Government of the Netherlands

Dutch Action Plan

for the reduction of antimicrobial resistance **2024 – 2030**

Version 1.0 2024

Contents

Foreword

The emergence and spread of antimicrobial resistance (AMR) is a growing and hard-to-tackle problem in the Netherlands and around the world. Around the start of the new millennium, the Dutch government launched a national and international strategy to combat AMR and its consequences.

These efforts are paying off: infections caused by resistant bacteria remain relatively rare in Dutch hospitals and Dutch doctors prescribe only limited amounts of antibiotics. Thanks to targeted policy over the past few years, the veterinary sector in the Netherlands has also further reduces their already relatively low use of antibiotics.

With the impact of resistance to key antibiotics still growing, it is essential that we stay vigilant, anticipate and take action.

For a long time, efforts to tackle antimicrobial resistance were confined to antimicrobial resistant bacteria and the use of antibiotics. Several years ago, however, this focus began to broaden as other microorganisms, such as fungi, viruses and single-celled parasites, and their resistance to the relevant antimicrobials also entered the frame and were included in policy on combating antimicrobial resistance.

In many respects, antimicrobial resistance (AMR) is a cross-border problem and therefore requires a cross-border approach.

Resistance transcends boundaries, both between domains and between economic sectors. This means that it is crucial that we adopt a *One Health* approach, i.e. an approach consisting of actions that span the divides between domains, sectors and policy departments. Even more so than in the past, this approach focuses not only on people and animals, but also on plant health and the role of the environment. The *One Health* triangle illustrates the interconnectedness and interdependence between the health of people, animals and plants. Microorganism transmission occurs in and across the three domains of people, animals and plants, where all organisms live together in ecosystems. Collaboration between domains and economic sectors is, therefore, an important pillar of the *One Health* approach.

Resistance also transcends national borders: the movement of people, animals, plants and food contributes to the cross-border spread of resistant microorganisms. Alongside a national approach, global action is the only way to effectively combat the growing resistance problem, including in the Netherlands. This is why international collaboration is such an important theme in the Dutch AMR-policy.

These themes – cross-border health risks and collective action targeting all microorganisms in all domains and countries – are reflected in this Dutch Action Plan. They feed into the ambitions, goals and concrete actions that will contribute to limiting the spread and impact of AMR.

May 15, 2024

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On behalf of Vivianne Heijnen
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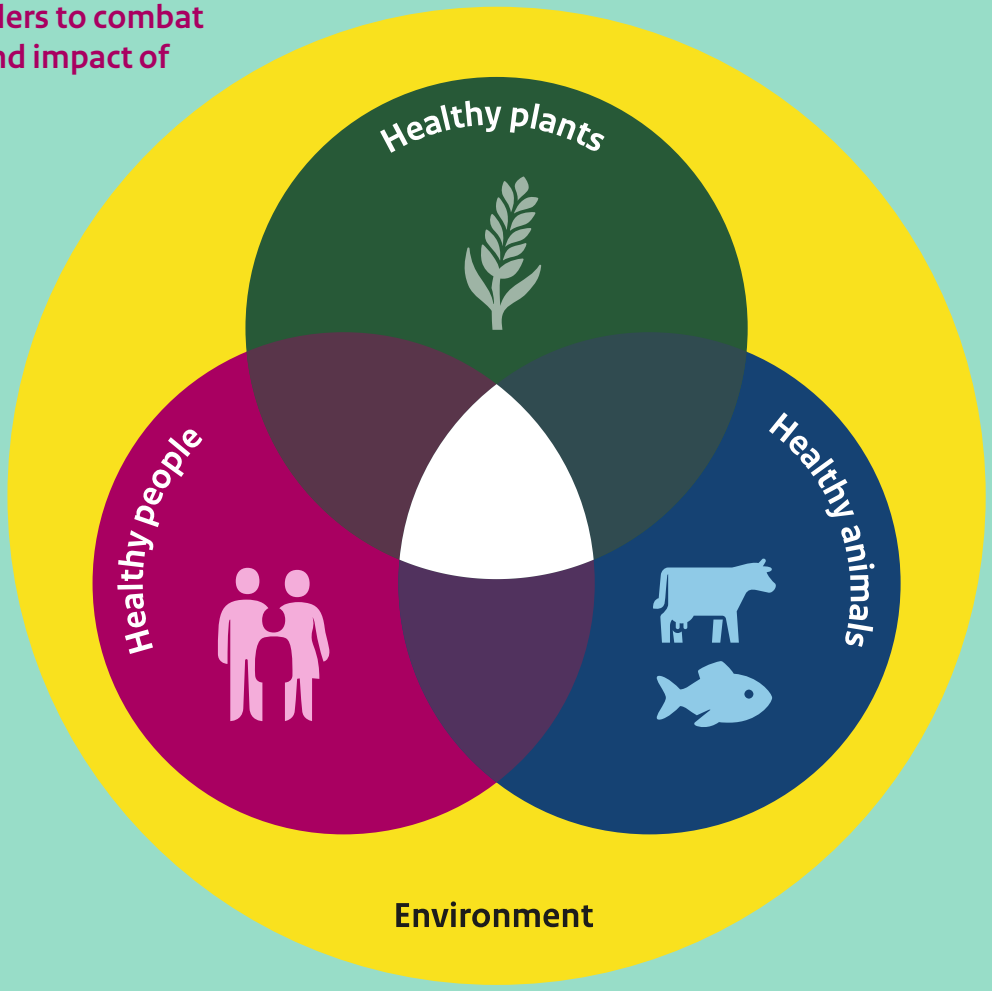
Figure 1 *One Health* – overlapping domains (Source: Quadripartite, 2023)

Healthy people, healthy animals, healthy plants

The *One Health* approach encourages collaboration across borders to combat the emergence, spread and impact of AMR.



Introduction

AMR: an urgent long-term challenge across the globe

Antimicrobials, including antibiotics, are among the most important discoveries of the 20th century and they save countless lives every year. They help prevent and treat infectious diseases caused by pathogenic bacteria, fungi, viruses and single-celled parasites (protozoa) in humans, animals and plants. They are used all over the world, in human and veterinary healthcare, agriculture and other economic sectors.

The more antimicrobials we use, the more microorganisms will become resistant. And the more microorganisms spread across the world in a variety of ways, the faster AMR will spread too.

Infections caused by resistant microorganisms lead to higher mortality rates, slower healing and more complications in vulnerable patients, causing healthcare costs to soar. Infections with resistant microorganisms also have a negative impact on animal health, agricultural production, the economy and food safety in the Netherlands and around the world, with low and middle-income countries likely to be the worst affected. On top of that, the problem is growing. Microorganisms turn out to be increasingly resistant to multiple types of antimicrobials, even to the 'critical' drugs that are used in human healthcare as a last resort. At the same time, the development of new antimicrobials has stalled due to a lack of economic incentives.

Problems caused by resistant microorganisms are on the rise

The World Health Organization (WHO) lists AMR among the greatest threats to public health.[1] In 2015, they issued a global action plan supported by the FAO (UN Food and Agriculture Organization) and the WOAH (World Organisation for Animal Health, formerly the OIE). The World Bank sees rising healthcare costs and productivity loss due to antimicrobial resistance as serious threats to the economic future of many countries and as barriers to achievement of the *Sustainable Development Goals*.[2] In 2023, the *United Nations Environment Programme* (UNEP) published a report entitled *Bracing for Superbugs: Strengthening environmental action in the One Health response to antimicrobial resistance*, emphasizing the need for a multi-sector approach.
The WHO, FAO, UNEP and WOAH have joined forces in the Quadripartite to implement the Global Action Plan on Antimicrobial Resistance to fight the emergence and spread of antimicrobial resistance.

Worldwide, an estimated 1.3 million deaths per year can be linked to resistant bacterial infections.[3] In the European Union (EU), 35,000 deaths each year are related to AMR. From the perspective of the European Union, this means that AMR is one of the biggest threats to health.[4] Like the WHO, the EU emphasizes the need to adopt an internationally oriented approach to the problem based on a *One Health* perspective.[5] After all, antimicrobial resistance does not respect the boundaries between species or ecosystems and spreads between all domains and levels. It is, therefore, critically important that we better understand the connections between AMR in the human, animal and plant domains, as well as the role of the environment. Measures to combat AMR are most effective when all domains are considered as a whole.

The Netherlands is still in a relatively good position

Compared with many other countries, levels of AMR in human healthcare have been relatively low in the Netherlands. Although there is currently no significant increase overall, resistance to some specific antimicrobial agents has been growing. This relatively favourable situation can mainly be attributed to the already cautious and prudent use of antimicrobials in the Netherlands.

In human healthcare in the Netherlands, most antibiotics are prescribed by general practioners, who are more restrained compared with their peers in other countries when it comes to prescribing antibiotics. In 2020 and 2021, antibiotic prescriptions by doctors in the Netherlands were actually lower compared to previous years, probably because the pandemic meant there were fewer general practioner visits and hospital admissions for diseases other than COVID-19.

This pandemic-related effect on the use of antibiotics is beginning to subside. In 2022, general practioners and hospital doctors prescribed more antibiotics than during the COVID-19 years. In hospitals, antibiotic use has all but returned to pre-pandemic levels. general practioners, however, still prescribe antibiotics slightly less often than before the pandemic. In addition, hospitals and nursing homes are reporting more outbreaks of infections caused by resistant bacteria than during the COVID-19 years. In 2022, this number was still lower than in the years before the pandemic.[6] The use of antibiotics in Dutch hospitals is also low from an international perspective, although there are still considerable differences between healthcare institutions. Further reduction will be a challenge.

In the Dutch livestock sector, the use of antibiotics has drastically reduced in the past ten years, which has led to a decline in antibiotic resistance in indicator organisms in the animal species monitored over the same period.[7] This is a very important point, as it shows that reducing the use of antibiotics in animals has had a clear effect on the development of AMR in animals.[8,9,10] Through benchmarking, animal owners, animal sectors and veterinarians have gained an understanding of the antibiotic use for which they are responsible, and have obtained insight into their progress relative to their peers in the same sector and into where they stand in relation to the applicable limit value set by the Netherlands Veterinary Medicines Institute (SDa). Between 2009 and 2022, overall use fell by 77.4%, which is proof that policies aimed at reducing antibiotic use, along with efforts by animal owners, veterinarians, animal sectors and quality management systems, have paid off. Today, the per-animal average of antibiotics sold in the Netherlands is lower than the European Union average.[11] However, with regard to animals, there are still significant differences in use between particular animal sectors and individual farms.[12,13]

Action is still required

Microorganisms will continue to develop resistance, particularly where antimicrobials are used to fight them. The battle against AMR remains a constantly evolving challenge.

For example, infections caused by resistant non-bacterial micro-organisms such as fungi are occurring more frequently in hospitals. The impact of viruses with resistance to antiviral agents is also increasing. Where the focus in the past decades used to solely be on resistant bacteria, growing attention is now also being given to antimicrobial resistance in other types of microorganisms.

At the same time, it is clear that antimicrobial resistance can also develop outside of human and veterinary healthcare, for example when antimicrobials are used in sectors such as crop cultivation and the food industry. Furthermore, residues of antimicrobials and resistant organisms can spread through the environment via food, waste, sewage and surface water flows, as well as animal waste streams, contributing to the development and perpetuation of antimicrobial resistance.

Action is also needed to address the impending shortage of effective antimicrobial drugs for humans and animals. There is a lack of economic incentives for the development and production of new human and veterinary medicines. Incentives are also often lacking for pharmaceutical companies to revise established dosage regimens, which means the effectiveness of the antimicrobials used may decline. Due to the emphasis on restraint in the use of antimicrobial drugs, there are few economic incentives for pharmaceutical companies and medicinal product manufacturers to continue to supply existing products or to develop innovative antimicrobial drugs for the market.

AMR is inextricably interwoven with other major challenges of our time, such as pollution, land degradation, deforestation, biodiversity loss, food insecurity and, in particular, climate change. The climate crisis also has an impact on animal health, plant health and the environment, which may, in turn, affect AMR. Extreme weather conditions, such as heat waves, storms and floods, are increasingly common. They threaten food security and water quality and could thus cause infectious diseases to increase and spread, including infections caused by resistant microbes.

This could prompt an increase in the use of antimicrobials for people, animals and plants.

Figuur 2 Overview of the AMR action plan

Long-term vision

Based on a *One Health* approach, we collaborate across borders to combat the emergence, spread and impact of AMR.

Themes

Strengthening collaboration and integration, from the regional to the global level

Expanding the focus to all antimicrobials

Broadening our scope to include plant health and the environment

Ambitions

Knowledge, insight and innovation

Infection prevention

Responsible use

Availability of antimicrobials

Raising awareness and spreading knowledge

Broader and closer collaboration

A proactive international role

An Action Plan for the Netherlands

The cross-departmental Dutch policy on combating antibiotic resistance dates back several years. Back in 2008, the Dutch government and animal sectors signed an agreement to reduce the use of antibiotics, and in 2015 the National Antibiotic Resistance Programme was launched, which is a *One Health* programme focusing not only on human health but also on veterinary care, food safety and the environment. Special attention was also given to innovation and international activities.

In 2019, the evaluation of this policy programme showed that it had produced tangible results.[14] For the first time, the policy is now being formulated into a National Action Plan by the three government departments involved: Infrastructure and Water Management (I&W), Agriculture, Nature and Food Quality (LNV) and Health, Welfare and Sport (VWS).

National Action Plans are the key pillars supporting the Global Action Plan on AMR launched by the WHO in 2015.[15] They are crucial instruments for moving forward at the national and international level.

This Dutch Action Plan for the 2024-2030 period builds on the policy that is already in place and adds new focus areas. It is an integrated strategy that will help a range of domains, sectors and actors work collectively towards shared ambitions and goals, based on their own responsibilities and areas of expertise.

