

Swedish strategy to combat antibiotic resistance



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Photo:
Jessica Gow/TT (cover),
Jessica Gow/TT (p 4, 13, 15)
Maskot/Folio (p 9),
John Sandlund/Folio (p 23).

The Government adopted this strategy on 21 April 2016
S2016/02971/FS Article no: S2016.007

Foreword

Antibiotic resistance is a problem of global dimension that affects us all. The use of antibiotics is linked to both the emergence and the spread of resistance.

Genuine commitment and vigorous actions are needed to combat antibiotic resistance if future generations will have effective remedies to our most common infectious diseases. Antibiotics must be considered as a global common good and must be accessible to anyone who needs them.

Resistant bacteria are of particular concern to the most vulnerable health care sectors: emergency and intensive care units and neonatal units. Modern health care depends on antibiotics, particularly in connection to medical procedures that involve an increased risk of infection, e.g. cancer treatment, transplantations and operations. Infections caused by resistant bacteria can have serious consequences, from protracted hospitalisation to increased mortality. This means suffering for patients and increased costs for health and medical care. Similarly, infections involving resistant bacteria can cause financial losses in the livestock industry and animal suffering. Low-income countries are particularly severely affected; limited access to clean water and sewage facilities, medicines and health care can dramatically increase child mortality. Most deaths caused by pneumonia among children under the age of five are due to a lack of access to effective antibiotics.

Antibiotic resistance is a complex problem. People, animals, food and other goods cross borders every day, contributing to the spread of resistant bacteria. An increasing number of bacteria are developing resistance to existing antibiotics, while the development of new classes of antibiotics has slowed down. This is due to several factors,

including low profitability, but also the scientific difficulty of finding new approaches. In view of the complexity of the problem, all of society must come together and work within a 'One Health' approach. The human and animal health care sector must jointly ensure that antibiotics are used in a responsible way, take preventive measures to limit the need for antibiotics and minimise the spread of infections.

Action is needed both from academic research and industry if new antibiotics, vaccines and diagnostic methods are to be developed. Issues related to environmental release of antibiotics require the involvement of the environmental sector. Resistant bacteria are spreading between people and animals, and in the environment. Surveillance of resistance is hence needed at international, national and local levels.

All of society must be involved; numerous relevant actors could be mentioned. To find global ways forward, the issue must be raised to Heads of States and Governments to ensure a true One Health perspective. Increased awareness among the general public is important regarding the consequences of widespread antibiotic resistance, both for individuals and for society in general.

In May 2015, WHO member states adopted a Global action plan on antimicrobial resistance, which provides a basis for the continuous work on antibiotic resistance. It is a top priority for Sweden that the action plan is put into practice, all countries must take responsibility for fighting the problems of resistance. This problem cannot be solved by individual countries; it requires intense global efforts.

The World Economic Forum has identified antibiotic resistance as a global risk beyond the capacity of any organization or nation to manage or mitigate alone.



Working at the international level is vital to achieving national goals on preserving the possibility of treating infections in humans and animals.

There is a broad political consensus in Sweden on prioritising action against antibiotic resistance. We have a long tradition of a broad and preventive approach and as a result we have a favourable resistance situation. Over the years we have developed a high level of expertise which is highly recognised in international forums. This applies to policy issues, but also to the research area, where Sweden has been deeply involved for several years, playing a role in the international Joint Programming Initiative on Antimicrobial Resistance. Sweden will continue to engage in advocacy and set a good example.

To tackle the problems of resistance, we need to make a concerted effort and coordinate our activities. To this end, we are presenting this Swedish strategy to combat antibiotic resistance. The strategy points out the direction of Swedish efforts and is also intended for international actors wishing to benefit from Swedish knowledge and experience.

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Swedish strategy to combat antibiotic resistance

Antibiotic-resistant bacteria are spread globally in the same way as other bacteria. This means they can be transferred between people, animals and foodstuffs, and they can spread in our environment. These links between the various sectors mean that efforts to combat antibiotic resistance must be made from a broad perspective.

This is called a One Health approach. It is important that the term One Health is understood in a way that all significant factors must be covered, such as issues concerning the economy, education, research and aid, in order to deal globally with the problems of resistance.

Health care environments are particularly at risk for the emergence and spread of antibiotic resistance. Infections caused by resistant bacteria can have serious consequences, such as increased mortality and prolonged illnesses, and a reduced ability to protect patients using antibiotics during a surgery and other medical procedures. This results in suffering for patients and increased costs for health and medical care services, and the society as a whole.

In addition, currently established treatment methods for diseases such as cancer, as well as some areas of transplant surgery and other advanced surgery, may need to be re-evaluated. This may, in time, also apply to more common surgical procedures, such as prosthetics.

In animal populations, resistant bacteria can spread quickly and thus represent a reservoir of bacteria that can spread further to both people and animals. Animals can also get infections that are difficult to treat as a result of resistant bacteria. This causes suffering for the animals and economic losses.

Important functions in society can also be affected by growing antibiotic resistance.

