Swedish work against antibiotic resistance – a one health approach

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Levels of antibiotic use and resistance in Sweden are among the lowest in the European countries, both in the human and the animal sectors. Early awareness and long-term interdisciplinary and intersectoral actions are important reasons for this relatively favorable situation. The global rise and unprecedented spread of resistance calls for continuous and intensified work. The Swedish experience is that antibiotic resistance can be tackled if all levels of society work together towards a common goal.

Long-standing national consensus

There is a long-standing broad national consensus between stakeholders from all relevant sectors on the overarching goal of preserving the possibility of effective treatment of bacterial infections in people and animals. This is reflected in the common priorities of the Swedish government, governmental agencies, and organisations within the healthcare sector, veterinary medicine, in animal husbandry and in the food chain.

The first Swedish national action plan was published in 2000 and emphasised the importance of taking a One Health approach. Today there is a long-term government strategy and a national action plan against antibiotic resistance. The latter is followed up by the intersectoral coordinating mechanism. This group engages 25 governmental agencies and organisations working in human health, animal health, food, environment, research, development, trade and civil contingency planning. Another flagship example of the One Health approach is the annual surveillance report on resistance and consumption of antibiotics, published jointly by the National Veterinary Institute and the Public Health Agency of Sweden.

Key components in the Swedish work against antibiotic resistance

- **Long-term work, with political and legislative support**
- **Consensus and cooperation, within and between sectors, locally, regionally and nationally**
- **Disease prevention – healthy people and animals do not need antibiotics**
- **Transparent and reliable data for action and follow-up**
- **Active involvement in international efforts**

Human medicine

The formation of Strama, the Swedish Strategic Programme against Antibiotic Resistance, in 1995 has been essential to counteract antibiotic resistance. Other important factors are regulated sales of antibiotics, up-to-date treatment recommendations, good availability of data on antibiotic use and resistance, as well as a long tradition of infection prevention and control. Importantly, data from surveillance is transparent and communicated widely.

The Strama model for collaborations at all levels

Swedish experience demonstrates that work to achieve prudent use of antibiotics should be carried out close to the prescribers. The regional Strama groups are key actors in facilitating the implementation of national and regional initiatives as well as identifying barriers that need to be addressed.

Strama was originally formed as a voluntary network of regional groups and national authorities and organisations to create collaborations and share of best practice. The regional Strama groups typically have representatives from several fields such as infectious diseases, primary care, pharmacy, communicable disease control, microbiology, and infection control. Strama is also established within dentistry.

Feedback and benchmarking of data on antibiotic consumption and use

All antibiotic use is by prescription only. All pharmacies in Sweden supply daily statistics on sales of medicinal products, which enables a comprehensive analysis of antibiotic sales. Complementary IT systems that automatically include additional information, such as diagnosis, are now also available for improved analyses.

Data on antibiotic consumption and use is widely communicated by the Public Health Agency and the regional Strama groups, for example to benchmark regions and health care centers. Strama groups also use the data to lead peer-to-peer discussions about prescribing policy and adherence to treatment guidelines.

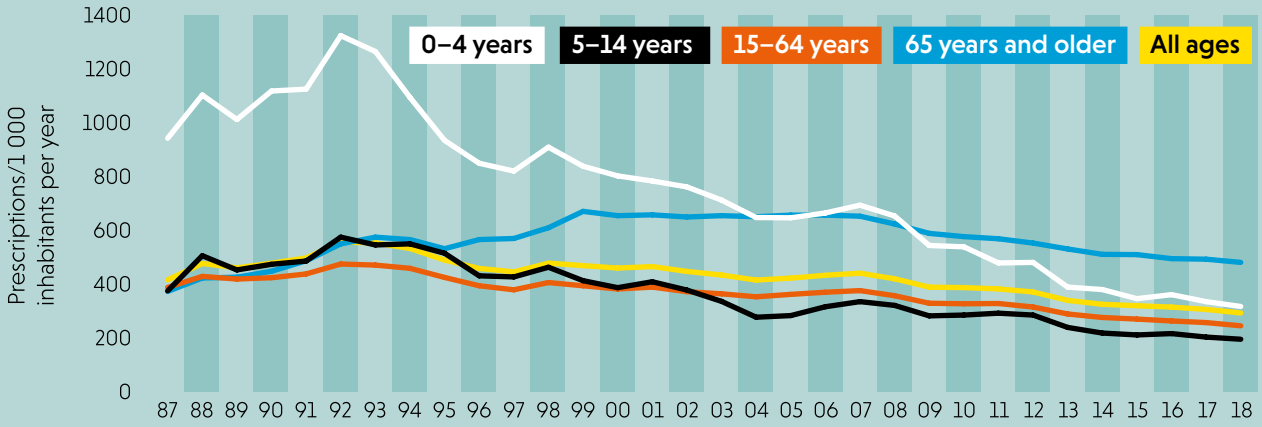

Figure 1. Since the mid-90s, total sales of antibiotics on prescriptions have decreased by about 50 %. The greatest change during these years is seen among young children (age group 0–4 years), where sales decreased by more than 75 %. Sales of antibiotics (J01 excl. methenamine) in the community sector, to humans, all genders, per age 1987–2018, prescriptions/ 1 000 inhabitants per year.