Actions to achieve these goals are pivotal to the action plan.
For example, the plan includes actions to raise awareness and increase knowledge sharing among citizens and professionals through communication, training and professionalisation, actions to stimulate and harness innovation and research, actions to share data between domains and across national borders, and actions to develop faster diagnostics and ensure their broad application.
The Dutch international effort is an important pillar.

Input for this action plan came from various sources, including the evaluation report (relating to the human domain) on the Antibiotic Resistance Programme[16] and other advisory reports. Relevant parties in the domain were also consulted, for example during a stakeholder meeting on 26 September 2023. The plan also ties into other elements of government policy, such as the Pandemic Preparedness Policy Agenda and the Dutch Global Health Strategy. All parties involved share, based on their own specific roles, responsibility for strengthening the collective approach to AMR.

Themes, ambitions, goals and actions

The Netherlands is set, by adopting an international *One Health* approach, combat the emergence, spread and impact of AMR.
This Dutch Action Plan to combat AMR for the 2024-2030 period is focused on addressing the adverse impact that resistant micro-organisms have on people, animals and plants in the Netherlands and beyond our borders, in the short and long term. Throughout the plan, particular attention is given to three themes that deserve special attention in the years ahead:

1. Strengthening collaboration and integration, from the regional to the global level.
2. Expanding the focus to all antimicrobials.
3. Broadening our scope to include plant health and the environment.

The plan describes ambitions along seven main lines:

1. Knowledge, insight and innovation
2. Infection prevention
3. Responsible use
4. Availability of antimicrobials
5. Raising awareness and spreading knowledge
6. Broader and closer collaboration
7. A proactive international role

Goals for 2030 have been formulated for each of these ambitions, along with actions towards achieving these goals. This makes the action plan dynamic, as it keeps developing over time. As and when necessary, actions will be adjusted and refined in the coming years, including on the basis of research results, budgetary scope and evolving insights.

Special focus on 3 themes

Theme 1

Strengthening collaboration and integration, from the regional to the global level

The Netherlands is a densely populated, internationally oriented trading nation with large livestock farming and agricultural sectors, all set in a water-rich delta. Against that backdrop, AMR presents a particular challenge. Antimicrobial resistance spreads across borders and boundaries of all kinds: between countries and regions; between healthcare sectors, institutions and professions; and between people, animals, plants and all the other components of the environment.

Preventing and reducing AMR will, therefore, require the structural involvement of numerous actors across various levels of society.

It will require ongoing knowledge sharing and collaboration between regions, countries, policy departments and their underlying domains, economic and healthcare sectors, organisations and individual professionals.

Each will bring their own culture, perspectives, interests and traditions, while sharing a collective responsibility to contribute to an effective strategy for the challenge of curbing antimicrobial resistance within their own field of work and capabilities. The Netherlands also actively contributes at an international level through the Quadripartite (a partnership between the WHO, WOAH, UN and FAO), among other channels.

Our country is a hub for major international trade and travel flows, where people, animals, and commodities spread antimicrobial resistance every day. Thanks to strong national efforts and focus, the pressure from resistant microorganisms in our country is, for now, relatively low. However, due to growing international mobility, the impact of AMR from abroad is increasing. In addition, the global impact of climate change could contribute to a rise in AMR. It is, therefore, critically important for collaboration and integration to be given an important place in the policy arena, for example by keeping the subject high on the international political agenda and by sharing our national experiences and expertise with international partners.

Collaboration and integration are key if we want to achieve results at the regional, national, European, and global level, which is why this is an important theme in this Dutch Action Plan.

Theme 2

Expanding the focus to all antimicrobials

In the fight against resistant microorganisms, the main focus was initially on infections caused by bacteria that had become impervious to antibiotics. However, other types of microorganisms, such as fungi, viruses and single-celled parasites, can also develop resistance to widely used antimicrobials, and then spread. This is an important argument for broadening the policy focus to combating resistance to all types of antimicrobials.

Fungal infections are increasingly causing problems, partly due to growing numbers of patients with weakened immune systems. For the past few decades, fungi such as *Aspergillus fumigatus* and yeasts such as *Candida auris* have developed greater resistance to antifungals. For example, in 2021, one in eight *Aspergillus fumigatus* infections treated at Dutch university medical centres was resistant to triazoles (active substances used to combat fungi).[17] Such resistance can lead to serious or even life-threatening infections.

Resistance to azoles - a broad group of antifungals - can also arise outside of healthcare. Research has shown that some of the resistance in hospitals originated from external sources. Azoles are used on a large scale to prevent or control fungal growth in crops such as flower bulbs, strawberries, potatoes and onions.[18] They are also used as fungicides for garden plants, garden timber, paint, mattresses, cosmetics, and more. In addition to the issues around fungi, there are other problems with microorganisms, such as HIV and tuberculosis.

For non-bacterial microorganisms (fungi, viruses and single-celled parasites), there is also a need to detect residues, monitor resistance and track what antimicrobials are used, such as antifungals (fungicides) and antivirals. Responsible use of existing drugs and research into new drugs or alternatives remain high on the agenda, which is why expanding our focus is a recurring theme in this action plan.

Stefani (24, Commercial Economics student)

In 2018, Stefani contracted a fungal infection that was very difficult to treat because the usual medication wasn't working. The infection nearly took her life, and the impact remains huge.

'The fungus did a lot of damage to my lungs, so I now only have 60 percent of normal lung capacity. I also can't write very well with my right hand anymore because my motor skills have diminished.'

Theme 3

Broadening our scope to include plant health and the environment

While the threat from antimicrobial resistant microorganisms is the most alarming in human healthcare, it is becoming increasingly clear that the causes and impact of AMR are not limited to human healthcare. Both antimicrobials and organisms that are resistant to them spread via a wide range of routes and across different domains.

Initially, the *One Health* approach mainly reflected an awareness that the health of humans and the health of animals are interwoven, particularly in terms of the development and spread of zoonotic infectious diseases and AMR. For an AMR strategy to be effective, AMR needs to be addressed in all domains, including those of plants and the environment. The WHO has identified wastewater, for example, as an important source of antimicrobial residues, resistant microorganisms and genetic elements that could transmit antimicrobial resistance.

For some time now, the policy focus has been largely on the use and reduction of substances with an antimicrobial effect in agriculture.

The role of the environment has not always been taken into consideration. The environment is a factor to consider because resistant microorganisms and residues of medicines, veterinary medicinal products and plant protection products, for example, can spread through the soil, water, waste or food products. Industries such as garden timber treatment plants can also act as sources of antimicrobials or resistant microorganisms. Other sectors, including crop cultivation and the manufacturing industry, are also not yet closely involved in AMR policymaking. This is why strengthening and expanding the *One Health* approach is an important theme of this action plan.

Strengthening and expanding the One Health approach

Ambition 1

Deepen and broaden our knowledge and understanding of AMR

Where we are now

Research and innovation

A great deal of fundamental and application-specific knowledge about the emergence and spread of AMR has already been gathered and made available. The Netherlands invests in research, including, since 2009, in the *Novel Antibacterial Compounds and Therapies Antagonising Resistance* project of the Dutch Research Council (NWO). The Netherlands Centre for *One Health* (NCOH), founded in 2015, is an example of a partnership between knowledge institutions aimed to forge an integrated *One Health* research approach to combating infectious diseases, including AMR. These programmes cover the spectrum from highly fundamental to translational (i.e., research that translates the results of fundamental research into practical applications) and practice-led research. Dutch knowledge institutions participate in a wide range of international research programmes and in the global coordination of those programmes.

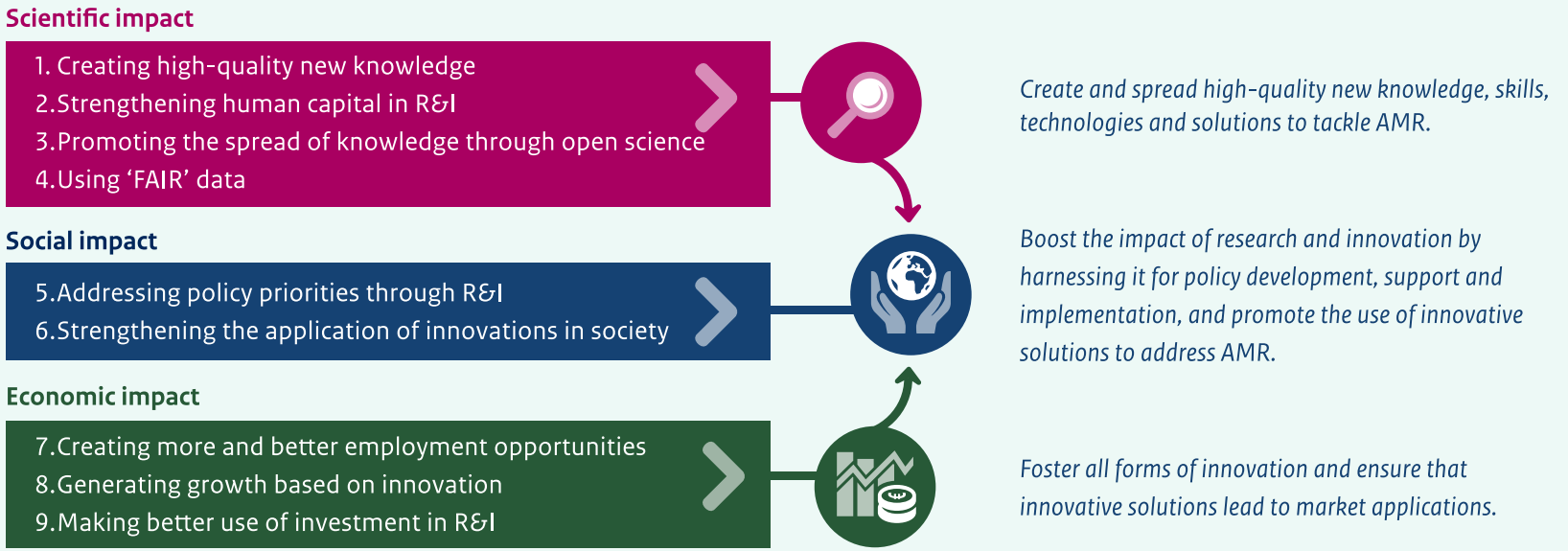
Investing in research remains necessary, since infectious diseases and AMR continue to develop. There is a need for more knowledge in many areas. Fundamental and application-specific knowledge about antimicrobial resistance in fungi, for example, is still lagging behind knowledge about antibiotic resistance in humans and animals.

In the human and veterinary domains, there is a need for improved methods of rapid and broad detection of microorganisms and antimicrobial resistance to enable doctors and vets to make quick and responsible treatment decisions. There is also a need for alternative treatment strategies, i.e., without the use of antibiotics, and a better understanding of the spread of resistant bacteria through home-grown or imported food products and the environment, as well as the possible impact this may have on health.

Little is known about the spread of AMR in the environment. Knowledge about the possible sources and transmission routes of resistance is still fragmented. There is also a need for more knowledge about residues of antimicrobials in the environment and the role they play in the prevention, development and spread of resistance. While research has already shown, for example, that resistant Aspergillus fungi found in hospitals are genetically related to resistant fungi in the environment, the epidemiology involved has not yet been explained.

The Dutch government, industry, knowledge institutions and civil society organisations have joined forces in the Health & Healthcare Knowledge and Innovation Agenda (2024-2027) under the Dutch Ministry of Economic Affairs and Climate Policy's Mission-driven Top Sectors and Innovation Policy. With a mission statement about preventing and better controlling socially disruptive health threats, the Agenda specifically mentions and addresses AMR.

Figure 3 The research and innovation (R&I) context for AMR



Through an independent government body called ZonMw, the Netherlands participates in the global Joint Programming Initiative on Antimicrobial Resistance (JPIAMR), under which 29 countries coordinate their research funding. This programme was followed up with a new EU programme called 'European Partnership: *One Health* Antimicrobial Resistance (EP OHAMR).' JPIAMR coordinates national public funding to support transnational AMR research and activities on six key priority topics: therapeutics, diagnostics, surveillance, transmission, environment and interventions. Part of the budget for the current ZonMw-funded AMR programme has been earmarked for international collaborations through JPI *joint actions*.

Under this programme, 38 projects are being funded with Dutch contributions. For example, the Netherlands is involved in the *Designing One Health Governance for Antimicrobial Stewardship Interventions* project, which compares national policies for combating AMR across a range of countries. Through *Horizon Europe*, many Dutch researchers and businesses share knowledge and expertise with partners in other EU Member States for the development of knowledge and innovation. Such initiatives fit within the general principles of innovation policy, where scientific, social and economic impact go hand in hand (see Figure 3).

Monitoring and surveillance

Data obtained through the monitoring and surveillance of the use of antimicrobials and resistance forms an important basis for the policy on combating AMR. Such data will help identify and map long-term trends and developments around resistance, infections and the use of antimicrobials. Monitoring and surveillance data will be leveraged in keeping the guidelines and prevention and response measures up to date and in evaluating their effectiveness. In the human domain, national and international data recording and sharing standards are used.

A number of *One Health* domains in the Netherlands, such as the human and animal domains, already have infrastructure for the monitoring and surveillance of the use of antimicrobials and AMR. Better aligning these infrastructures for *One Health* surveillance is a challenge.

In the human domain, the Dutch Working Party on Antibiotic Policy (SWAB) is gathering data about the sale and use of antimicrobials in and outside of healthcare institutions, in collaboration with the Dutch Foundation for Pharmaceutical Statistics.
In the *Infectious Diseases Surveillance Information System for Antimicrobial Resistance* (*ISIS AR*), the National Institute for Public Health and the Environment (RIVM) collects data about nearly all antimicrobial resistant microorganisms grown in medical microbiological laboratories, publishing an annual update on the current state of affairs under the title 'NethMap'. The data is shared internationally, including with the European Centre for Disease Prevention and Control (ECDC) and the WHO's *Global Antimicrobial resistance and use Surveillance System* (GLASS).