This strategy is to form the basis of Sweden's work to curb the development and spread of antibiotic resistance and to deal with the situation we have today. The strategy is to highlight areas and measures for effective work to combat antibiotic resistance. Sweden's work to combat antibiotic resistance must be long-term and sustainable, and it must build on the good international reputation Sweden has in this area.

The strategy, which covers work at the national level, as well as within the EU and at the international level, applies until 2020.

The global commitments made within the 2030 Agenda, as well as Sweden's Policy for Global Development, are key frameworks for Sweden's continued leadership in the international work.

The strategy is based on Sweden's current work to combat antibiotic resistance, the Global action plan on antimicrobial resistance that was adopted by WHO member states at the World Health Assembly in May 2015, confirmed by FAO and OIE resolutions, and relevant documentation, such as evaluations, action plans and other strategies.

This strategy sets up an overarching goal and seven strategic objectives where the Government has identified the important factors for achieving these objectives. This strategy may be supplemented with specific concrete initiatives for various areas and sectors.

Overarching goal

Preserve the possibility of effective treatment of bacterial infections in people and animals

Objective 1: Increased knowledge through enhanced surveillance

This objective involves:

- improving access to data on resistance and the sale and use of antibiotics and other antibacterial agents in all sectors, as well as access to data on the spread of antibiotics into the environment; and
- evaluating the success and cost-effectiveness of various measures, using continuous data collection.

It is necessary to continuously collect data on the occurrence of resistant bacteria and use of antibiotics. This enables us to analyse trends over time, see important changes that could indicate a spread of resistant bacteria, quickly detect such a spread, communicate findings and take measures at an early stage. Surveillance also makes it possible for us to monitor the effects of measures taken and to evaluate them.

Using comparable resistance data from various sectors, we can map out pathways of spread and the significance of different sources for the resistance problem. It is also important to be able to link an antibiotic prescription to a diagnosis so as to monitor and influ-

ence how well treatment recommendations are used by prescribers (e.g. doctors and veterinarians). We have a long tradition in Sweden and high level of expertise in surveillance, but the systems used need to be improved and further developed to become more effective and efficient, and to be adapted to new challenges.

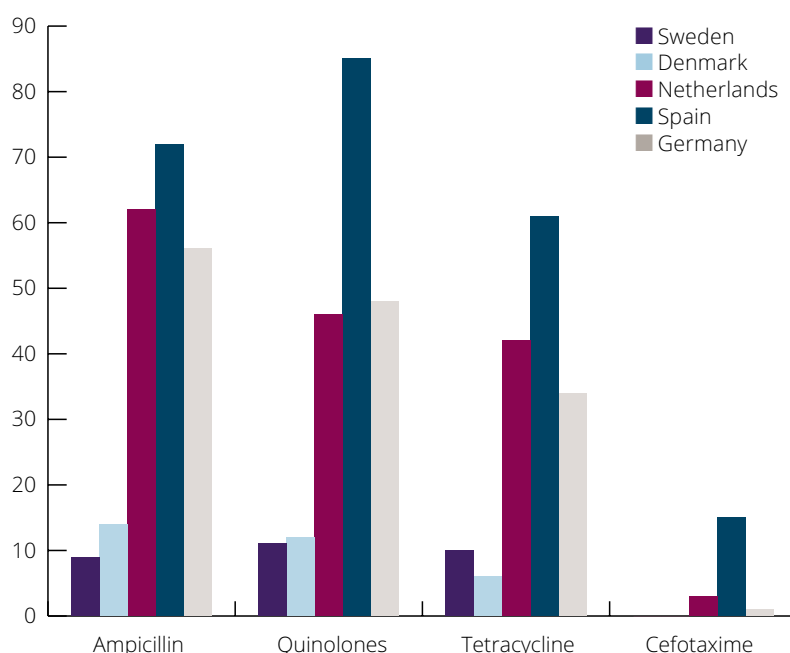
The Government expects:

- appropriate data to be collected from relevant sectors and fed back where relevant at local, regional and national level, as well as at EU and international level;
- efficient systems for early detection, compilation, analysis and reporting of information to be in place;

- possibilities to systematically monitor the long-term trends concerning resistance, sales and use of antibiotics, and human and animal infections to be maintained and further developed;
- data about the reasons for prescription and compliance with treatment recommendations to be available in all sectors and the results fed back into relevant services.

Figure 1. Proportion of resistant indicator bacteria (*Escherichia coli*) in broilers 2014, an international comparison.

Source: The European Food Safety Authority and the European Centre for Disease Prevention and Control 2016, The European Union summary report on antimicrobial resistance in zoonotic and indicator bacteria from humans, animals and food in 2014.



Objective 2: Continuous strong preventive measures

This objective involves:

- identifying and implementing preventive measures in relevant sectors so that spread can be prevented, detected and avoided as early as possible;
- minimising the spread of multiresistant bacteria.

The favourable resistance situation in Sweden does not mean we can be complacent. Resistance is growing here as well, albeit more slowly than elsewhere. We must remain vigilant and realise the importance of preventive measures so that the situation does not deteriorate. Infection prevention measures will reduce the need for antibiotics. People and animals that are healthy or that receive good treatment or care will be less in need of antibiotics.

