Swedish work on containment of antibiotic resistance – in brief
Tools, methods and experiences

Sweden has relatively low use of antibiotics per capita and favourable antibiotic resistance conditions. The antibiotic consumption in Sweden has decreased substantially since the mid-1990s. This current situation is influenced by different factors including a long tradition of strong local commitment and strategic work on both regional and national level.

The Public Health Agency of Sweden has published a report that describes the context of the Swedish healthcare system and the tools for and examples of Sweden’s successful work on containment of antibiotic resistance in human medicine, with a focus on the rational use of antibiotics and resistance monitoring. It can be used as a background document and inspiration for any work to control the trend of increasing levels of resistant bacteria.

For sustainable achievements in the work against antibiotic resistance, the efforts must be continuous and new systems and strategies developed. Prompt action is needed and collective measures are essential – both nationally and globally.

Swedish work to contain antibiotic resistance is characterized by local, national and international cooperation

The early response to the increasing antibiotic resistance in the mid-1990’s with initiation of long-term and structured measures from the profession and authorities is one important explanation of why Sweden has been able to slow the escalation of antibiotic resistance. Part of the strategy was implementation of treatment recommendations for common infections in outpatient care resulting in a sustained decrease in antibiotic consumption.

Political support and commitment for the work is strong and many stakeholders are involved on local and national level. Strama (the Swedish strategic programme against antibiotic resistance) plays a central role in this field. The

Strama network was initiated in 1995 and is characterized by multisectorial collaboration on local and national level. Essential components are multi-disciplinary interaction and networking, as well as local implementation where the local Strama groups play an important role. On a national level Strama has had different organisations over the years from initially being an NGO, later receiving a remit from the government, and since 2010 an advisory board to the Public Health Agency of Sweden.

The Public Health Agency of Sweden is responsible for national monitoring of antibiotic resistance and use of antibiotics in human medicine, with support from local

The full report can be downloaded at www.folkhalsomyndigheten.se

International political cooperation at the highest level is needed to achieve a global ban on antibiotics in animal feed and to phase out all sales of antibiotics without a prescription”

OTTO CARS, PROFESSOR, SENIOR EXPERT, THE PUBLIC HEALTH AGENCY OF SWEDEN
experts. Data is also communicated regularly to laborato-
ries, Strama groups, the healthcare sector, policy makers 
and the media.

The Public Health Agency of Sweden works for an 
interdisciplinary, locally approved model by ensuring 
involvement of all relevant stakeholders including national 
and local authorities and professional and non-profit 
organisations. In 2012, the Swedish intersectoral coordi-
nating mechanism was formed, a forum of 20 government 
agencies active in efforts against antibiotic resistance to 
strengthen action in the field.

Joint international efforts are important. Sweden has 
several bilateral collaborations and is actively involved 
global efforts to contain antibiotic resistance through 
cooperation with actors in other countries, the EU and the 
WHO.

Sweden has always had a strong 
public health sector

Any work on containment of resistance must be seen in 
and adapted to its context. In Sweden, the state is respon-
sible for healthcare policies. Healthcare is largely organ-
ized at and funded by taxes at the county council level. 
Pharmaceuticals are regulated with prescription-only sales 
of antibiotics and prescribers may not own a pharmacy or 
sell pharmaceuticals for personal gain. Data and statistics 
are available from sales at all registered pharmacies and 
surveillance of antibiotic use and resistance is an important 
part of the containment strategy.

Strategic work on containment of antibiotic resistance 
includes efforts to reduce transmission of infections, 
resistant bacteria and healthcare-associated infections. The 
establishment of infection control units have been impor-
tant and Swedish healthcare professionals are generally 
aware of and practice the basic procedures for infection 
control. Sweden has a strong core of specialists in clinical 
microbiology and infectious diseases that play a key role 
in promoting rational use of antibiotics and have done so 
from an early stage.

Additional factors that may explain the favourable 
situation in Sweden include high-standard laboratories, a 
tradition of frequent sampling and culturing, well-devel-
oped surveillance systems and high coverage of data on 
antibiotic sales. Still, there is a need for further progress 
including greater awareness, better infection control, 
improved diagnostics and adequate IT systems for diagno-
sis-linked prescribing data.

Strama – the Swedish strategic programme 
against antibiotic resistance

Strama was formed in the mid-1990s as a voluntary, multi-
disciplinary network with the aim to safeguard the effi-
ciency of antibiotic treatments. Strama has brought about 
many initiatives, being a driving force on issues concerning 
antibiotic resistance. Some key components of the Strama 
work are information and training of physicians, monitor-
ing, analysis and feedback of antibiotic use and resistance, 
treatment recommendations, studies, international moni-
toring and advocacy. Strama and work within the network 
are described in detail in the report, with examples of 
strategies and successful initiatives.

Local Strama groups play an important part in commu-
nicating data and results to prescribers in order to demon-
strate development and decide on the focus of local inter-
ventions. Networking and interaction are key elements in 
the Strama work: from the early identification of a problem, 
through analysis of possible measures, to implementation 
and follow-up. The Strama groups also share their experi-
ences at recurrent Strama Days and through the web portal 
strama.se. The Strama work is characterized by a cyclical 
process with continuous communication with prescribers.

The need for differentiated efforts in inpatient and 
outpatient care has in many places led to the establishment 
of separate groups, e.g. Hospital Strama, and in some cases 
also an ICU Strama group for intensive care.