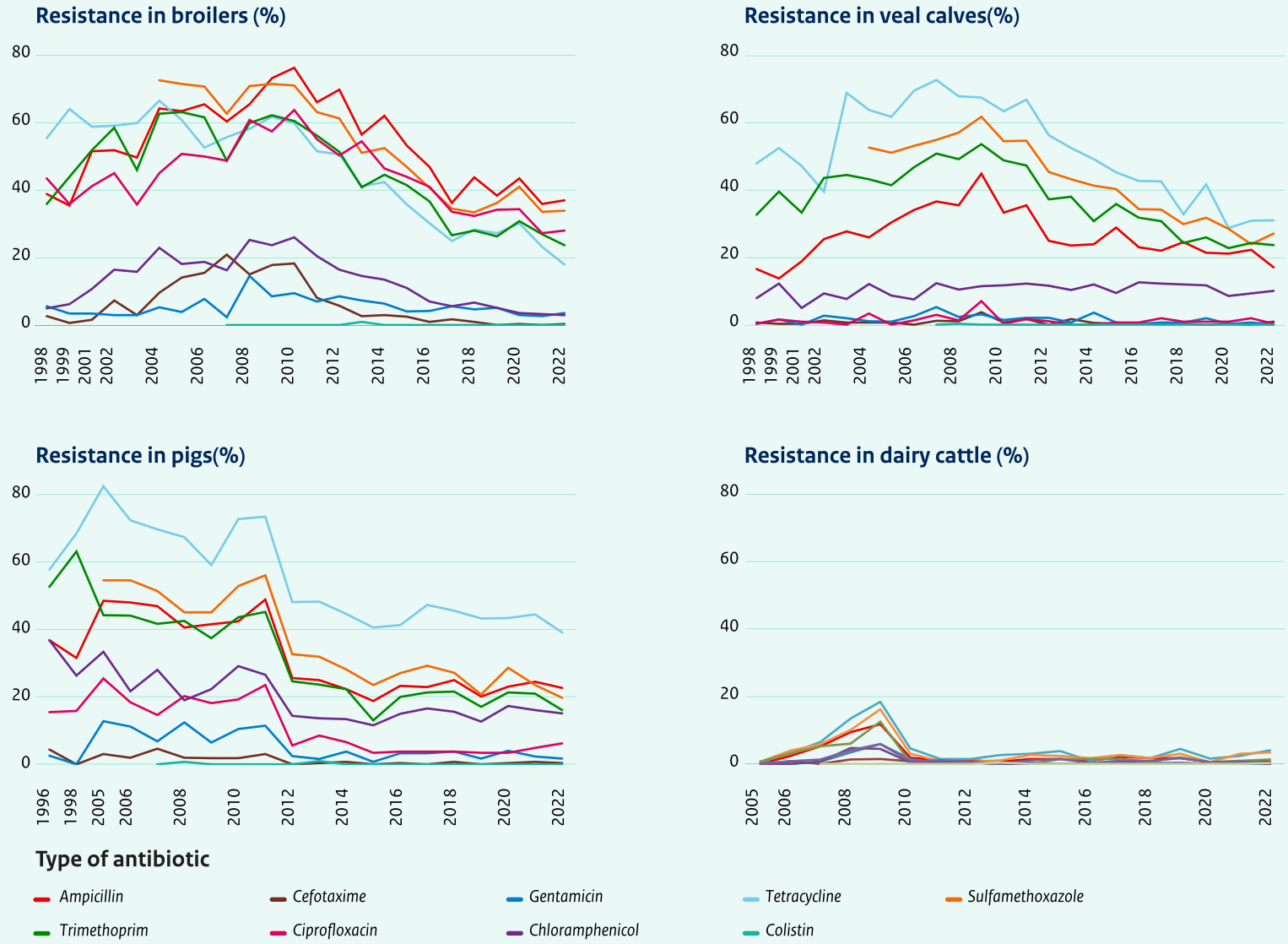
Special infrastructure has been set up to monitor microorganisms that are resistant to narrow-spectrum antibiotics or to multiple groups of antibiotics, known as 'highly resistant microorganisms' (HRMOs). Examples of HRMOs include methicillin-resistant Staphylococcus aureus (MRSA) and extensively drug-resistant Mycobacterium tuberculosis (XDR-TB). Hospitals and nursing homes report outbreaks of these high-risk organisms to the Healthcare Institutions and AMR Early Warning Committee (*Signaleringsoverleg Zorginstellingen en AMR*), which deploys experts to help contain the outbreaks. RIVM performs molecular typing of the microorganisms involved. For the riskiest microorganisms, the Municipal Public Health Services (GGDs) have a legal reporting obligation.

The Netherlands Veterinary Medicines Institute (SDa) collects data on the sale and use of antibiotics in livestock farming. Since 2010, data about the sale and use of antibiotics in the largest Dutch livestock sectors has been reported to the European Medicines Agency (EMA) and the World Organisation for Animal Health (WOAH). Under the EU's new Veterinary Medicinal Products Regulation[19] (2019/6), EU Member States must gradually expand this provision of data over the next few years to include all animal species which are kept, including individual animals kept for companionship such as dogs, cats and horses.

As the national reference laboratory, Wageningen Bioveterinary Research (WBVR) monitors the extent of resistance of commensal and zoonotic bacteria in food-producing animals and also tracks the prevalence of specific resistant bacteria, including ESBLs and carbapenem (CPE) resistance. The Veterinary Microbiological Diagnostic Centre at Utrecht University is researching CPE resistance in dogs and cats.

The current state of antimicrobial resistance in animals is reported annually to the European Food Safety Authority (EFSA) and published in the MARAN report that is issued along with the NethMap and currently only covers antibiotic resistance. As a result of the significant decrease in the use of antibiotics, commensal gut bacteria, which are monitored as a measure for the development of resistance in animals, have become increasingly less resistant in pigs, cows, calves and chickens kept for food production.

Figure 4 Proportion (%) of antimicrobial resistance in *E. coli* bacteria originating from various animal species (source: 2023 MARAN Report)[20]



Wageningen Food Safety Research (WFSR) screens food and environmental sources for the presence of antibiotic resistance.

WFSR also collects data about antimicrobial residues in food-producing animals and animal products for the National Residues Plan. The results of the National Residues Plan for animals and food products from animals are reported annually to the EFSA.

In the Dutch aquaculture industry, there is currently no structural monitoring taking place.

Transmission of AMR from animals to humans can occur through contact with animals, but also through the consumption of food products that contain antimicrobial resistant microorganisms. The role and impact of livestock farming and animal products in preventing infections with resistant microorganisms in humans seem to be less significant than previously thought. However, the current knowledge base from which this conclusion could be drawn is still not sufficiently substantiated.[20]

Animal, animal product and food imports could contribute to the spread of resistant microorganisms to the Netherlands. There is a heightened risk of that happening through meat and fish imports from countries where excessive use of antibiotics is still common or where antibiotics are used as growth promoters. In 2021,[21] the EU made AMR monitoring mandatory for imported meat, alongside the already mandatory AMR monitoring of the domestic meat supply chain.

In the Netherlands, this monitoring is handled by the Netherlands Food and Consumer Product Safety Authority (NVWA) and WFSR, with controls at locations such as the Port of Rotterdam.

In other sectors, there is still no comprehensive system of monitoring and surveillance in place. However, a number of developments are underway. All sales of plant protection products (including antimicrobials) are recorded by the Netherlands Enterprise Agency (RVO). Each year, these statistics are published by Statistics Netherlands and Eurostat, as well as on the central government's website. The sale or use of antimicrobials and biocides in industrial sectors is not subject to a duty of disclosure.

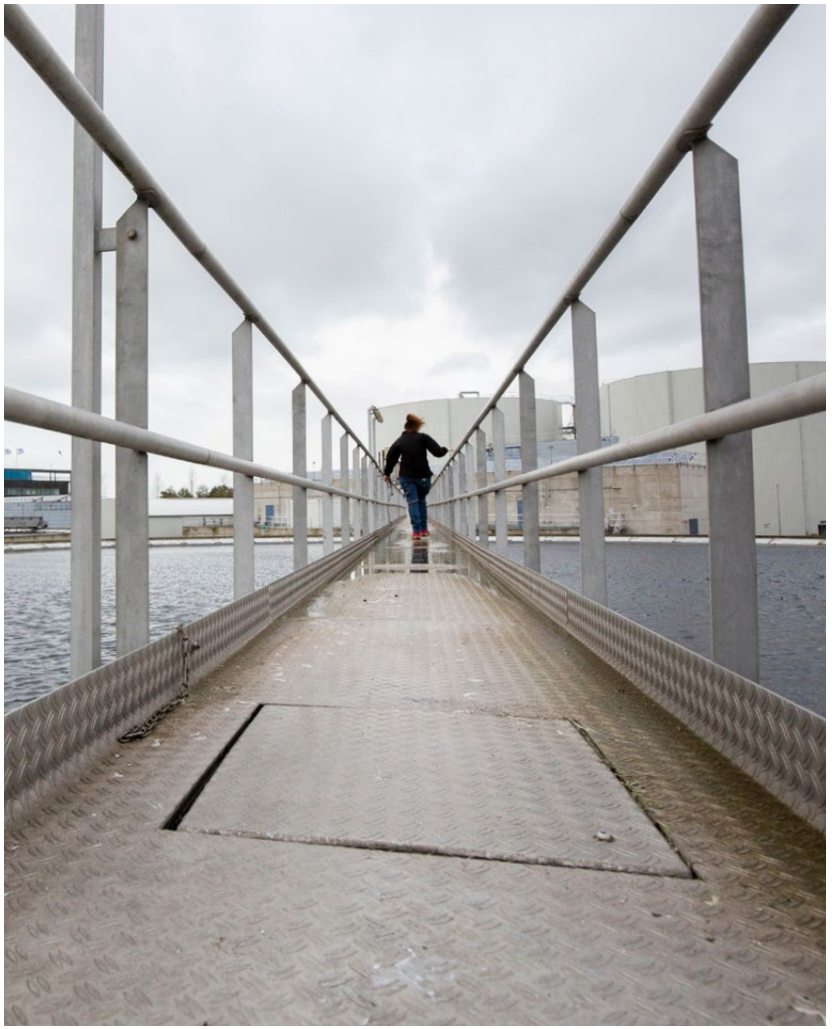
On a smaller scale, research has been conducted into AMR in certain parts of the environment, such as swimming water, compost heaps and wood and plant waste storage areas.

In recent years, more attention has gradually been given to the emergence and spread of AMR in the environment, including in the soil, waste flows and surface water, and the potential impact on people, animals and plants.

Residues of antimicrobials and resistant microorganisms end up in the environment through food, manure, water and waste. Antimicrobial resistant bacteria have been found in Dutch surface water, for example, and residues can lead to extra selection pressure and the emergence of resistant microorganisms in the environment. The revised European Urban Wastewater Treatment Directive, on which a political deal has meanwhile been reached, makes AMR monitoring compulsory at plants that treat wastewater from more than 100,000 inhabitants. Among other things, this monitoring will serve to grow scientific knowledge about the sources of resistance and will pave the way for appropriate action to be taken in the future. More knowledge about the risks and transmission routes of AMR in the environment is necessary as a basis for possible measures to combat the spread of AMR.

The Health Council plans to issue an unsolicited follow-up advisory report on disinfectants and cross-resistance. Following the Health Council's 2016 advisory report, our current policy is geared towards this type of antimicrobial agent in relation to resistance.

In summary, the Netherlands has an extensive system of independent AMR monitoring and surveillance systems in place in the human and veterinary domains, including for the products of food-producing animals. In other sectors (apart from plant protection products), research into the use of antimicrobials and AMR is still only conducted on an ad hoc scale.



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Data

Collecting and sharing good, up-to-date data on the use of and resistance to antimicrobials helps at every level to ensure a more effective response. It is way to identify trends that can be used to substantiate future policy. Data sharing also enables healthcare providers to make faster and better treatment decisions, care networks to implement measures more quickly to combat regional spread, and researchers and policymakers to obtain faster and better insights into new developments and the effectiveness of policy.

In the surveillance of AMR, healthcare-associated infections and antibiotic use, we follow national and international data recording and sharing standards. With regard to the human domain, the National Vision and Strategy for the Health Information System[22] sets out steps to improve the sharing and availability of public health data in the Netherlands. Data availability is the starting point for those steps, which includes making recorded health data more widely available, more accessible and easier to use for national and international surveillance and infectious disease prevention.

International organisations such as the European Commission, WHO, Codex Alimentarius and the Quadripartite recommend that countries develop integrated surveillance programmes to collect, store and analyse relevant data on microorganisms from patients, animals, food products and the environment in a coordinated, harmonised and integrated way.[23] Greater complementarity of systems in the various domains - where useful and necessary - and better options for data sharing would provide more opportunities for monitoring and for rapid and proactive measures. The Netherlands does not currently have integrated data infrastructure.

The national institutes with a statutory AMR monitoring function (RIVM and Wageningen Research) have joined forces to take charge of AMR control with a focus on the transmission of AMR in the *One Health* domain. To this end, a research consortium called DOMINANTS (*Distribution Of aMr IN A One Health perspective*) was set up in 2022. Monitoring and surveillance data from the *One Health* sectors (human and non-human sources) is used to obtain a comprehensive overview of antibiotic resistance. The data is also used to conduct more in-depth research.