The national vaccination programmes and measures to maintain good hygienic standards in health care settings are fundamental as infection prevention measures. Healthcare-associated infections are the most common adverse event in health care settings, and a number of these infections are caused by bacteria that have acquired various resistance mechanisms. Health care settings are particularly sensitive for the development and spread of antibiotic resistance, partly because of the high level of antibiotic

use and partly because of the spread of bacteria to patients more susceptible to infections. This, in turn, means a greater risk of serious complications for these patients.

The need for antibiotics in animals is reduced through efficient disease control, good farm management, biosecurity, and sound animal husbandry systems. Safe international trade in both living animals and animal products is particularly important. This also reduces the risk of resistant bacteria spreading to other animals, to foodstuffs and to people.

Releasing antibiotics and other antibacterial agents into the environment can give rise to resistance. Although our knowledge about how antibiotics and other antibacterial agents can select for antibiotic-resistant bacteria in the environment is incomplete, there is data to indicate that this is an important factor.

An important success factor for effective national work against antibiotic resistance has been close cooperation between the local and national levels in the health care sector, and also between central government and the livestock industry.



The Government expects:

- a high level of compliance with vaccination and health programmes to be maintained to keep people and animals as healthy as possible, thus reducing the need for antibiotics;
- relevant staff to have knowledge about antibiotic resistance, the spread of infectious diseases and the importance of a high degree of compliance with basic hygiene routines and other infection prevention measures, as well as knowledge about the seriousness and complexity of the issue from a global perspective;
- county councils and municipalities to have access to expertise regarding basic hygiene in health care settings so that good hygiene standards can be maintained;
- relevant actors in animal production, veterinary medicine, and the food chain to have access to expertise on hygiene and efficient disease control regarding infectious diseases in order to ensure good animal health and safe foodstuffs;
- antibiotic resistance, infection prevention and control/hygiene to be included in relevant education and training programmes;
- a high level of vigilance, rapid diagnoses, and established routines and guidelines to prevent, detect and stop the spread of infectious disease;
- technology for the cleaning of pharmaceutical residues and other substances that are difficult to treat in water treatment plants to be tested and evaluated by 2018;
- the development of rules on good manufacturing practice and criteria in support of the county councils' procurement processes so as to move towards minimising releases of antibiotics into the environment during pharmaceutical production.

Responsible and sustainable breeding practices in animal husbandry are prerequisites for healthy animals, in need of less antibiotics.

Objective 3: Responsible use of antibiotics

This objective involves:

- using and handling antibiotics and other antibacterial agents in a wise and responsible manner.

Increased use of antibiotics leads to an increased risk of development of resistance. Equally, the risk of resistance increases if antibiotics are used incorrectly, for example in inappropriate doses or using antibiotics with an unjustifiably broad antibacterial spectrum. It is therefore important that antibiotics and other antibacterial agents are only used when they are needed, that the right type of antibiotic is used and that treatment recommendations are developed and followed. To reduce the risk of development of resistance, it is important that drugs of particular importance for human medicine are not used for animals.

Data on compliance to treatment recommendations must be fed back to the prescribers to ensure that prescribing are made in the correct way. It is also important to be able to monitor that antibiotic prescribing do not decrease to such an extent that com-

plications arise due to insufficient treatment.

Recommended first-choice drugs that are available in other EU Member States are not always available in Sweden. This could pose a risk that more expensive second-choice drugs are prescribed, alternatively pharmaceuticals with negative side effects or are worse from a resistance point of view. Hence, it is therefore important that access to recommended first-choice drugs is guaranteed. More knowledge is also needed on how the efficacy of older antibiotics can be optimised and preserved.

There is a risk that the widespread – and in many cases unnecessary – use of antibacterial agents in everyday products could be a contributing factor to the emergence and spread of resistant bacteria.

Sweden has the lowest level of antibiotic use in food-producing animals in the EU.

The use of antibiotics as growth promoters for animals was prohibited in Sweden in 1986 and in the EU in 2006.