Decreased antibiotic consumption and improved quality of prescribing

The community sector accounts for the vast majority of antibiotic consumption in Sweden. Part of the strategy in targeting this sector has been the implementation of easy-to-use national treatment recommendations for common infections in community care. Quality indicators and a quantitative national target of no more than 250 prescriptions per 1 000 inhabitants per year in the community sector have also been important tools in improving antibiotic prescribing. The result has been a continuous decrease in antibiotic consumption along with improvements regarding the use of the right type of antibiotic.

Resistance monitoring with good geographic coverage

High quality and comparable resistance data are ensured by all laboratories using the same standardised methods and there is an established collaboration between the national and local laboratories. Four types of antibiotic resistance are notifiable in line with the Communicable Disease Act. Resistance monitoring is largely based on voluntary, automated and daily reporting from the laboratories to a national system. This allows for an early alert on findings of very serious antibiotic resistance as well as for continuous resistance monitoring, locally and nationally. Data on notifiable types of antibiotic resistance has also been used to model future costs for Swedish healthcare.

Long tradition of infection prevention and control

Sweden has a long tradition of working in infection prevention and control (IPC). This is supported by several legally binding regulations, such as standard precautions for all healthcare professionals and regulations that aim to protect employees from being exposed to infectious diseases. In addition, healthcare providers must have access to expert advice in IPC.

Swedish healthcare professionals are generally well aware of the procedures for IPC, and surveys show that it is considered a priority. To identify areas of improvement, regular assessments are carried out regarding compliance with the standard precautions for infection prevention as well as occurrence of health care associated infections in hospitals, in primary healthcare and in long-term care facilities.

Animals and veterinary medicine

Many factors have led to the current relatively favourable resistance situation among farm and companion animals in Sweden. Cornerstones in the work have been the early ban on antibiotics as growth promotors, a strong tradition of control of infectious diseases, strict regulations on animal welfare, and access to data on sales of antibiotics for animals. Close collaboration between academia, authorities and stakeholders has been vital for continued improvement.

Early awareness and action

In 1980, the Federation of Swedish Farmers adopted a sector-wide policy on antibiotic use. The policy aimed for a more controlled use of antibiotics, with a strong focus on prevention of diseases. Since 1986, the use of antibiotics for growth promotion is no longer authorised. Following this change, an increase in health disturbances were noted, and efforts to implement preventive strategies were strengthened. Over time, the need to use antibiotics to treat infections has declined.

Prevent infections and spread of resistance

Sweden has a long tradition of control of infections in animals. Several infectious agents are notifiable in Sweden. Since 2008 certain types of resistance are also notifiable which allows for monitoring of trends.

Disease control programmes create incentives for the introduction of biosecurity measures at farm level and in trade. Today, a general biosecurity programme is run by animal health service organisations.

Advice on prevention of diseases is available through organised animal health services. Farmers can get farm-specific advice on how to prevent diseases occurring at their own farm. These organisations provide a vital link between authorities and academia on one side, and practising veterinarians and farmers on the other.

A regulation on infection prevention and control (IPC) was introduced in 2014 stipulating that all veterinary practices must have an IPC programme. The implementation of this regulation was supported by expertise from the human health sector. Comprehensive guidance on how to develop an IPC-programme and on practical aspects, such as hand washing, disinfection, clothing and cleaning, was developed.

Prudent use of antibiotics

Antibiotics for animals are only available on prescription and can only be sold by pharmacies. Guidance on prudent use of antibiotics in various animal species, based on evidence or expert consensus, is readily available to veterinary prescribers.

Current regulations on the use of antibiotics are in line with the guidance on prudent use: antibiotics should only be used when needed and the risk of resistance should be considered when prescribing. A regulation from 2013 states that certain antibiotics must not be prescribed by veterinarians, and that restrictions apply to some other antibiotics (quinolones, 3rd generation cephalosporins).