Where we will be in 2030

1.1 Broader and better AMR monitoring and surveillance

Action	Description	Owner	Period
1.1.a	For the human domain, we will implement updated EU legislation and plans and mandates for the European Medicines Agency (EMA) and the European Centre for Disease Prevention and Control (ECDC) relating to integrated surveillance and reference laboratories.	VWS	2024 onwards
1.1.b	As we work towards *One Health* surveillance, we will encourage all healthcare providers and healthcare institutions, as well as relevant veterinary parties and water managers, to connect to national and/or regional infrastructure for AMR surveillance, detection and response through the development and application of new methods of data collection, interpretation and accessibility.	VWS LNV I&W	2024 onwards
1.1.c	We will encourage the re-use of human healthcare data for the purposes of AMR surveillance, detection and response through the development and application of new methods of data collection, interpretation and accessibility.	VWS	2024 onwards

Action	Description	Owner	Period
1.1.d	We will scale up AMR surveillance in the human domain by monitoring resistance to antifungals, antivirals and antiparasitics (against single-celled parasites).	VWS	2024 onwards
1.1.e	We will continue to monitor for AMR in animals and monitor trends.	LNV	2024 onwards
1.1.f	We will explore the possibility and relevance of expanding the scope of AMR monitoring in animals by including antimicrobials.	LNV	2024 onwards
1.1.g	Along with the veterinary profession, animal sectors and pharmaceutical companies, we will investigate the possibility of setting up AMR monitoring of animal pathogens for the purpose of continued development towards more refined and targeted prescription of antibiotics and keeping guidelines up to date.	LNV	2025
1.1.h	Drawing on our knowledge of surveillance, particularly environmental surveillance, we will contribute to the EU joint action JAMRAI-2, which encourages collaboration between EU Member States from a *One Health* perspective.	VWS LNV	2024-2028

1.2 Scientific research on AMR has been applied, broadened and strengthened

Action	Description	Owner	Period
1.2.a	We will gather knowledge about background values, critical limit values and the relationship between azole levels and the development of resistance in *Aspergillus fumigatus*.	VWS LNV I&W	2024 onwards
1.2.b	The Netherlands will participate in working groups as part of the European research project on azole resistance in *Aspergillus fumigatus* by the agencies EFSA, ECHA, EMA, ECDC and EEA to expand the knowledge base on this fungus..	LNV I&W	2024 onwards
1.2.c	We will conduct research into the prevalence of resistance to ionophore coccidiostats in poultry and into the relationship with other forms of antibiotic resistance.	LNV	2024 onwards
1.2.d	Based on ongoing European research into the use of ionophore coccidiostats and how it affects public health, we will review the need for further measures.	LNV	2024 onwards
1.2.e	We will conduct a baseline measurement in the aquaculture sector to gain visibility into AMR.	LNV	2024 onwards

1.3 Faster, more complete and more cost-effective gathering of and access to up-to-date AMR surveillance data within and between domains, sectors and countries

Action	Description	Owner	Period
1.3.a	Pending the introduction of the *European Health Data Space*, RIVM will update the *Legal Guide to Data Sharing in Infectious Disease Control*, including the options for widespread data sharing within the boundaries of current privacy legislation.	VWS	2024
1.3.b	We will support and contribute to initiatives to set up *One Health*/integrated surveillance at the national, European and global level.	VWS LNV I&W	2024 onwards
1.3.c	Where possible, we will contribute to improving data sharing with international surveillance systems.	VWS LNV I&W	2024 onwards

1.4 Better tracking and more effective combating of resistant microorganism transmission to and through the food system and the environment

Action	Description	Owner	Period
1.4.a	Where necessary, we will adjust policies and actions in response to the EU's revised Urban Wastewater Treatment Directive, which is set to be adopted in the next few years.	I&W	2024 onwards
1.4.b	We will continue structural surveillance of antimicrobial resistance in food.	VWS	2024 onwards
1.4.c	We will continue the validation and use of wastewater surveillance as a supplementary form of AMR surveillance.	VWS	2024 onwards
1.4.d	Through research, we will explore methods to stem the spread of azole-resistant *Aspergillus fumigatus* spores in organic material storage areas.	I&W	2024 onwards

Ambition 2

Ensure the number of microorganism infections remains low

Where we are now

AMR emerges through natural selection, particularly where antimicrobials are used to fight microorganisms. For people, animals and plants, preventing infections at the source is the best way to limit the need for treatment with antimicrobials and thus minimise AMR.

Human healthcare

The Health and Youth Care Inspectorate (IGJ) ensures that healthcare institutions have their infection prevention policies in order, including the application of guidelines, from practical implementation to administrative responsibility. The sector sets its own guidelines.
In human healthcare in the Netherlands, there is a major focus on hygiene and general infection prevention, particularly in large healthcare institutions. Many of these institutions are also active and effective in slowing the spread of resistant bacteria, including through rapid detection and isolated nursing and care for patients or residents at increased risk. Knowledge organisations and the ten regional AMR care networks set up in 2017 support institutions in both their curative and their long-term care practices, including in their efforts to achieve long-term change in the behaviour of healthcare professionals with a focus on hygiene improvements and infection prevention.

Research performed by the IGJ and other bodies, as well as experiences during the COVID-19 pandemic, show that there is room for improvement in infection prevention at many hospitals, nursing homes and disabled care facilities. Infection prevention, such as compliance with hygiene measures, could also be improved outside of healthcare institutions, such as in home and informal care. The importance of infection prevention is illustrated by specific challenges. It is becoming increasingly clear, for example, that healthy people with no symptoms of infectious disease can carry resistant microorganisms for a long time and introduce them into their environment or into healthcare institutions. In addition, new resistance mechanisms and instances of resistance to different antimicrobials are cropping up.

Animal healthcare

In animal healthcare, a great deal has been achieved in terms of infection prevention in recent years. The resulting reduced need to resort to antibiotics has helped push back antibiotic use. Vaccines have played an important role in preventing infectious diseases in animals. New and innovative vaccines will continue to play a major role in the future in dealing with new, emerging animal diseases. Vaccine manufacturers and the European Commission will be required to maintain an ongoing focus on these needs.

In addition, measures aimed at reducing infection pressure, such as biosecurity, as well as promoting the general health of animals, including measures to improve feed, shelters and barn climate, will play an important role in preventing infections. In the past, the Dutch government supported the 'critical success factors for research' that gave rise to knowledge on the reduction of antibiotic use through preventative measures and the associated behavioural changes required. Specific research has also been conducted into behavioural change for the purpose of reducing antibiotic use, as a basis for improving infection prevention.[24]

It is a well-known fact that insight into one's own actions contributes to behavioural change. Benchmarking provides insights into the current situation at a farm/practice compared with peers, as well as prompting preventative or other measures that may be necessary in order to improve. Benchmarking of antibiotic use has worked successfully. In addition to benchmarking of antibiotic use, a 'Care of Young Animals' project is currently underway, which sees individual animal owners obtain insights into the health and welfare of young animals through benchmarking. The effect of benchmarking, behavioural change and preventative measures can contribute to a positive effect on animal welfare and animal health and can thus have a positive effect on reducing antibiotic use.

The livestock farming sector in the Netherlands is committed to tackling the broad challenge of improving sustainability. Responsible antibiotic use in animals is part of that. In the current livestock farming system, we are reaching the limits of further reduction. A system change can contribute to improving animal health and thus potentially to reducing antibiotic use. The 'Pilot of Healthy Animal Husbandry in Calves' grant scheme has researchers look at whether a system change could contribute to a comprehensive solution to animal health and welfare problems. The broad commitment to preventative animal health will continue to require efforts from all stakeholders in the years ahead.

Where we will be in 2030

2.1 The prevention and control of infectious diseases in human healthcare chains has been strengthened

Action	Description	Owner	Period
2.1.a	We will focus on monitoring the implementation and effectiveness of infection prevention guidelines in human healthcare chains. To this end, we will encourage institutions in regional care networks to participate in national surveillance initiatives in this area, such as the surveillance of healthcare-associated infections at institutions.	VWS	2024 onwards
2.1.b	We will encourage the relevant professional groups to develop clear, practically applicable, evidence-based guidelines and protocols for infection prevention and *outbreak management* across the entire healthcare chain, from primary and curative to long-term human healthcare, and to keep these up to date.	VWS	2024 onwards
2.1.c	We will consolidate and increase the scope of the regional AMR care networks.	VWS	2024 onwards
2.1.d	We will promote the practical application of acquired knowledge regarding effective interventions in daily healthcare practices, including through the ZonMw/AMR-3 research programme.	VWS	2024-2025
2.1.e	We will promote the development and implementation of activities aimed at raising awareness, building knowledge and driving behavioural change with regard to hygiene (including hand hygiene) and infection prevention among practitioners and executives in human healthcare.	VWS	2024 onwards
2.1.f	The Health Council is planning to issue an unsolicited follow-up advisory report on disinfectants. We will consider these recommendations in due course.	VWS I&W	2024 onwards

2.2 The prevention and control of infectious diseases in livestock farming and veterinary healthcare continue to require commitment

Action	Description	Owner	Period
2.2.a	We will seek continued commitment to infection prevention from livestock sectors to minimise the use of antibiotics. This may include measures to improve feed, shelters and barn climate and the use of vaccination.	LNV	2024 onwards
2.2.b	We will encourage animal sectors to commit to behavioural change among animal husbandry professionals with regard to infection prevention for the purpose of improving animal health and thus working towards low and responsible antibiotic use. This includes the plans of the livestock sectors for the approach to high user farms and the Care for Young Animals project.	LNV	2024 onwards
2.2.c	We will encourage regional AMR care networks to connect more with veterinarians, where useful, so as to promote the exchange of knowledge and best practices between the animal and human sectors.	VWS LNV	2024 onwards
2.2.d	In consultation with livestock sectors and veterinarians, we will work towards making biosecurity plans mandatory in the livestock farming sector, which will contribute to preventing infections and improving animal health; this is also included as an action in the National Action Plan to Strengthen Zoonosis Policy.	LNV	2024 onwards

Ambition 3

Promote reduced and responsible use of antimicrobials

Where we are now

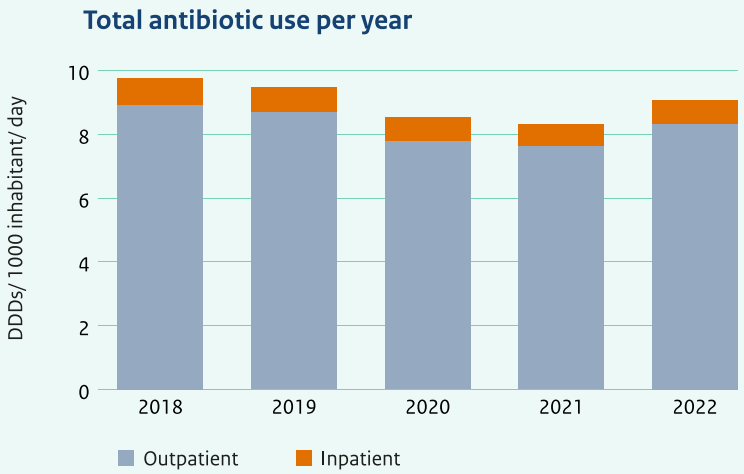
Relatively few antibiotics are prescribed in human healthcare in the Netherlands compared with other countries. Nevertheless, we are aiming to reduce the number of antibiotics prescribed even further. Reducing the use of antimicrobials will lead to a slower development of AMR. The 2023 European Council Recommendation urged EU Member States to set targets for the human sector. One target that was set was for a reduction in overall antibiotic use in primary healthcare, the hospital sector and long-term care institutions by 2030. In the Netherlands, antibiotic use must fall by 3% compared with 2019 levels. According to the same Recommendation, by 2030, more than 65% of antibiotics used in humans in the Netherlands must belong to the group of drugs for which, according to the WHO, there is relatively little risk of resistance developing.[25]

Further improvements appear to be possible. For example, the monitoring of the use of antibiotics has shown that prescription culture still varies between individual doctors, medical practices and healthcare institutions and is not always fully in line with existing treatment guidelines for responsible antibiotic use.

Various ongoing programmes focus on improving *Antimicrobial Stewardship*, i.e., helping prescribers and institutions ensure that antimicrobials are always used responsibly in human healthcare. For example, guidelines (such as those for the treatment of respiratory and urinary tract infections) are being updated and top prescribers, from general practioners to healthcare institutions, are being encouraged to practise responsible use through information, education, professional development and peer support.

In the veterinary sector, the Netherlands has made progress in recent years in the reduction and responsible use of antibiotics. Efforts by animal owners and vets in the various livestock sectors have led to a significant reduction and refinement of antibiotic use. This successful public-private partnership is characterised by transparency in antibiotic use, setting sector-specific reduction targets and quality requirements for animal owners and vets combined with national regulations for the responsible use of antibiotics in animals. For example, antibiotics that are also ‘critical drugs for human use’ can only be used in animal if certain strict conditions are met. Consequently, the use of such antibiotics in animals has all but disappeared. In addition, under the Veterinary Medicinal Products Regulation (2019/6), a European list has been published of antimicrobials that are reserved for human use. These antimicrobials may no longer be used in animals. In the Netherlands, they are already no longer used in animals. Furthermore, the EMA-AMEG classification of antimicrobials provides a basis to further refine the use of antibiotics in animals.