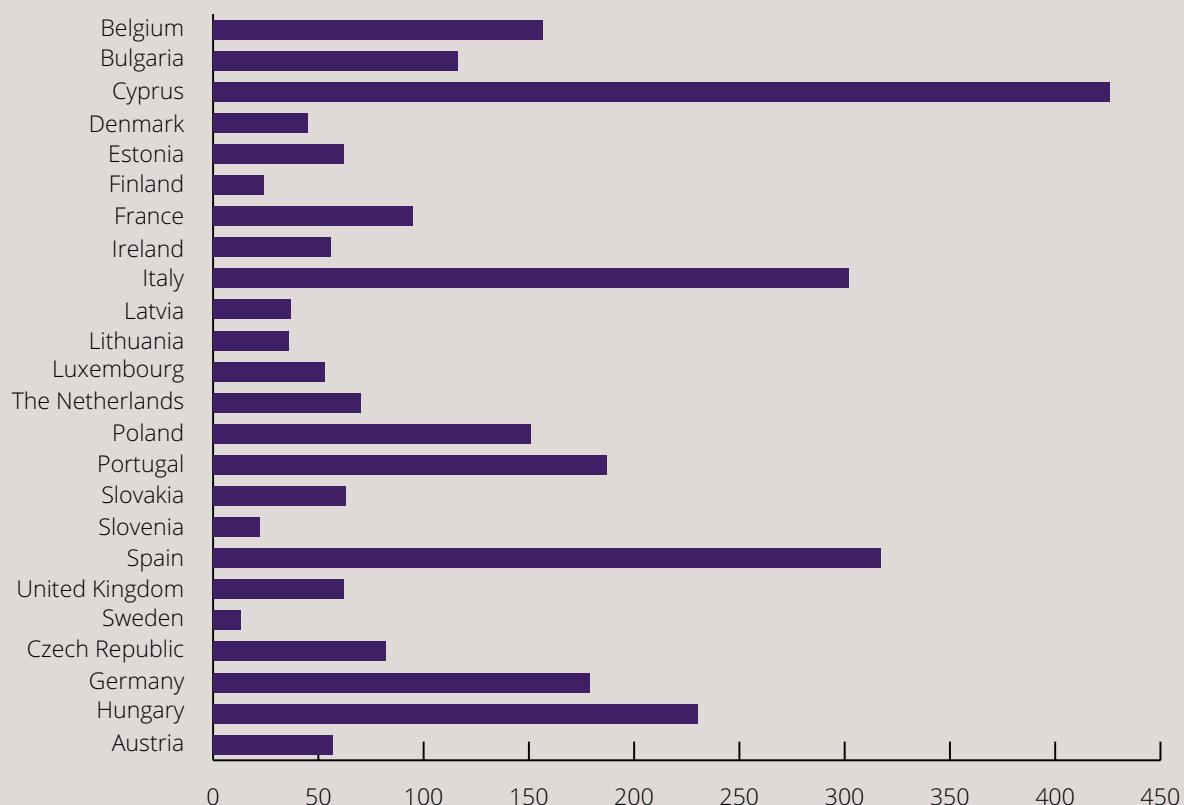


Figure 2. Sales of veterinary antimicrobial agents for food-producing animals in the EU. Expressed as mg of active substance per Population Correction Unit (PCU). PCU corresponds to the total weight of live animals within a country, expressed in kilograms. The measure is not exact and should therefore be interpreted with caution. Source: Fifth ESVAC report 2013, European Medicines Agency.

The Government expects:

- antibiotics to, continuingly, only be used following a prescription from professionals that are authorised to prescribe antibiotics;
- recommendations to be drawn up at the relevant level (local, regional or national) concerning the diagnosis and handling of common infections within both human health care and veterinary care, and that those recommendations will be harmonised as far as possible and used in day-to-day work;
- data on compliance with treatment recommendations to be accessible for prescribers, service managers, government agencies and the public, in both human and veterinary medicine;
- data to be available regarding reasons for prescription of medicines used for treating animals, especially as regards production animals, in order to facilitate controls regarding compliance with treatment recommendations;
- the regular use of quality-assured microbiological diagnostics with as short response times as possible, so that unnecessary and incorrect treatment can be avoided;
- access to both new and older antibiotics to be guaranteed on the Swedish market;
- increased knowledge about how the availability and use of new antibiotics and older antibiotics – where national availability is inadequate – can be guaranteed, while at the same time the risk of developing resistance is minimised and the best possible care is provided;
- antibiotics of particular importance to continue to be given to animals only when there are exceptional grounds for doing so;
- environmental data to make up part of the basis of the approval process of antibiotics and to be made available to government agencies and other relevant stakeholders for the assessment of environmental risks;
- discarded antibiotics to be dealt with in an environmentally sound way;
- antibacterial agents to be used in a prudent, responsible and evidence-based way in various types of consumer products.

Objective 4: Increased knowledge for preventing and managing bacterial infections and antibiotic resistance with new methods

This objective involves:

- increasing knowledge about basic bacterial infection mechanisms so that new diagnostic methods, vaccines and treatment options can be developed;
- increasing knowledge about the emergence and spread of resistance so that the use of new and existing antibiotics can be optimised and the extent of the resistance problem can be prevented and limited.

One contributing factor to the seriousness of the resistance problem is that the development of new antibiotics and other treatment options has slowed down. This is due to several factors, including low profitability, but also the scientific difficulty of finding new approaches. To enable the development of new treatment strategies and preventive measures, research is necessary into how bacteria give rise to infections and what other factors affect which individuals are infected and how severely they are affected. Equally, research is needed to be able to optimise and preserve the efficacy of existing treatments for as long as possible. The development of cost-effective methods for better infection diagnostics and sensitivity tests could reduce the incorrect use of antibiotics in health care, veterinary medicine and animal husbandry.