Access to data and communication

Data on sales of antibiotics for animals has been available since 1980. After the ban on antibiotics for growth promotion there was a strong focus on reducing the need to medicate groups of animals. The quality of prescribing has improved, and today most animals are treated individually and narrow-spectrum penicillins are the most commonly prescribed antibiotics.

From the year 2000 a formalised monitoring of antibiotic resistance, the Svarm-programme, was initiated. The programme includes resistance of potential significance for public health, but also resistance in animal pathogens. The programme Svarmpat supplements Svarm with data on antibiotic resistance in pathogens of farm animals. Results of the monitoring are communicated via various channels and are discussed with relevant stakeholders.

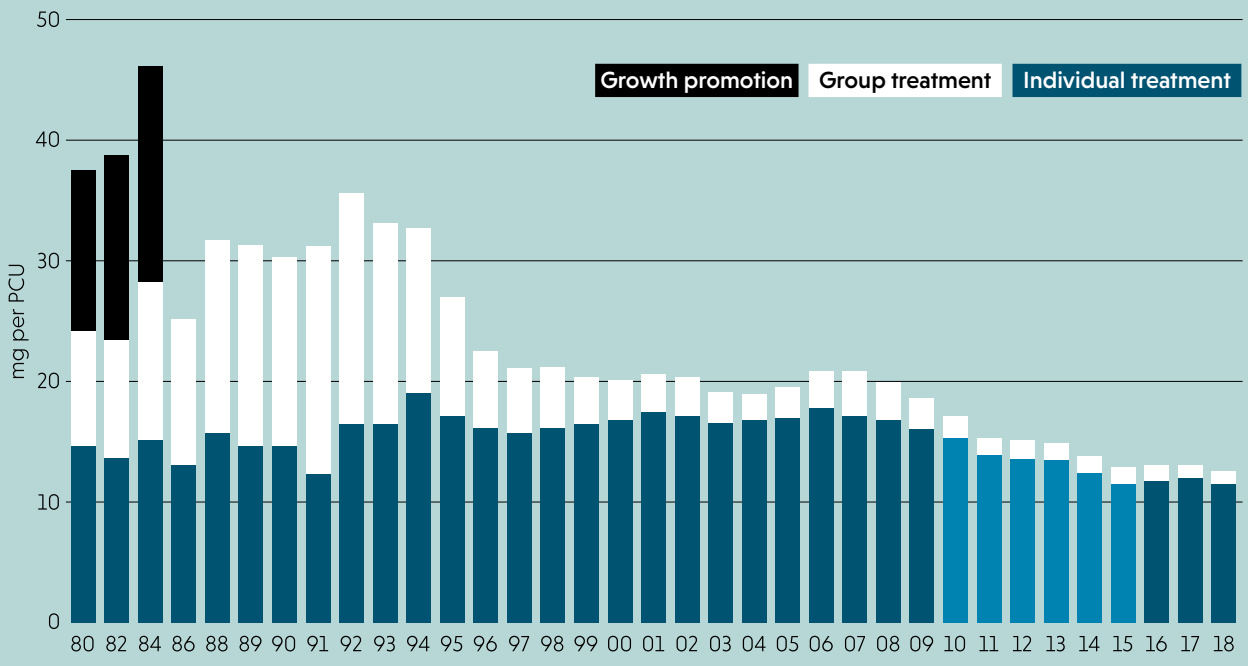

Figure 2. Since the mid-80s, sales of antibiotics have decreased by two thirds, corrected for the numbers of animals present each year.

PCU refers to population correction unit, an estimate of the biomass of animals in the country.
There is a lack of completeness for injectable products between 2010 and 2015, indicated by a paler colour.

Environment

An environment with a low level of resistant microbes and antibiotics reduces the risk of resistance transmission via water and food. Antibiotic resistance can spread via the environment which calls for close cooperation between sectors. In Sweden the authorities responsible for managing environmental risks participate in the work of the intersectoral coordination mechanism.

Examples of actions initiated:

- Sweden promotes increased environmental consideration in pharmaceutical legislation to reduce emissions from drug production.
- The Swedish Environmental Protection Agency (SWEPA) administers state funded investment grants for the better technological treatment of pharmaceuticals (including antibiotics) in the effluent of municipal wastewater treatment plants.
- Within the framework of the implementation of the EU strategy for the Baltic Sea region, the SWEPA is leading a dialogue platform on pharmaceuticals in the environment, including risks related to antibiotic resistance (BSR Pharma platform).
- The Swedish Water & Wastewater Association has started a pre-procurement group with the main objectives of disseminating knowledge and facilitating the cost-efficient implementation of technology for advanced wastewater treatment (including antibiotics).
- A knowledge center for pharmaceuticals in the environment has been established at the Medical Products Agency. The center provides a platform for dialogue and cooperation.