Figure 5 Use in human healthcare
(Source: SWAB 2018-2022)

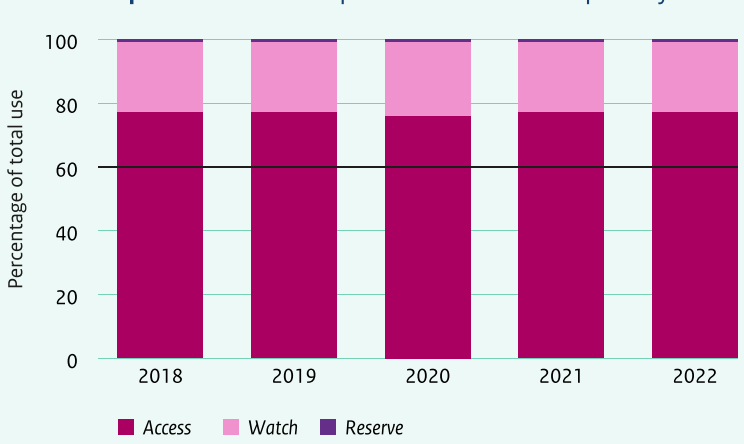


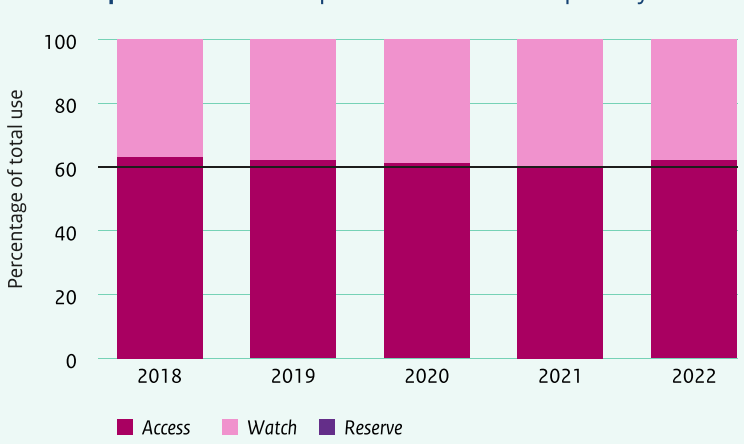
DDD *(Defined Daily Dose)* – average daily dose

Inpatient – care provided within an institution such as a hospital, nursing home, etc.

Outpatient – care provided outside of an institution, such as by a general practioner, home care, etc.

AWaRe *(Acess, WAtch, REserve)* – for the purpose of stewardship at the local, national and global level, antibiotics will be Accessed, Watched and Reserved, which means the impact of various anti-biotics on AMR will be taken into consideration to emphasise the importance of appropriate use.





To reduce antibiotic use, commitment is required from animal owners and vets to prevent animal diseases, and from vets to change their prescription behaviour. This behavioural change is supported by studies into the 'critical success factors for low antibiotic use' specific to each animal sector. The results provide animal owners and vets with tools to decrease the use of antibiotics on farms.

By 2022, antibiotic use in animals had dropped 77.4% on 2009 levels in the Netherlands. The goal of the European *Farm to Fork* strategy is to halve antibiotic sales (in mg/kg) in the EU by 2030. The Netherlands has already made good progress towards this target, with sales already 50% below the European average in the reference year of 2018. Naturally, the Netherlands is committed to at least maintaining this level. The Veterinary Medicinal Products Regulation (2019/6) includes an obligation to submit antibiotic sales and use data to the EMA.

In the EU, this obligation is being introduced in phases. By 2030, data must be submitted for all animal species which are kept (including companion animals). The Netherlands is already ready for the first phase. By 2027, this data must be submitted for all food-producing animal species, and by 2030 it must also be submitted for non-food-producing animal species. Steps still need to be taken for these latter groups.

Each year, the SDa provides insights into antibiotic use in the livestock farming sector in its SDa Report. Every farm veterinarian surgeon and animal owner supplies data to the animal sector databases. Each year, the SDa receives anonymised data on antibiotic use in the calf, cattle, pig, poultry, goat and rabbit sectors.

In addition, the SDa sets benchmark values[26] for animal owners and vets. These are target values for antibiotic use for each animal sector or category and for vets in general. The SDa also monitors antibiotics that are critically important for human medicine. These benchmarks give sectors, farms and vets insight into their own antibiotic use and they enable implementation of targeted (sector-specific) policies.

There is room for further improvement in the veterinary domain. The latest SDa report for 2022 shows that there are still differences between the various animal sectors, livestock farm and veterinarians. In the calf, turkey and rabbit sectors, for example, antibiotic use is still high. Since 2019, policies have, therefore, been focusing on sectors, farms and vets that use relatively high quantities of antibiotics, since that is where the risk for the development of resistance is highest. Another focus area is the size of the packaging used for antimicrobials for animals. For example, many antibiotics for food-producing animals come in large packages, often containing more antibiotics than prescribed by the vet.

The leftover antibiotics remain at the farm, which is an undesirable situation. To be able to supply the exact prescribed quantities, antibiotic package sizes need to be reduced.

A recent study[27] showed that the system of quality assurance for veterinary professional practice is limited in scope. The researchers believe that strengthening the quality assurance system in the veterinary sector would be desirable. Working with valid, workable and well-maintained veterinary practice guidelines would boost the quality of veterinarians' actions. At present, the government is actively working[28] to bolster the role and position of vets for the long term, including through proper quality assurance, which is related to the responsible prescription of antibiotics. After all, a strong and well-organised veterinary sector would contribute not only to better animal health and welfare but also to good public health and food safety.

Antimicrobials are also used in other sectors, and the residues can end up in the environment. Antifungals such as azoles, for example, are used for plant protection in the agricultural sector, so as to both prevent and control fungal growth. Azoles are also used for other purposes, such as timber treatment and mattress production.

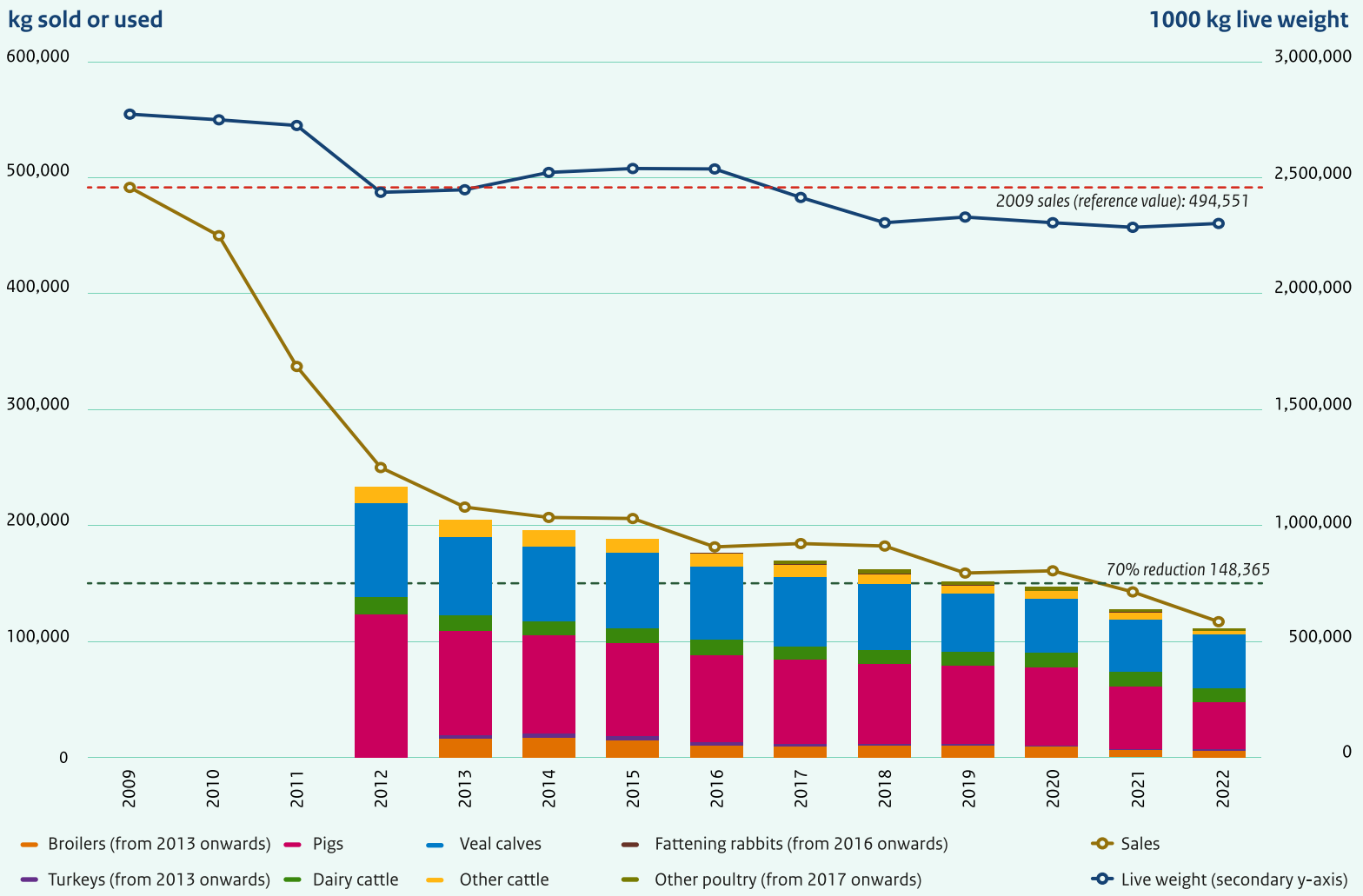
There are strong indications that the widespread use of azoles has contributed to the emergence of severe, difficult-to-treat fungal infections in patients with a weakened immune system.

The Netherlands has endorsed the European Commission's proposal to take the risk of resistance to related antimicrobial drugs developing into consideration when deciding whether or not to authorise biocides and plant protection products (see also Ambition 7).

Our knowledge about the use of antimicrobials outside of the agricultural sector, the spread of residues and their impact on the health of people, animals and plants is still far from complete.

To ensure that critical antimicrobial drugs continue to be effective for use in the long term, we must look carefully at the sometimes extremely broad use of drugs with comparable mechanisms of action in the production of substances and goods elsewhere in the economy. This will require national and international cooperation with parties across all three *One Health* domains.

Figure 6 Long-term trend in the volume of antibiotics used* and sold in the Dutch livestock farming sector since 2009. (Source: SDa report 2023)



*The volume of antibiotics used is broken down by animal sector monitored. In addition, the live weight of animals in the animal sectors monitored in 2022 is shown for this period.

Where we will be in 2030

3.1 In human healthcare, the irresponsible use of antimicrobials will have been further reduced, particularly where the use is still relatively high, whereby we aim for a reduction of total antibiotic use in primary healthcare, the hospital sector and long-term care by at least 3% compared with 2019 levels (in line with the European Council Recommendation)

Action	Description	Owner	Period
3.1.a	We will encourage the development and updating of guidelines and protocols for the responsible use of antimicrobials across the entire healthcare chain, from primary to curative to long-term healthcare.	VWS	2024 onwards
3.1.b	We will encourage the development and more widespread use of human antiviral and antibacterial vaccines.	VWS	2024 onwards
3.1.c	We will implement the international provisions from legislation including EU regulations relating to human medicinal products and agreements stemming from the *Health Emergency Preparedness and Response Authority* (HERA).	VWS	2024 onwards
3.1.d	We will encourage healthcare professionals to follow examples of good prescription behaviour, for example in a pharmacotherapeutic consultative body, diagnostic test consultative body and through the 'A teams'.	VWS	2024 onwards
3.1.e	We will encourage lifelong learning (professional development and refresher training) and reflection by professionals in all healthcare domains with regard to responsible use and possible improvements.	VWS	2024 onwards

3.2 Responsible use of antimicrobials is promoted in the animal husbandry sectors

Action	Description	Owner	Period
3.2.a	As the government, we will actively work with the veterinary profession (through the government consultation structure for the veterinary profession) to strengthen quality assurance of veterinary conduct.	LNV	2024 onwards
3.2.b	We will facilitate and encourage the veterinary profession to organise the components of the quality assurance system, which includes developing, maintaining and implementing guidelines (including professional development) on the use of antibiotics, in a future-proof way.	LNV	2024 onwards
3.2.c	We will encourage the veterinary profession to embed peer support and reflection on antimicrobial prescription behaviour in their quality assurance system.	LNV	2024 onwards
3.2.d	We will facilitate the veterinary profession, in the current situation, to continue developing guidelines to achieve further refinement in the use of antibiotics. Both the EMA classification and the national situation will be included in the revised guidelines.	LNV	2024 onwards
3.2.e	In conjunction with the parties concerned (including SDa, animal sectors and the MEB Agency), we will optimise management of antibiotic sales and use data for animals for submission to the EMA as required under the Veterinary Medicinal Products Regulation (2019/6).	LNV	2024 onwards

Action	Description	Owner	Period
3.2.f	In line with the Veterinary Medicinal Products Regulation (2019/6), the SDa's gathering of antibiotic sales and use data will be scaled up to include animals which are kept. This data will be submitted to the EMA.	LNV	2024 onwards
3.2.g	We will work on a follow-up to the sector-specific antibiotics policy for the period after 2024. We will ask the livestock sectors to take the initiative. The focus will remain on high-user sectors and farms, to further reduce antibiotic use in animals.	LNV	2024 onwards
3.2.h	We will add the group of polymyxins (including colistin) to existing regulations on the use of critical antibiotics in humans (which requires susceptibility testing as justification for responsible use). This will contribute to responsible use in animals.	LNV	2024 onwards
3.2.i	We will encourage antibiotics manufacturers to reduce antibiotic package sizes.	LNV	2024 onwards

3.3 New diagnostic tools are available and used to reduce irresponsible use of antimicrobials

Action	Description	Owner	Period
3.3.a	We will encourage the development and availability of new technologies (such as rapid diagnostics) and strategies that contribute to the responsible use of antimicrobials.	VWS	2024 onwards
3.3.b	We will promote the use of diagnostics to ensure that antimicrobials are used more responsibly than at present.	VWS LNV	2024 onwards

3.4 Responsible use of antimicrobials is promoted in crop cultivation and industry

Action	Description	Owner	Period
3.4.a	We will support efforts to reduce the use and risks of chemical plant protection products (including those used to control fungi, parasites and plant viruses) by 50% compared to the reference period (in line with the European *Farm to Fork*-strategy).	VWS LNV I&W	2024 onwards
3.4.b	The *Integrated Pest Management* (IPM) approach is the guiding principle when it comes to use of biocides with an antimicrobial effect, with the aim of preventing avoidable use.	VWS LNV I&W	2024 onwards
3.4.c	We will promote research into reducing the avoidable use of antimicrobials in the living environment, such as in livestock farming and crop cultivation, to combat the development and spread of anti-microbial resistance, using the IPM approach as one of the guiding priciples.	VWS LNV I&W	2024 onwards
3.4.d	We will promote the responsible use of antimicrobials in all relevant sectors, such as crop cultivation and industrial fungus control, including the IPM approach.	VWS LNV I&W	2024 onwards

3.5 The transmission of antimicrobial residues through the food chain and environment has been better identified and is being controlled

Action	Description	Owner	Period
3.5.a	We will encourage research into the extent and risks of the transmission of antimicrobial residues through the food chain and environment (and the possibility of setting limit values).	VWS LNV I&W	2024 onwards
3.5.b	We will harness implementing actions in the ongoing Chain Approach to Reducing the Presence of Medical Residues in Water[29] to control antimicrobial residues in sewage and surface water.	I&W	2024 onwards

Ambition 4

Ensure long-term availability of effective antimicrobials

Where we are now

The availability of and access to effective antimicrobial drugs for humans and animals cannot be taken for granted, neither in the short term nor in the long term. Availability and access depend on more than just the development of antimicrobial resistance, reducing the use of antimicrobials and controlling the spread of resistance.