Moreover, there is a need for new knowledge to be able to estimate the burden of disease and costs of anti-

biotic resistance for the health sector. The effects of actions taken must be measurable as well as the economic consequences of resistance. The costs and benefits of antibiotic use and resistance in animal production must be possible to estimate to justify further improvements at national and international levels. Increased knowledge is also needed about how the structure of health and medical care systems, animal production, global trade and tourism affects the spread of antimicrobial resistance between bacteria, people, animals and the environment.

These challenges cannot be solved by individual nations; they require coordinated international cooperation spanning many sectors. The EU is an important platform for the work to be carried out by Sweden.

Antimicrobial resistance refers to resistance among bacteria, viruses and other microorganisms, whereas antibacterial resistance (antibiotic resistance) refers only to resistance in bacteria.



The Government expects:

- research to be carried out in the area of antibiotic resistance, including research into how resistance develops and spreads, into how existing and new antibiotics can be optimally used to prevent the emergence of resistance, into communicable disease control and preventive measures, and into the consequences of antibiotic resistance – for the economy, for health and for society in general;
- research to be carried out into basic bacterial infection mechanisms;
- research to be carried out into how new strategies and other knowledge can best be implemented in relevant activities;
- measures to be taken to bridge the gap between basic research and the commercialisation of research findings;
- Sweden to take part in international research cooperation in the area of antibiotic resistance and related areas;
- universities and other higher education institutions, government agencies, health and medical care institutions and the industry to collaborate at national level, within the EU and at international level to identify and bridge knowledge gaps;
- Sweden to contribute to the development of knowledge about new business models and financial incentives to stimulate the development of new antibiotics and other treatment options.

Objective 5: Improved awareness and understanding in society about antibiotic resistance and countermeasures

This objective involves:

- knowledge, competence and increased awareness among all relevant parties – including the general public – about measures to prevent the spread of infections and about the risks of resistance development through the use of antibiotics.

Antibiotics are only available on prescription in Sweden, prescribers have the full responsibility to use them wisely. However, the public's knowledge and expectations can influence decisions about prescribing antibiotics. Therefore, a high level of awareness about why it is important that antibiotics are only used when they are needed is essential for building a sustainable approach in the society to antibiotics. Equally, a high level of awareness about the importance of good hygiene and preventive measures are important to reducing the spread of infectious diseases and thus the need for antibiotics. It is also important that consumers are given the opportunity to make well informed decisions. For example, labelling of the origin of meat can help consumers choose meat from countries with prudent use of antibiotics in animal production.

Many actors in Sweden are currently working to disseminate information and knowledge about antibiotic resistance and preventive measures via their channels and networks. This is a strength but at the same time, it is

important that information is co-ordinated within each sector and between sectors so that the general public will have the same message from all actors. Collaboration makes it easier to produce information tailored to specific needs.

The Government expects:

- people working in health care and social services, dental care, with animals and with food production to have good knowledge of the One Health concept, antibiotics, antibacterial agents, general hygiene, hygiene in health care settings and infection control;
- patients and animal keepers to have good knowledge about the importance of using antibiotics as prescribed;
- national, regional and other relevant parties to collaborate to produce and disseminate tailored and coordinated information about antibiotics and antibiotic resistance, general hygiene and other preventive measures.

The responsible use of antibiotics, infection prevention and a high level of knowledge among health care staff are prerequisites for preventing healthcare-associated infections.



Objective 6: Supporting structures and systems

This objective involves:

- conducting work related to antibiotic resistance in a coherent, efficient and strategic manner on the basis of the roles of different stakeholders;
- this work being followed up and lessons learned.

Work to prevent and handle antibiotic resistance spans across several sectors and actors. Clear systems and structures for collaboration are needed to make use of the accumulated knowledge that exists among the different stakeholders and to identify knowledge gaps. Coordination enables resources to be used more efficiently and helps to avoid duplication of work and to communicate coordinated messages.

Successful work to contain antibiotic resistance builds on support for the implementation of measures targeting both individuals and targeting the development of supporting structures in the organisations. For example, established systems related to the follow-up of antibiotic use and compliance with treatment recommendations can influence how and when antibiotics are prescribed.

The Government expects:

- the Government Office to be well-coordinated in its work on issues concerning antibiotic resistance;
- a national coordination function with relevant government agencies and other stakeholders to coordinate overall national work;
- the Swedish strategic programme against antibiotic resistance (Strama) to lead national work and to coordinate the county councils' Strama groups, that support and monitor activities in work on the prudent and responsible use of antibiotics for humans. Within the animal and food sector, Strama VL (for the veterinary and food sectors) continues to provide knowledge support to various stakeholders);
- knowledge to be developed and used regarding how organisational factors should support the work on antibiotic resistance.

The Public Health Agency of Sweden and the Swedish Board of Agriculture have been tasked by the government to jointly coordinate the work against antibiotic resistance and healthcare-associated infections in Sweden.

Objective 7: Leadership within the EU and in international cooperation

This objective involves:

- Sweden showing leadership in efforts to combat antibiotic resistance and to work for the prudent and responsible use of antibiotics globally in multilateral processes, work at EU level and in bilateral contacts and cooperation;
- global commitments made as part of the 2030 Agenda, as well as Sweden's Policy for Global Development, being key frameworks.