Resistance data and data on antibiotic prescrip-
tion form the foundation for work at local level

National and local monitoring forms the basis for develop-
ing treatment recommendations and following resistance 
development and implementing and measuring the effect 
of interventions. Data from clinical cultures, along with 
screening and transmission-tracing data, form the basis 
of Sweden’s resistance surveillance. Four types of anti-
A good starting point is to set up a national infrastructure consisting of a network of high standard laboratories, using standardised methods and harmonised breakpoints to detect and define resistant bacteria. It is crucial that these national, public health laboratories agree on methods and standards."

GUNNAR KAHLMETER, ADJ PROFESSOR IN CLINICAL BACTERIOLOGY

Biotic-resistant bacteria are monitored according to the Communicable Diseases Act and epidemiological typing is carried out on all notifiable forms of resistance.

Sweden is actively working for a quality-assured methodology for resistance surveillance. Comparing the prevalence of antibiotic resistance between different laboratories over time requires common susceptibility breakpoints and Sweden has used those established by the European Committee on Antimicrobial Susceptibility Testing for many years.

Four systems have been developed and used in national resistance surveillance that are further described in the full report;

**ResNet** Annual resistance monitoring and quality assurance online. Since 1994, participating laboratories submit susceptibility testing data to this web-based programme and are able to observe resistance conditions locally and nationally, and continuously assess the quality of their own diagnostic methods.

**EARS-Net** European resistance monitoring of invasive infections. Sweden contributes with national resistance data on serious infections to EARS-Net, a programme that has an important role in informing about the occurrence and spread of antibiotic resistance in Europe.

**SmiNet** Continuous monitoring of resistance. SmiNet is a web-based programme that receives and manages notifications from treating physicians and laboratories. Resistance is reported sooner and can be monitored continuously, unlike in EARS-Net and ResNet.

**Svebar** An IT system for early alerts and continuous resistance monitoring. The system is based on all results from cultures being transferred on a daily basis from microbiological laboratories for early warnings and local feedback. Resistance monitoring in Sweden is mainly done on a voluntary basis and has good geographic coverage. The Public Health Agency of Sweden and the Swedish Veterinary Institute analyse and compile national data on antibiotic sales and resistance in an annual report, SWEDRES/SVARM.

**Monitoring of the use of antibiotics includes all sales**

Sweden experience demonstrates that work for rational use should be carried out close to the prescriber, which requires prescription data from the hospital clinic or health centre level and from individual prescribers. The Swedish eHealth Agency maintains pharmaceutical sales statistics, delivered by all registered pharmacies. Data on county and national level are published on the Public Health Agency of Sweden's website and in electronic newsletters.

The systems currently used for monitoring in Sweden have developed gradually, from the relatively simple diagnosis-prescription studies of the 1990s to today's increasingly sophisticated instruments, such as the Anti-Infection Tool IT system. Strama has conducted repeated manual diagnosis-prescription studies in outpatient care, covering counties with a total of approximately 1.2 million people. Local Strama groups have also previously performed point prevalence measurements in inpatient care, with coordination from the Public Health Agency of Sweden. The studies have provided in-depth knowledge about indications and prescribing patterns. Several initiatives have been taken in recent years to set up registers and systems that automatically generate diagnosis-linked data in outpatient care as well as in inpatient care. Examples include:

**PRIS** Register for dealing with infections in primary care. The register is based on data automatically retrieved from patients’ medical records and includes diagnosis-linked prescribing data.

**The Anti-Infection Tool** A national IT system for continuous registration of healthcare-associated infections and antibiotic prescription. The system makes it possible to calculate the proportion of healthcare-associated infections or antibiotic prescriptions among all admitted patients.

Other systems have been developed on local levels such as a tool for better prescribing in primary care. Within intensive care, ICU Strama has been running a special project since 2000 to systematically register and analyse antibiotic use and infection control in intensive care units. Sweden also participates in ESAC-Net, a European network for surveillance of antibiotic consumption. These, and other initiatives, are further described in the full report.
Evidence based treatment recommendations give support to the prescriber

Treatment recommendations are needed to more clearly define when an antibiotic is indicated. To gain the highest possible credibility and acceptance they are written in consensus with experts representing several medical specialties from both out- and inpatient care. The Medical Product Agency and the Public Health Agency of Sweden have published national recommendations for treatment of common infections in outpatient care and national care programmes for infections in inpatient care have been developed by the Swedish Society of Infectious Diseases, a nationwide group consisting mainly of infectious disease specialists.

Local organizations such as Strama groups and pharmaceutical committees are key actors for the dissemination and implementation of recommendations in healthcare settings. Based on national recommendations, local guidelines and memoranda adapted to local needs are produced, including local patterns of antibiotic resistance, traditions and information channels. Brochures, seminars, articles in the medical and news press, apps for smartphones as well as patient information leaflets are examples of how national and local recommendations have been communicated.

Extensive communication efforts on rational use of antibiotics are needed on many levels, locally, nationally and globally to spread the message on the prompt need to stop the spread of antibiotics resistance.

The total use of antibiotics has decreased since the mid-1990s. This coincides with the founding and first active years of Strama, and the low levels are maintained by a continuos Swedish strategic work. (Source: SWEDRES/SVARM)

The report has been produced within a collaboration project between the Indian National Center for Disease Control (NCDC) and the Public Health Agency of Sweden as a part of the countries’ work for rational antibiotic consumption and improved surveillance of antibiotic resistance. The project has been financed by Sida.