Availability of existing drugs

In the short term, the availability of antimicrobial drugs depends on, among other things, the availability of raw materials for production, the security and continuity of production facilities, stocks and emergency stocks, the limiting of undesirable dependencies in the production and supply chain, and strategic interests surrounding production and storage capacity at the national, European and global level. In this area, the Netherlands is collaborating intensively at the EU level. For example, the *European Health Emergency Preparedness and Response Authority* (HERA) is working on new procurement models for antimicrobials for human use that are in line with the Pharmaceutical Strategy for Europe published in 2020.[30] This strategy contains ambitious objectives in the area of AMR. The Netherlands has endorsed the objectives and the accompanying action plan (see also Ambition 7).

Shortages of effective antibiotics may also arise in veterinary medicine as no or few new antibiotics are produced. Newly developed antibiotics are first, and often only, made available for humans. This leads to a high degree of dependence on existing antibiotics to continue to treat animals, which further adds to the need to use the drugs available for animals as responsibly as possible. Where there is a lack of antibiotics for certain indications or animal species in the Netherlands, vets may prescribe different antibiotics or antibiotics from other EU Member States (under the 'cascade' scheme). Extra conditions are attached to such use under a European Commission implementing regulation, such as an antibiogram and susceptibility testing, to ensure responsible use of antibiotics. See also the earlier description of the Netherlands' commitment to ensuring responsible antibiotic use for as long as possible.

The EU Veterinary Medicinal Products Regulation (2019/6) also imposes requirements on marketing authorisation applications for antimicrobials in relation to the risk posed by AMR for people, animals and the environment. In addition, the regulation contains incentives in the form of data protection for new antibiotics that are placed on the market or for when the indications and dosages of existing generic antibiotics are updated.[31] The regulation also states that summaries of product characteristics (SPCs) for veterinary medicinal products authorised at the national level by Member States must be harmonised at the EU level. For antimicrobials (and other products), this means that the indication, application and dosage must be harmonised across the EU. The initiative to achieve this kind of harmonisation lies with the Member States and marketing authorisation holders, who produce an annual list of products requiring harmonisation.

Developing innovative drugs in the human domain

For the long term, it is important that – in addition to existing drugs – new, innovative antimicrobials and antimicrobial drugs are developed.

Through its national scientific funding organisations (ZonMw and the Dutch Research Council), the Netherlands funds long-term research programmes focused on developing new antimicrobial drugs and alternative therapies. For example, the *Novel Antibacterial Compounds and Therapies Antagonising Resistance* (NACTAR) programme is specifically focused on an innovative ecosystem around antibiotic research and valorisation of projects targeting clinical applications.

The *Future Affordable and Sustainable Therapies* (FAST) centre of expertise, commissioned by the Dutch Ministry of Health, Welfare and Sport and the Dutch Ministry of Economic Affairs and Climate Policy and funded by the former, is focused on producing new therapies and making them available for patients in faster and smarter ways. Infectious diseases, where AMR can play a role, is one of the focus areas of this centre of expertise. At the EU level, University Medical Centre Utrecht (UMC Utrecht) has, for the past few years, been leading an initiative of the public-private *Innovative Medicines Initiative* to build pan-European infrastructure for clinical research into innovative antibiotics. In the next few years, the resulting infrastructure will become available through the *European Clinical Research Alliance on Infectious Diseases* (ECRAID-Base).

The Netherlands participates in the *Global AMR R&D Hub*, an organisation that uses an online dashboard to highlight investments in and the results of research into new antimicrobials, thus facilitating better global coordination of research funding with a focus on a *One Health* AMR research agenda. The Netherlands also co-finances the *Global Antibiotics Research and Development Partnership* (GARDP), a WHO initiative for the development of new antibiotics.

Innovative market models in the human domain

In both the short and the long term, it is important that private parties continue to be involved in the development and production of antimicrobials. However, companies and investors are being asked to invest in products that, in practice, will preferably be used as little as possible. This does not fit with the usual business model for the biotechnology and pharmaceutical sector, where investment in research and development generates returns through revenue from medicinal products. As a result, investors anticipate inadequate returns, innovative developers go bankrupt and even existing antibiotics disappear from the market.

The Netherlands is expressly collaborating with other countries in Europe to design and implement innovative market models. We are looking with interest at a proposal from the European Commission and at countries that are experimenting with new models, such as Sweden and the United Kingdom.

Where we will be in 2030

4.1 We have taken measures to guarantee production and availability of existing antimicrobials

Action	Description	Owner	Period
4.1.a	In the context of general medicines policy, we will implement measures such as monitoring possible shortages and restoring stockholding obligations.	VWS	2024 onwards
4.1.b	We will encourage veterinary pharmaceutical companies to update the specific production characteristics (SPCs) of old generic antibiotics.	LNV	2024 onwards
4.1.c	We will ensure harmonisation of the specific product characteristics (SPCs) of antimicrobials, as described in Art. 69 of the Veterinary Medicinal Products Regulation (2019/6).	LNV	2024 onwards
4.1.d	We will actively collaborate at the EU level to permanently guarantee the availability of new and existing antimicrobials.	VWS	2024 onwards

4.2 We have invested in the development of new and innovative antimicrobials

Action	Description	Owner	Period
4.2.a	In 2024, we will invest a further 2 million euros in the *Centre for Future Affordable Sustainable Therapy*. We will ask this centre of expertise to specifically focus on innovative antimicrobial diagnostics and medicinal products.	VWS	2024 onwards
4.2.b	Together with the Dutch Research Council, we will invest 8 million euros in a new research programme to boost research into new and innovative antimicrobials.	LNV	2024 onwards
4.2.c	Through the NACTAR programme, in partnership with the Dutch Research Council's domain of Applied and Engineering Sciences (AES), we will invest an additional 1 million euros (minimum) in preclinical studies of new antimicrobial drugs.	LNV	2024 onwards
4.2.d	We will provide funding to the international organisation GARDP to enable the development of new antibiotics.	VWS	2024 onwards

4.3 We contribute at the international level to the long-term availability of existing and yet-to-be-developed effective antimicrobial drugs

Action	Description	Owner	Period
4.3.a	Together with other pioneer countries and the EU's *Health Emergency Preparedness and Response Authority*, we will explore a list of critical antimicrobials for human use and discuss the work required to ensure they remain available.	VWS	2024 onwards
4.3.b	We will advocate for and contribute to market push incentives for research into and development of new antimicrobials through participation in new and existing European innovation structures and innovation funds (such as *Horizon Europe*).	LNV	2024 onwards
4.3.c	Within the EU, we will actively participate in consultations on proposals for the design and governance of market pull incentives for the commercial development of and access to innovative antimicrobials.	LNV	2024 onwards
4.3.d	We will be actively involved in the Global AMR R&D Hub, including as chair of the *One Health* sub-group.	VWS	2024 onwards

Ambition 5

Raise awareness of the causes, risks and control of antimicrobial resistance

Where we are now

For a structural approach to preventing and combating AMR, it is necessary to increase and maintain the level of knowledge and awareness regarding AMR right across the spectrum, from citizens to professionals and board rooms. In the long term, a broad range of target groups must also be involved in finding solutions and collaborate on solutions.

Professionals

With regard to making human and animal health professionals aware of the importance of infection prevention, hygiene and responsible use of antimicrobials, many parties within the various sectors play an important role. Building knowledge and raising awareness starts during professional training: in degree programmes in areas such as medicine, veterinary science, nursing, pharmacy, dentistry, agricultural science and agronomy. After graduation, in professional practice, professional associations, trade organisations, the Dutch Labour Inspectorate, industry regulators and the like have an important role to play in improving and maintaining the standard of knowledge and conduct among human and animal health professionals.

The regional ABR (antibiotic resistance) care networks, for example, are closely involved in the Comparative Information on Antibiotics in Primary Care project, which lets general practioners compare their antibiotic-prescribing behaviour with the average across all practices. For hospitals and nursing homes, audit tools have been developed to measure the quality of their infection prevention. Education, in-service training and professional development are also among the networks' tasks.

The stakeholders are aware of the risks of AMR to a greater or lesser degree. In practice, however, there are opportunities for improvement, for example by providing high-quality knowledge, promoting the application of that knowledge and adjusting behaviour. In terms of knowledge regarding *One Health* collaboration, it is important for this to be brought to the attention of human and animal professionals during their degree programmes.

It is still not uncommon for doctors and vets to prescribe antibiotics for probable virus infections, for human and animal health professionals to not adequately follow hygiene rules, and for investment in infection prevention to not be sufficiently prioritised at an administrative level.

Understanding doctors' and vets' prescription behaviour is key in raising awareness and motivation to effect behavioural change in the prescribing of antimicrobial drugs. Besides awareness, there are other aspects that have an impact on behaviour. This is an area that could be further explored to see how a policy intervention could unlock opportunities.

In the livestock farming sector, research has been conducted in recent years into the behaviour of and behavioural change in animal owners, veterinarians and farm advisers with regard to antibiotic use and prescriptions as an important component of reducing antibiotic use. This includes projects where coaches were deployed to support behavioural change. The initial focus of behavioural change is not on excluding antibiotic treatment, but rather on factors that can help improve animal health and that, consequently, indirectly reduce antibiotic use. This strategy is used in various animal sectors alongside the strategy for high-user farms. Recent research looked at the potential of interventions that are not yet used in antibiotic policy to influence behaviour around the use of antibiotics.[32] For livestock farming sectors and purchasers of animal products, this research provides insights into where opportunities for new interventions still lie.

Other research done in recent years specifically examined the use of A teams (focusing on stewardship and with a different composition and working methods from the A teams in the human sector) as a form of peer support for vets. A teams were used to reflect on colistin (polymyxins) prescription behaviour among pig vets. The vets found the use of A teams valuable; it contributed to greater understanding and awareness of their own prescription behaviour, which in turn contributed to more refined and responsible use of colistin (polymyxins) in pig farming.[33]

Citizens

In recent years, campaigns and other forms of public communication have been launched to increase knowledge and awareness of antibiotic resistance among the general public. Whether knowingly or unknowingly, everyone in the Netherlands can have an impact on the emergence and spread of AMR, including by using antimicrobials, knowing and applying good hygiene practices (particularly food and kitchen hygiene), administering antimicrobials to pets and during a stay in a foreign hospital.

Boosting knowledge among citizens, in collaboration with the regional care networks, professional associations, the Netherlands Nutrition Centre, umbrella organisations such as the Joint Dutch Health Foundations, and the Netherlands Patients Federation, remains important, including in the long term. Alongside greater awareness and more knowledge, it also helps to keep AMR high on the national agenda.

International

The Netherlands is working to promote widespread awareness and knowledge sharing in the area of AMR through international partnerships and on the global stage as well. For example, the Netherlands participates in international communication activities aimed at raising broad awareness, such as *European Antimicrobial Awareness Day and World Antimicrobial Awareness Week* (see also Ambition 7).

Pieter (a 54-year-old philanthropy consultant)

Pieter became infected with a multidrug-resistant bacterium after being admitted to a hospital abroad following a car accident.
'I was cared for in strict isolation for four months, and as well as the usual surgeries, I had six other surgeries to fight the infection in my knee. That was 13 years ago, but the consequences of the bacterial infection are still visible and noticeable.'

Where we will be in 2030

5.1 AMR awareness and knowledge levels are permanently high among professionals and executives in all sectors concerned and among the general public.

Action	Description	Owner	Period
5.1.a	In a working group comprising communication professionals from the departments concerned and relevant executive agencies, chaired by the Dutch Ministry of Health, Welfare and Sport, we will develop an overarching *One Health* AMR communication strategy. The departments and executive agencies will then use this strategy to develop their own concrete, domain-specific communication activities	VWS LNV I&W	2024
5.1.b	We will encourage and facilitate chain parties and organisations (including umbrella organisations) to promote knowledge, awareness and behavioural change around AMR among healthcare administrators, human and animal health professionals and the general public, in their own domains and through their own channels.	VWS LNV I&W	2024 onwards
5.1.c	We will provide support - where necessary and desirable - based on communication actions from the National Action Plan, with activities focused on increasing knowledge and raising awareness.	VWS LNV I&W	2024 onwards
5.1.d	In all domains, we will stimulate research into new ways to influence behaviour and spread knowledge to prevent AMR.	VWS LNV I&W	2024 onwards
5.1.e	We will promote the raising of awareness, influencing of behaviour and spreading of knowledge with regard to new challenges in the context of climate change (such as arboviruses and microplastics) in relation to AMR.	VWS LNV I&W	2024 onwards

Ambition 6

Facilitate and encourage collaboration across all domains, industries and levels

Where we are now

The *One Health* approach has already firmly taken root in the Netherlands. It is now broadly recognised that we cannot promote human health without at the same time examining its connections to the health of animals, plants and the environment. To achieve effective policy, particularly in a small country such as the Netherlands with a relatively large human and animal population, we must collaborate with organisations and forums at the regional, national, European and global level. This has resulted in an extensive, widespread network of public parties and actors that are collaborating to combat AMR, based on their own roles and responsibilities.