Antibiotic resistance is a global problem that requires many countries contributing to the solution. The major international organisations WHO, FAO and OIE are platforms for this work. The political will to act on the threat of resistance has grown throughout the world in recent years. The fact that in 2015, WHO members adopted the Global action plan on antimicrobial resistance to give concrete form to and speed up efforts is proof of this. In light of this, it is also important to stress that the global action plan is based on a clear One Health approach, where measures have also been identified in the area of agriculture and are supported by both the FAO and OIE. These organisations adopted at the same time resolutions to support the global action plan in their areas of expertise. However, international pressure is still needed to move the issue high up on the agenda in all countries and to increase awareness in all relevant sectors.

Sweden has currently a favourable situation, with regard to resistance, but this can change quickly as a result of travel and trade and depending on how resistance develops and spreads internationally. This is why Sweden needs to contribute to work so that the resistance status of other countries is also improved. Sweden's relatively good situation is a result of long and laborious work, which has led to a very high level of expertise on antibiotic resistance that is asked for internationally. Different countries have different situations when it comes to tackling the resistance problem. For example, there may not be sufficient data for new treatment recommendations. Equally, many countries lack health and medical care systems and veterinary agencies that have the capacity to implement these recommendations.

Healthy animals are the overall objective in animal husbandry in Sweden. Strategies based on improving animal health result in a reduced spread of infectious diseases and a reduced use

The Swedish strategic work has a long tradition of collaboration between all relevant sectors and disciplines such as the human, animal, food and the environment sectors.

of antibiotics. Preventive animal health measures and low levels of antibiotic use in animal production result in a favourable resistance situation. However, the resistance problem is not tied to national borders; for example, resistance can spread via the international trade of animals. To get to grips with the resistance problem in animal production, it is therefore necessary for other EU Member States to take similar measures to those already implemented in Sweden. This is also important from a competitiveness perspective, so that the animal keepers who continuously work to reduce antibiotic use are not disadvantaged. Sweden must therefore try to influence the other EU Member States to continue to work with strategies based on improving animal health and using antibiotics in a more responsible way in animal production.

The fact that many international initiatives are under way to manage antibiotic resistance is good news. However, resources are required to follow and coordinate various initiatives and to actively participate in them. By channelling resources through the EU, the large international organisations and the cooperation between the Nordic countries, we can improve the leverage of our resources. Sweden also has bilateral agreements with certain countries where we can focus on special initiatives.

Antibiotic resistance risks undermining a series of advances that have been made through the Millennium Development Goals, as infections caused by resistant bacteria occur to a disproportionately high degree in developing countries. Lack of access to water, sanitation, health and medical care and relevant antibiotics are some of the causes. Moreover, measures to reduce antibiotic resistance

tend not to reach the poorest people. The problems of antibiotic resistance are also present in the area of sexual and reproductive health and rights. Maternal and child mortality, infections in new-borns and resistant gonorrhoea are some of the areas that risk being hit hardest by antibiotic resistance. Efforts to combat antibiotic resistance in developing countries have traditionally focused on the health sector. However, the nature of the resistance problem means that a broader approach is desirable, including preventive measures that cover the environmental sector and animal production, as well as the health sector.

Knowledge about how antibiotic use and resistance affect economic and social aspects is generally poor globally. By producing such knowledge, analyses and models, we can influence understanding of this problem to a higher degree. For example, the OECD has shown through a study financed by Sweden that the costs of ceasing to use antibiotics as growth promoters in animal production are relatively low in wealthy nations in the world. More such studies are needed to monitor development and as incentives for change.

The Government expects:

- Sweden to support the WHO, FAO and OIE in efforts to combat antibiotic resistance, also within the framework of the EU and Nordic cooperation. It is particularly important to support the implementation of the Global action plan on antimicrobial resistance. The focus of Sweden's engagement should be on building up a global surveillance system for antibiotic resistance. In the long term, Sweden should work for integrated global surveillance systems for antibiotic resistance and antibiotic

Every year, the Public Health Agency of Sweden and the National Veterinary Institute publish a joint report giving an overview of the resistance status and antibiotic use.

