Transversal Spotlight 'Sciensano 2025'

Transversal domain : Antimicrobial resistance

What are the (future) societal challenges in this scientific field to which Sciensano will be able to make a contribution?

Antimicrobial resistance (AMR) causes therapy failure with around 25,000 deaths per year in Europe (ECDC figures). Other consequences include longer hospitalisation periods, higher morbidity, mortality and more expensive treatment costs. The use of antibiotics in livestock and pets to prevent and treat diseases contributes to the spread of antimicrobial resistance.

AMR is also imported through the global food trade from countries with lower hygiene standards and high use of antibiotics, with environmental aspects also becoming increasingly apparent in the spread of AMR. AMR is therefore quite evidently an area that needs to be treated in a *One Health* perspective.

The authorities (regional, national, EU, international: OIE, WHO, ECDC, FAO, etc.) is increasing the pressure with new or amended legislation; reviewing the increasingly frequent and much criticised reimbursement model for antibiotics (*patent-driven business* model).

Campaigns in the media to enhance awareness and reduce the use of antibiotics have alerted the population and created high expectations.

The most important demographic evolution in the field of antimicrobial resistance is undoubtedly the increase in vulnerable people in the population due, among other things, to the ageing of the population, the rise in immigration, and treatment-related immuno-deficiencies (diabetes, transplantations, neutropenia, malignancies, etc.). Due to increased globalisation, there is a greater chance of contact with "exotic" pathogens that can be introduced into a largely naive population when people return. Other factors to be taken into account include population growth, housing density (crowding) and the further intensification of livestock farming. The further division and fragmentation of powers and competencies in Belgium makes it difficult to monitor and combat antimicrobial resistance efficiently.

With regard to agriculture, as well as the health care sector in particular, we see a development towards transparency, quality indicators and *open data policies*.

Rapid & patient-side (farm-side; pet-side) diagnostics that can help to prevent inappropriate use of antibiotics; spectrometric methods and *in silico* testing (e.g. TBC) with high-throughput sequencing; and relevant bio-informatics for the appropriate interpretation of the (mass of) data; studies of the microbiome; metagenomics will be practically and financially possible at population level in the near future. Real-time reporting and e-health will go hand in hand.

How will Sciensano's Scientific Directorates contribute? By setting which priorities?

Sciensano has large technological laboratory capacity, expertise in data analysis and extensive epidemiological knowledge at its disposal. This enables us to respond to the need for epidemiological and laboratory surveillance, independent advice, opinions, recommendations for antibiotic use, as well as real-time and validated benchmark feedback for specific target groups (departments, diagnosis-related patient groups). We can monitor the link between use and resistance in different sub-sectors and supply scientific publications, which we transform into policy recommendations. We also provide an answer to the need for accreditation – quality control (proficiency testing).

Sciensano also has strong historical biological databases and culture collections relating to antimicrobial resistance in germs isolated from humans, food and animals. The data are standardised and are increasingly communicated electronically and automatically by way of health data (HD).

As a leader of the scientific *One Health* platform, Sciensano wants to play an active part in bringing together all players working in the area of AMR.

What added value will this bring for our target groups? [1]

Sciensano is the National Focal Contact point for antimicrobial resistance and related entities for ECDC (EARS-net, ESAC-net, Clostridium difficile, ICU, SSI, PPS, HALT) and works independently. This independence is also expressed among the various international, federal and regional partners. During field support (MDRO-OST; multi-drug resistant organisms - Outbreak Support Team) in particular, these official bodies are respected for their specific areas of competence, with Sciensano working in this regard in a consultation model based on scientific proof.

Sciensano provides field support in healthcare institutions for the taking of environmental samples and assistance to reduce use. In opinions concerning the prevention of infection (screening, contact isolation, cohorting, hand hygiene, etc.) we encourage the use of rapid diagnostic techniques and technical tools.

Sciensano is an important partner in the drawing-up of a *One Health* report on AMR as included in the objectives of BAPCOC and AMCRA.

What crucial questions will be dealt with in these priorities?

Animal-food-human-environment link for AMR

- What is the best way to map antimicrobial resistance and consumption of antibiotics in the areas of animals-food-humans-environment? What tools and information do we have at our disposal and what is lacking?

- How can we centralise and manage the resistance and consumption data and draw conclusions from these, that are useful for public health and also help policy?

- What is the influence of globalisation (e.g. tourism), climate warming, immigration, import & export of goods, and the environment in the development and spread of AMR?

Patient & resistance

- How can new resistances in animals-food-humans-environment be detected quickly and how can their spread be limited (real-time result, with clinical relevance)? What techniques should be applied for this purpose? What other tools, or other databases, need to be developed for this?

- What diagnostic developments are of importance in relation to AMR? For what (infectious) diseases is the situation most alarming with regard to AMR and what can be done about this? How can therapy failure in humans and animals be avoided? What are the developments relating to the mechanisms and transmission paths of resistance? How do we use this knowledge to prevent therapy failure?

- What advanced laboratory methods and genetic (NGS), phenotypical (spectrometry, cytometry) bioinformatics do we need to develop and implement in order to detect emerging resistance in a rapid, precise and flexible manner and provide an accurate laboratory diagnosis? Can we offer methods that can be used in the field as initial screening and which confirmations are still needed? What additional value can the (r)evolution of new sequencing and high-throughput technologies have for the surveillance system, provision of services (outbreak support) and expertise.

- How can the use of antibiotics be reduced? What are the alternatives to treatment with antibiotics (e.g. phage therapy/vaccination) and can we contribute to the development of this?

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[1] Our target groups are: health professionals, policy makers, general population

Quality of healthcare

- How can 'good practices' for the prevention of resistance be collected and defined?
- How can antibiotic use be reduced as much as possible in a safe way? How can we make care sustainable, and what role do quality indicators and Pay4Quality play in this?

Which current projects contribute to the question?

Details of current projects can be found in the accompanied Excel 'PMO tool Schijnwerpers'.

Which strategy will be used to achieve this spotlight?

1/ Development of the projects listed in the Excel, as well as new projects to be launched.

2/ More transversal work with all internal experts via an internal platform to be created and taking our position in the Belgian AMR landscape by creating an external platform (One Health AMR project).

3/ Increased cooperation with our stakeholders so as to be able to sharpen the focus of research questions at the start of a project and thus ensure closer alignment of the opinions and output of the project to the research field.

4/ Creation of a human AMR reference laboratory (the process already started).

5/ Use the budget for scientific projects strategically and in a transversal way.

6/ Better information of stakeholders to provide a better picture of what Sciensano can offer them, so that Sciensano can be used more to examine and research essential questions.

Summary

Sciensano is the reference for Belgium with regard to surveillance and advice on antimicrobial resistance in a *One Health* perspective.

Our core activities include:

- Epidemiological and laboratory surveillance of antimicrobial resistance in humans, animals and related environments.
- Centralisation of consumption data of antimicrobial agents in humans and animals.
- Field support in care institutions with hard-to-treat bacteria, in cooperation with competent authorities.
- Scientific research into resistance mechanisms and alternatives to antimicrobial treatments.
- Development of big databases, electronic data transmission, advanced statistical and laboratory methods, determination of antimicrobial resistance, new sequencing and high-throughput technologies.