For example, the Netherlands organised the first ministerial conference on antibiotic resistance in 2014, and AMR was an important theme during the Dutch presidency of the Council of the EU in 2016.

The required approach makes it necessary to span many apparent divides. After all, each domain and level has its own methods of organisation and forms of funding, sometimes even its own language or culture. Bringing all of these actors together requires a sustained effort - from policy departments, academic disciplines, healthcare and economic sectors, and from organisations, professionals and citizens at all levels.

Focus on three domains

Driven by the growing threat of AMR and zoonotic infectious diseases, the human and veterinary domains have been at the forefront of this integration. The increase in attention for the importance of plant health and the environment, including the role of soil and water, is more recent. In sectors such as crop cultivation, industry and soil and water management, awareness of AMR is currently less advanced. Scientific knowledge and cross-domain networking and collaboration are also less developed than in human and animal health care. The Netherlands Centre for *One Health*, which was set up in 2017 to focus on cohesive and interconnected research in all three domains, is a good example of collaboration. The aim is to achieve an integrated, holistic perspective, which can be used as the basis for sustainable investment and intervention strategies.

The relevant policymakers at the global, European and national level are increasingly managing to connect with one another. In the Netherlands, the three policy departments that are the most closely involved in this issue are collaborating well, as evidenced by this action plan.

In the next few years, we can build on this strong foundation: we will collaborate in new ways to better unite, coordinate and integrate our knowledge about and our efforts to combat AMR.

From the regional to the national level

At the national level, cooperation between ministries, government agencies, knowledge institutions and professional and sector organisations is extremely important. Such cooperation is well developed in the Netherlands, but it requires ongoing commitment from the various parties.

An important part of the approach to the spread of AMR in the human domain plays out at the regional level. That is where healthcare clinics and institutions constantly exchange information and knowledge about patients and between professionals, often in close contact with livestock establishments and the broader living environment. It means that knowledge sharing and cooperation within regions is crucial too. For this reason, in 2017, the Netherlands set up ten regional care networks dedicated to AMR. They are tasked with promoting cooperation between healthcare providers in their region. They make risks and measures clear to all regional healthcare parties, share knowledge and expertise, identify options for infection prevention and promote responsible use. Barring a few exceptions, vets are not yet affiliated with the care networks. This regional approach forms a good starting point for future Dutch policy.

Where we will be in 2030

6.1 Collaboration between the human, animal, plant and environmental domains has been intensified at the regional and national level.

Action	Description	Owner	Period
6.1.a	Within the government, we will strengthen and expand cross-sector and interdepartmental collaboration in the area of AMR and involve chain parties where relevant.	VWS LNV I&W	2024 onwards
6.1.b	We will organise theme-based meetings with chain parties and stakeholders to agree on a course towards realising ambitions and actions.	VWS LNV I&W	2024 onwards
6.1.c	We will explore options for improving the exchange of knowledge and best practices between human and animal healthcare practices.	VWS LNV	2024 onwards
6.1.d	We will strengthen public-private collaboration between experts, professionals and organisations from all three *One Health* AMR domains by expanding consultative and collaborative partnerships to include plant health and the environmental domain, including water.	VWS LNV I&W	2024 onwards
6.1.e	The progress of the action plan will be evaluated after three years, in accordance with the EU Council Recommendation.	VWS LNV I&W	2027
6.1.f	We will make use of the annual *Tripartite AMR Country Self-Assessment Survey* (TrACSS) and the European report evaluating the implementation of this National Action Plan, including in relation to collaboration between domains and levels.	VWS LNV I&W	2024 onwards

6.2 Impediments to cooperation within and between sectors have been resolved.

Action	Description	Owner	Period
6.2.a	We will continue paying subsidies to regional ABR care networks that strengthen and expand awareness, collaboration, consultation and knowledge sharing at and between all healthcare levels.[34] We will enlarge the networks' remit to include non-bacterial microorganisms.	VWS	2024 onwards
6.2.b	We will promote collaboration through research funding bodies such as ZonMw and the Dutch Research Council based on a *One Health*-perspective.	VWS LNV I&W	2024 onwards
6.2.c	We will promote collaboration between public and private parties such as laboratories, biotechnology companies, drug manufacturers, health foundations, agricultural organisations, farms and water companies through mission-driven innovation policy.	VWS LNV I&W EZK (Dutch Ministry of Economic Affairs and Climate Policy)	2024 onwards
6.2.d	We will promote collaboration and data sharing between human and veterinary institutes and laboratories for the purpose of obtaining a better understanding of the epidemiology of AMR for the greater good.	VWS LNV	2024 onwards

Ambition 7

Act as a proactive connector and partner at the international level

Where we are now

Awareness, agenda-setting, coordination and collaboration

AMR is a cross-border health risk, meaning that an effective AMR strategy requires international cooperation. The associated efforts will ultimately also yield results in our own country. In all *One Health* areas and in the role of proactive innovator, advocate and connector, strengthening international ambitions and actions to combat AMR is, therefore, a Dutch policy priority.

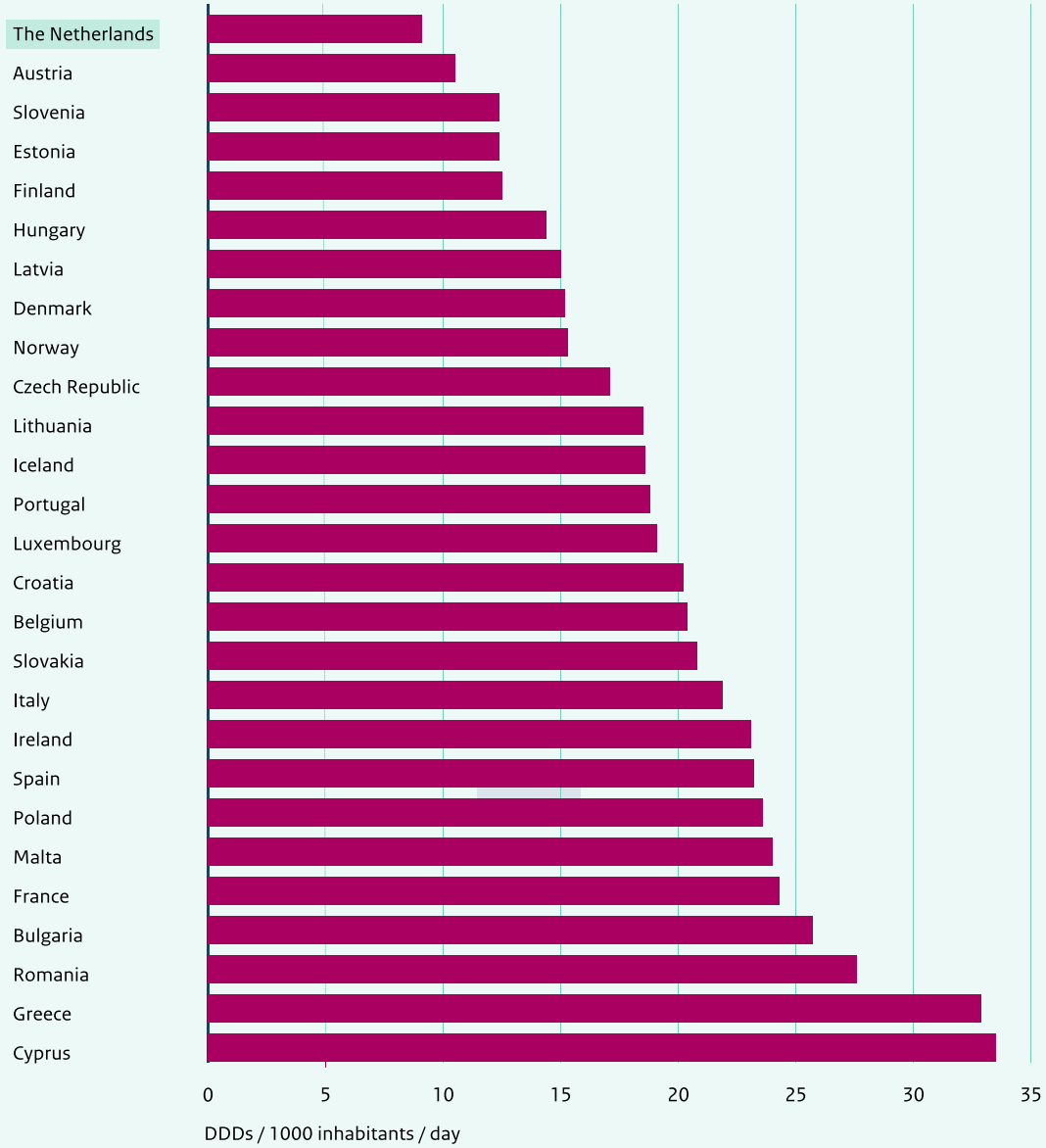
On the international stage, the Netherlands has long been active in the fight against AMR. For example, the Netherlands played an active role in the development of the WHO's *Global Action Plan on AMR* in 2015 and in the *High-Level Meeting on Antimicrobial Resistance* of the United Nations General Assembly in 2016.[35] In 2014 and 2019, the Netherlands organised the first and second international *One Health* AMR conferences.

Under the Dutch presidency of the Council of the EU in 2016, the *Council conclusions of 17 June 2016 on the next steps under a One Health approach to combat antimicrobial resistance* placed a strong emphasis on a collective approach to AMR in the EU, thus forming the foundation for the European Action Plan, *A European One Health Action Plan against Antimicrobial Resistance* (AMR),[36] in which the *One Health* approach is the central focus. These Council conclusions also formed the basis for the EU AMR *One Health* Network, a consultation forum led by the European Commission with the aim of boosting collaboration between policy officers from all member states.

The COVID-19 pandemic had a significant negative impact on the implementation of international collaboration in the area of AMR. In the post-pandemic phase in which we now find ourselves, international agenda-setting requires renewed attention. Previously made agreements must be reaffirmed and – where necessary – strengthened.

Through close collaboration between the relevant departments, work will be done from a *One Health* perspective to keep collective, targeted actions to combat AMR in the form of harmonised, stringent and efficient anti-AMR measures high on European and global policy agendas, and to boost international action.

Figure 7 Overview of the systemic use of antibiotics in humans in 2021 (Source: 'Surveillance of anti-microbial resistance in Europe', European Centre for Disease Prevention and Control (ECDC) and WHO/Europe, 2023)



European efforts

Within the EU, we put collective actions and initiatives in the area of AMR on the agenda and support them in our role as a connector. Examples include the *European One Health Action Plan against AMR*, the *Farm to Fork Strategy*, the *EU Global Health Strategy*, the *EU4Health programme* and the *Zero Pollution Action Plan*. We are committed to harmonised, stringent and efficient measures to combat AMR in all *One Health* areas.

At the EU level, we put policy topics on the agenda that require attention and/or a strategy specifically in the EU context, such as resistance to carbapenems, the use of ionophores, the spread of AMR in the environment, the careful use of antimicrobials on crops, etc. We also want to focus on the European Commission playing a proactive role and showing commitment in the area of AMR in global forums. Alongside EU Member States, the European Commission can bring all its weight to bear in these forums and raise awareness at the global level.

The differences in approach between EU Member States in the area of AMR are considerable. Significant benefits could be derived from the exchange of knowledge when it comes to best practices and experiences. To this end, the Netherlands has positioned itself as a proactive partner through collaboration and active participation in EU consultation structures, networks, policy groups, expert groups and other initiatives of the European Commission and EU agencies.

The Netherlands will play a leading and active role in the second *Joint Action on AMR and Healthcare-Associated Infections* (JAMRAI-2; 2024-2028), as it did in the first JAMRAI (2017-2021). This role will include supporting European countries in implementing their National Action Plans. Through this Joint Action, implementation of the Council Recommendation adopted in 2023 will be encouraged. In particular, this will include additional measures for careful use of antibiotics in the human healthcare sector and activities in the environment.

At the same time, it is important to continue long-term partnerships with other European countries that are controlling AMR to the same extent, as well as those that are lagging behind. Through collaboration with these countries, we can strengthen the Netherlands' unique position in the challenge of minimising AMR.

On the European stage, the Netherlands will continue to be strategic and contribute to combating AMR based on a *One Health* approach. In doing so, the Netherlands will act as a connector and advocate within the EU by participating in key European networks, consultation structures and working groups, such as the *EU AMR One Health Network*, and will actively work towards an ambitious *European One Health Action Plan against AMR*. Among other things, there will be a focus on a more coordinated and consistent approach within Europe. A strong, collective EU approach is of strategic importance in order to make a tangible contribution to the global discussion on AMR.

Global efforts

Combating AMR requires a global, multi-sector strategy based on a *One Health* approach. In addition to its efforts at the European level, the Netherlands also plays the role of advocate, proactive connector and partner in the global arena. The Netherlands would like to strengthen this role over the next six years.

The Netherlands is committed to putting and keeping the approach to AMR high on the international agenda, and to encouraging international multi-sector collaboration in the development of *One Health* strategies.

The *High-Level Meeting on AMR* of the United Nations General Assembly in 2024 will be a benchmark in this regard. This momentum will be used to continue to influence future global agreements to combat AMR.

To give political direction to international efforts to combat AMR, the Dutch Minister of Health, Welfare and Sport works within the Alliance of Champions against AMR and the Global Leaders Group on AMR, which is a United Nations initiative that aims to keep AMR high on international agendas and advise UN organisations.