Research

Swedish antimicrobial resistance research is coordinated by the Swedish National Research Programme on Antibiotic Resistance with the mission to initiate and fund One Health antimicrobial resistance research in collaboration with national public funding agencies and other stakeholders. The programme is led by the Swedish Research Council and research priorities are defined in a national strategic research agenda. This agenda covers prevention and control of the emergence and spread of resistant bacteria between humans, animals, and the environment. It includes surveillance, diagnostics, and the development of new antibiotics, vaccines, as well as alternatives to antibiotics.

The development of the Joint Programming Initiative on Antimicrobial Resistance (JPIAMR) was coordinated by the Swedish Research Council, which also serves as the host of the international JPIAMR secretariat. Sweden is funding international research and innovation collaborations through: the Swedish Research Council, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, the Swedish International Development Cooperation Agency and Sweden's Innovation Agency. Sweden also participates in calls for proposals from JPIAMR, Joint programming initiative water, European and Developing Countries Clinical Trials Partnership (EDCTP), Eurostars and in bilateral calls with e.g. India and China.

Sweden is actively involved in international efforts

Sweden is actively involved in international efforts regarding antibiotic resistance through cooperation with other countries and stakeholders, such as the EU, WHO, OIE, FAO and UN. Furthermore, Sweden is home to the European office of ReAct, an international network dedicated to the issue of antibiotic resistance with the aim to stimulate and advocate for strengthened global engagement. The Public Health Agency of Sweden is a designated WHO Collaborating Centre for antimicrobial resistance containment, assisting WHO and its member states in the implementation of the Global Action Plan including the development of the Global antimicrobial resistance surveillance system (GLASS). Swedish experts also engage in research and capacity-building together with other countries.

Communicating to a wider audience

The Swedish population has a broad awareness of the responsible use of antibiotics, as measured by the Eurobarometer. A contributing factor has been long-standing communication efforts aimed at increasing the awareness of antibiotic resistance and knowledge of common infections as well as the importance of good hygiene and prudent use of antibiotics (see for example the Save antibiotics campaign https://saveantibiotics.se/). Efforts to prevent the emergence and spread of infections have also included activities to achieve a high vaccination coverage.

Further reading

Swedish strategy to combat antibiotic resistance. Government Offices of Sweden.
www.government.se/information-material/

The intersectoral coordinating mechanism against antibiotic resistance.
www.folkhalsomyndigheten.se/amr-intersect-coord-mechanism

Swedres – Svarm. Annual surveillance report on antibiotic resistance and consumption, published jointly by the National Veterinary Institute and the Public Health Agency of Sweden.
www.sva.se/en/antibiotics/svarm-reports

The Swedish National Research Programme on Antibiotic Resistance.
www.vr.se/english/mandates/funding-and-promoting-research/antibiotic-resistance---national-research-programme.html

JPIAMR, Joint Programming Initiative on Antimicrobial Resistance.
www.jpiamr.eu

Future costs of antibiotic resistance. Final reporting of Government commission on direct and indirect costs and consequences of antibiotic resistance in Swedish health care. Public Health Agency of Sweden, 2018.
www.folkhalsomyndigheten.se/amr-future-costs

Mölstad S et al. Lessons learnt during 20 years of the Swedish strategic programme against antibiotic resistance. Bulletin of the World Health Organization 2017; 95:764-773.
www.who.int/bulletin/volumes/95/11/16-184374/en/

Biosecurity programme for farm animals, in Swedish.
www.xn--smittskra-02a.se/

The Public Health Agency of Sweden | The Swedish Board of Agriculture | Formas - the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning | National Veterinary Institute | ReAct – Action on Antibiotic Resistance | Strama – the Swedish Strategic Programme Against Antibiotic Resistance | Sweden's Innovation Agency | Swedish International Development Cooperation Agency, Sida | The Association of Regional Medical Officers for Communicable Disease Control | The County Administrative Boards | The Dental and Pharmaceutical Benefits Agency | The Health and Social Care Inspectorate | The National Board of Health and Welfare | The National Board of Trade | The Swedish Agency for Marine and Water Management | The Swedish Association of Local Authorities and Regions | The Swedish Chemicals Agency | The Swedish Civil Contingencies Agency | The Swedish eHealth Agency | The Swedish Environmental Protection Agency | The Swedish Food Agency | The Swedish Medical Products Agency | The Swedish Research Council | The Swedish Research Council for Health, Working life and Welfare | The Swedish Work Environment Authority