 2008 in Greece found that it was possible to buy broad-spectrum antibiotics without prescription, or any other justification, in the Greater

Athens area in 53 per cent of cases for ciprofloxacin, and in all cases for amoxicillin/clavulanic acid [26]. In addition, the EU report indicates that Greece is not taking measures to enforce the laws on prescription-only use for antibiotics [22].

The situation in Greece is an example where the failure to enforce an agreed policy in one country can be detrimental to other countries. In Greece, the resistance of Enterobacteriaceae has been a growing concern since 2000. While several European countries have adopted stringent policies regarding the use of carbapenems, including banning the sale of carbapenems in outpatient settings, Greece has the highest outpatient consumption of carbapenems in Europe and one of the highest hospital consumption rates [27]. This has been linked with a higher prevalence of carbapenem-resistant Enterobacteriaceae in Greece than in other European countries. Owing to the ease with which AMR spreads across borders, this situation is not only worrying for Greece, but also poses a threat for other countries. As an example, holiday-makers in Greece requiring treatment during their stay are at risk of acquiring resistant bacteria (mostly without any symptoms) and then transmitting them when they return to their own countries [28]. Such reports are appearing more frequently in medical literature.

The situation in Greece, illustrated in Figure 1, is of particular concern and lessons need to be learnt from this huge failure of infection control coupled with over-the-counter use, overconsumption and a lack of resources. However, as stated above, other gradients of diffusion exist within the EU and Europe. As borders have become more porous, these gradients are more likely to be levelled out. From an EU perspective, the free movement of people in the Schengen area and of commodities in the EEA entails the free movement of micro-organisms – including highly resistant ones – meaning that the spread of antibiotic resistance is a negative externality of the free movement of people and commodities. However, it is the failure of individual countries in implementing commonly agreed policies that compounds the problem – if they are not jeopardizing the efforts of all other countries, they are at the very least adding additional costs to the whole community of states. This clearly requires greater commitment from member states to comply with existing EU law. The EU, however, is not a hermetic entity and the entire WHO European Region would benefit from a common approach to the problem. There is clearly a role for WHO at regional and global level. At European level, the strengthening of collaboration between ECDC and the WHO Regional Office for Europe is particularly important.

Figure 1  
Proportion of Carbapenem-resistant *K. pneumoniae* isolates in participating countries in 2009, EARSS data



## What role for Europe in the global fight against AMR?

What is true for the spread of AMR in the EU, and more broadly in Europe, is also true beyond its borders. "Given the migration and trade flow from outside Europe and the exposure to resistant microbial strains from other continents" [18], Europe is not in a position to isolate itself from the rest of the world. This means that European institutions have to work globally towards a more rational use of antibiotics. Lessons learnt from the EU experience indicate that political commitment, resource mobilization and raising awareness are of paramount importance to implement the agreed policies to tackle AMR. The comprehensive WHO Global Strategy for Containment of Antimicrobial Resistance was published in 2001, but was never consistently implemented. Effective interventions set out in the strategy include increasing the visibility and awareness of the problem among prescribers and the general public (better surveillance of resistance and antimicrobial use, total transparency regarding antimicrobial use in the food industry), introducing new regulations governing antimicrobial use (and ensuring their enforcement), educating prescribers and patients about rational antimicrobial use, and encouraging the development and introduction of new antimicrobial drugs and improved diagnostic methods for infections and the detection of AMR.

As antimicrobial use in agriculture and aquaculture largely exceeds use in humans, it is vital to include these areas in any strategy against AMR. More importantly, in order to give weight to European countries when discussing and negotiating AMR issues in the global arena, Europe needs to lead by example and pursue best practice locally. To be credible, all European countries need to play their part. In addition, through its various instruments for technical and financial assistance, the EU and its member states can support neighbouring countries, EU accession countries, countries in the wider WHO European Region, as well as low- and middle-income countries where the EU is already a partner for health in an effort to tackle AMR. Rather than channelling aid for AMR containment through vertical programmes dedicated to specific resistance problems, this aid could be dedicated to strengthening health systems in developing countries that play a key role both in the detection of antibiotic resistance (adequate laboratory capacities) and its control. This needs to be done in order to help those countries, but also to protect European citizens from the rapidly increasing threat of AMR – not as aid for development, but as an allocation of public finance for the provision of a global public good from which all countries and future generations can benefit [29].

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## About Global Health Europe

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