- use in humans and animals and, where appropriate, also in food-stuffs, in cooperation with the WHO, FAO, OIE and the Codex Alimentarius;
- Sweden to continue building alliances with other countries in order to advance the antibiotic resistance issue at a high political level, e.g. through a high-level UN meeting in 2016. The purpose is to raise important overarching issues that cannot be solved by the health sector and the agricultural sector alone. This concerns issues such as access to and the correct use of new and old antibiotics, and diagnostic methods and other treatment methods. These are important issues for ensuring that the problem with resistance will not increase and the new antibiotics do not quickly become ineffective;
- Sweden to continue pushing for the OECD to develop economic analyses about the consequences of antibiotic resistance in both the agricultural sector and the human health sector;
- Sweden to continue working as one of the leading countries in the action package for antimicrobial resistance under the Global Health Security Agenda (GHSA);
- Sweden to work for a global phase-out of the use of antibiotics as a growth promoter in animal production and of other routine use of antibiotics in animals, and for a transition to sustainable production systems;
- Sweden to share knowledge and experiences with other countries, considering in particular the needs of low-income countries. In this work, Sweden should argue for a broad approach that also includes, in addition to the health sector, for example the environmental and agricultural sectors. Sweden should also, in the international cooperation, make use of experiences from other countries and learn from others;
- Sweden to cooperate with other EU Member States, the European Commission and the EU agencies on the implementation of the EU Action Plan against the Rising Threats from Antimicrobial Resistance. In working on a new EU action plan, Sweden should argue for concrete and clear objectives;
- Sweden to be a driving force in negotiations concerning new regulatory frameworks, recommendations and guidelines in the EU to work towards the responsible use of antibiotics in animal production;
- Sweden to continue its involvement in the EU Joint Programming Initiative on Antimicrobial Resistance;
- Sweden to work to ensure that increased environmental consideration is taken into account in the EU pharmaceuticals legislation and internationally, for example should a regulation on minimum requirements for production conditions be considered;
- Sweden to promote issues related to antibiotic resistance through bilateral agreements with other countries.

Past and present work in Sweden

The basic idea behind the Swedish work against antibiotic resistance is that an overall low infection rate in the society leads to a healthy population and healthy animals with lesser need of antibiotics. This in turn leads to a reduced selection of resistant bacteria. Prevention control practices may include anything from vaccinations, good diagnostics, good hygiene, active animal health work and good animal husbandry, to public health interventions against lifestyle diseases directed towards the profession as well as the general public.

Significant attention has been paid, at an early stage, to antibiotic resistance in Sweden, and measures were taken to prevent the spread of resistant bacteria and to limit the unnecessary use of antibiotics. Due to close collaboration between government agencies and interested parties representing animal husbandry, Sweden was the first country within the European Union to prohibit antibiotic additives as growth promoters in animal feed-stuff. This was already in place 1986.

The favourable situation, from an international perspective, as regards antibiotic resistance in humans and animals is a result of early awareness of the problem. One example is the low prevalence of methicillin resistant *Staphylococcus aureus* (MRSA) (see figure 3, page 21). Also, this bacterium has yet not become established in our Swedish pig population. From an international perspective, Sweden has a relatively low use of antibiotics per capita (see figure 4, page 22). Prescription of antibiotics has decreased since the middle of the 1990s, we have seen a total decline with over 40 percent. For animals the use of antibiotics is the lowest within the EU. The total amount of antibiotics given to animals in Sweden has decreased by 60 percent since the middle of the 1980s.

Today there is a strong consensus amongst the country's animal health organizations, veterinary personnel and professional animal keepers on restrictive and responsible antibiotic use. Sweden has a long tradition of preventive work to keep the animals healthy, and healthy animals need little antibiotics.

We carry out continuous resistance surveillance in Sweden and are well informed about the current resistance situation. Samples are often collected from patients within the health care system which provides us with data for surveillance. Sweden has also invested in well-functioning standardized laboratories. The systems for surveillance of antibiotic resistance are based on voluntary participation of laboratories complementing the notifications made in accordance with the Communicable Diseases Act. The Public Health Agency analyses, compiles and provides feedback of national data of antibiotic resistance and antibiotic use, and the incidence of health care associated infections.

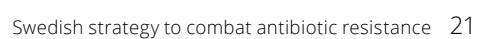
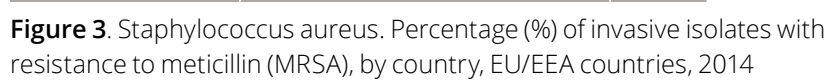
Sweden also has a programme for monitoring of antibiotic resistant bacteria in food producing animals and food. The Swedish National Veterinary Institute is responsible for this monitoring, regarding food this work is conducted in collaboration with the National Food Agency. Through yearly surveillance of antibiotic residues in meat, samples are taken in order to ensure that animals used for food production will not be treated with antibiotics prior to slaughter.

The results from the surveillance of resistance and antibiotic use in humans and animals are presented annually in a joint report by the Swedish National Veterinary Institute and the Public Health Agency. The relatively good situation in

Sweden is a result of regulated sales of antibiotics both on the animal and the human side, and sound surveillance of the prescription of antibiotics. Treatment recommendations for infections, both the within health care and dental care, are produced and updated by the Medical Products Agency and the Public Health Agency. Corresponding work regarding veterinary medicine has been performed for the major domestic animal species by the Medical Products Agency and by the Swedish Veterinary Association. Furthermore, the Swedish Board of Agriculture has adopted regulations on antibiotics that should not be given to animals.

In order to further support optimized use of antibiotics through surveillance, analysis and feedback on compliance to treatment recommendations, data is needed that links prescription with diagnosis.

Antibiotic resistance has been a prioritised research topic in Sweden for many years. The latest research and innovation government bill included a focus on antibiotics and infection, resulting in graduate schools and research grants within this area. Sweden was also – along with Italy – the initiator of the international research collaboration that was initiated in the field of antibiotic resistance in 2010, Joint Programming Initiative on Antimicrobial Resistance. Today the collaboration includes 22 countries, of which several are non-European. Sweden had the presidency for the first six years and the secretariat is located at the Swedish Research Council. JPIAMR has developed a strategic research agenda, which has formed the basis for several countries' national agendas.



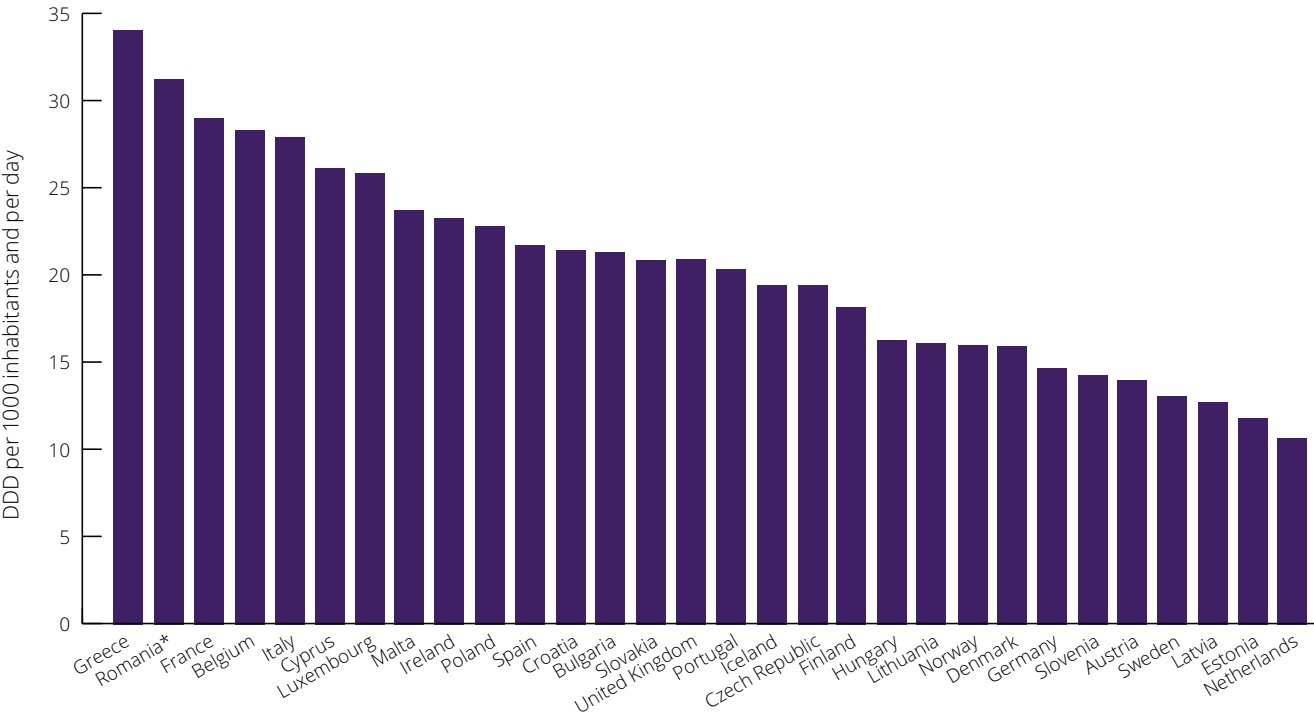
In order to coordinate the work of the national government agencies, a national intersectoral coordinating mechanism was established in 2012 for antibiotic resistance and health care associated infections. The Public Health Agency and the Swedish Board of Agriculture are jointly responsible for this function, 21 government agencies participate in this mechanism.

Other success factors is the regional and local work within the Swedish Strategic programme against antibiotic resistance (Strama), the clinical microbiological laboratories, the infection control units, the communicable disease control units and the drug therapeutic committees.

The county councils and the regions' local Strama groups can disseminate knowledge on treatment recommendations and give feedback on individual prescription data and resistance level to prescribers. Today the Strama groups are a part of the Swedish Association of Local Authorities and Regions where they have established the Strama Programme Council. Close contact and good collaboration between national government agencies and the regions, county councils and local authorities will first and foremost guarantee strong implementation of knowledge and evidence-based action.

The Strama group for dental care develops and supports the implementation of treatment recommendations as well as disseminates knowledge on antibiotics within Swedish dental care. Strama VL (veterinary and food stuff) is a network where a broad group of interested parties participates. The Swedish National Veterinary Institute has been mandated to support this collaboration and therefore hosts a Strama VL secretariat. The secretariat shall promote coordination, be a point of contact and a centre of knowledge.

Figure 4. Consumption of Antibacterials For Systemic Use (ATC group J01) in the community (primary care sector) in Europe, reporting year 2014



*Country provided only total care data.



"For animals the use of antibiotics is the lowest within the EU"

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