The Netherlands is also a member of the Group of Friends on Tackling AMR and the Group of Friends of *One Health*. These are informal intergovernmental groups of like-minded countries among the permanent missions to the UN in New York, the WHO in Geneva and the FAO in Rome, which promote dialogue and encourage UN member states to take action.

The Netherlands continues to actively support the following international initiatives of UN organisations and the Quadripartite:

- The *Global Action Plan on AMR*;
- The *One Health Joint Plan of Action*;
- The Quadripartite's AMR Multi-Stakeholder Partnership Platform;
- AMR efforts under the WHO partnership programme, which provides secondments and support on AMR, such as the *WHO collaborating centres*;
- Participation in various strategic, technical and advisory groups under the WHO and Quadripartite;
- Codex Alimentarius, a UN organisation under the auspices of the WHO and FAO - long-term support with the worldwide development and implementation of the AMR Codex Guidelines;
- The AMR Multi-Partner Trust Fund - financial and knowledge support to assist lower and middle-income countries to implement their National Action Plans.

In addition, the Netherlands is active at the global level in a range of multilateral initiatives that see countries collaborate and share technical and policy knowledge and expertise. Active participation in these groups is important for exchanging knowledge, sharing lessons learned in the Netherlands and keeping up with international developments. These initiatives include:

- The *Global Health Security Agenda*, a partnership of 70 countries (including many low-income countries) that support each other to strengthen healthcare systems and respond close to the source when infectious disease outbreaks arise. The Netherlands is a member of the work package for AMR, which is a platform to share knowledge, expertise and best practices;
- The *Global AMR R&D Hub*, which aims to improve coordination of AMR R&D, including from a *One Health* approach;
- And other organisations and forums such as the OECD and G20.

The Netherlands has longstanding bilateral collaborative relationships in the area of AMR with the countries in the Kingdom of the Netherlands and with countries outside the EU, focusing on knowledge sharing and improving antibiotic use, setting up AMR stewardship programmes, surveillance and environmental research. To promote the exchange of knowledge, new partnerships with strategic countries will be initiated and existing bilateral partnerships between governments will be strengthened over the next few years. One of the ways this will happen is through collaboration in the context of memoranda of understanding (including with Indonesia, India, Colombia and China) and via the Global Health Partnership Programme. In doing so, we will implement the government-wide Global Health Strategy (2023-2030).

Successful implementation of an international AMR strategy hinges on substantial efforts from knowledge institutions, the business sector and both governmental and non-governmental organisations. We promote such cross-sector collaboration and knowledge sharing through the Netherlands Global Health Hub.

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Our goals for 2030

7.1 Commitment and cooperation within the European Union

Action	Description	Owner	Period
7.1.a	We are committed to the ambitious *European Health Action Plan against AMR* and any future updates. This plan contains implementation mechanisms and tools, sets measurable goals and covers the entire *One Health* spectrum.	VWS LNV I&W	2024 onwards
7.1.b	We will ensure that important topics in the area of AMR at the European and international level are placed on the agenda in EU consultation forums such as the *EU AMR One Health Network*.	VWS LNV	2024 onwards
7.1.c	We will step up the coordinated contribution of Dutch expertise through new and existing EU consultation structures, networks, expert groups and initiatives, including the *EU AMR One Health Network* and other consultation forums of the Council, the European Commission and the EU agencies.	VWS LNV I&W	2024 onwards
7.1.d	In the EU's second Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (JAMRAI-2), we will, from our role as work package 5 coordinator, encourage the formation of networks, the implementation of broad *One Health* strategies and the drafting/updating of National Action Plans in all EU member states, along with the sharing of best practices.	VWS LNV	2024-2028
7.1.e	We will put forward our international priorities in EU consultation forums: resistance to carbapenems, the spread of antimicrobial resistance in the environment, the careful use of antimicrobials on crops, the impact of climate change on AMR, EU representation in international forums, etc.	VWS LNV I&W	2024 onwards

Action	Description	Owner	Period
7.1.f	At the European level (and in international forums), we will examine the possibility of the risk of cross-resistance being taken into account in European approval of active substances and in national authorisation of biocides and plant protection products.	VWS LNV I&W	2024 onwards
7.1.g	We will advocate for proper support from the EU/EMA for EU Member States in the form of high-quality guidelines on the implementation of the Veterinary Medicinal Products Regulation (2019/6) and the requirement to supply data on antibiotic sales and use. Having a correct and effective indicator for antibiotic use in animals is important.	LNV	2024 onwards
7.1.h	We will advocate in European forums for newly developed fungicidals to be reserved for human use.	VWS LNV I&W	2024 onwards
7.1.i	We will continue our contribution to the European AMR monitoring and surveillance efforts in the context of Commission Implementing Decision (EU) 2020/1729.	LNV	2024 onwards
7.1.j	We will continue our contribution to the work of VetCAST/EUCAST to promote the development and/or harmonisation of methods and interpretation criteria for susceptibility testing of bacteria from humans and animals.	LNV	2024 onwards
7.1.k	We will advocate for the use of ionophores in animal feed, their role in the development of AMR and the possible impact of the resulting AMR on public health to be placed on the agenda in the EU and to be the subject of further European research, in anticipation of the review of the EU regulation on animal feed additives (Regulation (EC) No. 1831/2003).	LNV	2024 onwards

7.2 Commitment and cooperation at the global level

Action	Description	Owner	Period
7.2.a	We will continue and step up our support for the initiatives of the Quadripartite organisations (WHO, FAO, UNEP, WOAH) and continue our efforts to update and implement the Global Action Plan on AMR, the *One Health* Joint Plan of Action and other AMR-related activities and initiatives.	VWS	2024 onwards
7.2.b	We will continue or step up our practical collaboration and/or knowledge exchange with global multi-lateral partners, such as GHSA, OECD, JPIAMR, Alliance of Champions, G20 and the Codex Alimentarius Commission.	VWS LNV I&W	2024 onwards
7.2.c	We will step up the coordinated contribution of Dutch knowledge and expertise through new and existing consultation structures, networks, expert groups and initiatives of the Quadripartite, other UN organisations and consultation forums with multilateral partners.	VWS LNV I&W	2024 onwards
7.2.d	We will continue to support the AMR Multi-Partner Trust Fund, also financially.	VWS	2024-2028
7.2.e	Combating AMR will remain a priority for the Netherlands in its collaboration with strategic partners, for example via the Global Health Partnership Programme. Lessons learned in various bilateral projects will be compiled and widely shared.	VWS	2024 onwards
7.2.f	We will make every effort to ensure an ambitious resolution is adopted at the High-Level Meeting on AMR of the UN General Assembly in 2024, including a global ban on antimicrobial growth promoters in the animal production chain.	VWS LNV I&W	2024

Action	Description	Owner	Period
7.2.g	We will make every effort to ensure an ambitious passage on AMR is included in the Global Pandemic Treaty, and provide active support to other countries during the implementation phase to comply with these obligations.	VWS	2024
7.2.h	We will continue our contribution to and collaborate with the WHO through the WHO partnership programme, including the Dutch-based WHO Collaborating Centres on AMR Epidemiology and Surveillance and Risk Assessments of Pathogens in Food and Water.	VWS	2024 onwards
7.2.i	The involvement and commitment of knowledge institutions, the business sector and organisations in the Netherlands Global Health Hub will continue to be a priority. We will aim for innovative, multi-sector partnerships with the potential to accelerate and scale up the development of new insights and products.	VWS	2024 onwards
7.2.j	We will advocate in international forums for newly developed fungicidals to be reserved for human use.	VWS LNV I&W	2024 onwards
7.2.k	We will continue or strengthen bilateral collaboration with countries with which the Netherlands has signed a memorandum of understanding.	VWS	2024 onwards

Stakeholders

Action to combat AMR requires coordination and collaboration with many parties at a variety of levels. The success of Dutch government policy depends on the involvement and commitment of the network of stakeholders.

Important input and contributions were collected through a stakeholder meeting on 26 September 2023 and through stakeholder consultations at other times. This input was taken into account in writing the final plan.

Definitions

AGISAR	WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AMR	Antimicrobial resistance
Antibiotic	A chemical substance with a direct effect on bacteria, used for the treatment or prevention of infections or bacterial infectious diseases.
Antimicrobials	Chemical substances with a direct effect on microorganisms, used for the treatment or prevention of infections or infectious diseases. They include antibiotics, antiviral drugs, antifungals and antiprotozoal agents.
Antimicrobial resistance	The ability of microorganisms to survive or increase in number in the presence of a concentration of an antimicrobial that is usually sufficient to kill or inhibit the growth of microorganisms of the same species.
A-team	A teams are responsible for monitoring the quality of antibiotic policies in hospitals.
Azoles	A group of chemicals that are used in a variety of ways to prevent fungal growth or combat fungal infections.
HRMOs	Highly resistant microorganisms: microorganisms that are resistant to first-line antibiotics or to multiple groups of antibiotics[37]
CAESAR	Central Asian and European Surveillance of Antimicrobial Resistance (under the WHO)
Carbapenems	A category of antibiotics used as a 'last resort' against bacteria that are resistant to other groups of antibiotics.
Cib	Centre for Infectious Disease Control (under RIVM)
DDDvet	Defined daily dose for veterinary medicines.
Animal domain	One of three *One Health* domains, focusing on animals and food products from animals.
EAAD	European Antimicrobial Awareness Day
EC	European Commission
ECDC	European Centre for Disease Prevention and Control (under the EU)

EEA	European Environment Agency (under the EU)
EFSA	European Food Safety Authority (under the EU)
EMA	European Medicines Agency (under the EU)
ESAC-Net	European Surveillance of Antimicrobial Consumption Network
ESBL	Extended spectrum beta-lactamase
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
EUCAST	European Committee on Antimicrobial Susceptibility Testing
FAO	Food and Agriculture Organization (a UN agency)
Royal GD	Animal Health Service
GGDs	Municipal Public Health Services
GHSA	Global Health Security Agenda
GLASS	Global Antimicrobial resistance and use Surveillance System (under the WHO)
Humaan domein	One of three *One Health* domains, focused on humans.
I&W	Dutch Ministry of Infrastructure and Water Management
IGJ	Health and Youth Care Inspectorate
IMI	Innovative Medicines Initiative (a public-private EU programme)
ISIS-AR	Infectious Diseases Surveillance Information System for Antimicrobial Resistance (under RIVM)
JAMRAI	Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (under the EU)

JAMRAI-2	Follow-up to the Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections (under the EU)
JPIAMR	Joint Programming Initiative on Antimicrobial Resistance
KRW	Water Framework Directive
Environment	The complete ecosystem in which humans, animals, plants and microorganisms live and in which economic sectors such as health care, livestock farming, crop cultivation and industry operate.
LNV	Dutch Ministry of Agriculture, Nature and Food Quality
MARAN	Dutch Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals
Microorganism	An umbrella term; in this action plan, it is used for organisms classified as bacteria, fungi, viruses or single-celled parasites (protozoa).
Environmental domain	Overarching *One Health* domain, focusing on the role of the broader living environment: soil, air and water.
MPTF	Multi-Partner Trust Fund (under the AMR Global Leaders Group)
NCOH	Netherlands Centre for *One Health*
NethMap	Netherlands Human Antimicrobial Resistance Surveillance
NVWA	Netherlands Food and Consumer Product Safety Authority
NWO	Dutch Research Council
OECD	Organisation for Economic Cooperation and Development
OHN	One Health Network AMR (under the Europese Unie)

One Health	An integrated, collaborative approach to balancing and optimising the health of people, animals, plants and their shared living environment. It requires collaboration between multiple sectors and disciplines (such as public health, animal health, agriculture and the environment) at all levels.
PCU	Population correction unit
Plant health domain	One of the three *One Health* domains, focusing on the health of crop plants
Quadripartite	A partnership between four organisations: WHO, FAO, WOAH and UNEP
RIVM	National Institute for Public Health and the Environment
SABEL	Comparative Information on Antibiotics in Primary Care
SDa	Netherlands Veterinary Medicines Institute
SO-ZI/AMR	Healthcare Institutions and Antimicrobial Resistance Early Warning Committee
SRI	Network for Infection Control Guidelines
Surveillance	The systematic and structured collection, analysis, interpretation and reporting of, in this case, data on the use of antimicrobials and the spread of resistant microorganisms.
SWAB	Dutch Working Party on Antibiotic Policy
UNEP	United Nations Environment Programme (a UN agency)
Responsible use	A set of principles and criteria for the desirable use of antimicrobials. Also described as ‘prudent’, ‘judicious’, ‘efficient’, ‘careful’, ‘correct’ or ‘appropriate’ use.
Veterinair domein	See: Animal domain
UN	United Nations

VWS	Dutch Ministry of Health, Welfare and Sport
WAAW	World Antimicrobial Awareness Week
WBVR	Wageningen BioVeterinary Research
WFSR	Wageningen Food Safety Research
WHA	World Health Assembly (under the UN)
WHO	World Health Organization (a UN agency)
WOAH	World Organisation for Animal Health
WUR	Wageningen University & Research

Sources and literature

The experiences of Pieter and Stefani can be found in *Leven met infectieziekte: persoonlijke verhalen van impact en veerkracht* (Living with an infectious disease: personal stories of impact and resilience), published by the Association of Collaborating Health Foundations (SGF), 2023 and available on the SGF website, https://www.gezondheidsfondsen.nl/activiteit/infectieziekten-en-antimicrobiele-resistentie/

The Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a *One Health* approach (2023) can be found at the URL https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023H0622%2801%29&qid=1733310548640

The World Bank's 2023 publication *Drug-Resistant Infections: A Threat to Our Economic Future* can be found at https://www.worldbank.org/en/topic/health/publication/drug-resistant-infections-a-threat-to-our-economic-future

Endnotes

1 World Health Organisation: Antimicrobial Resistance (2023)

2 World Bank: Drug-Resistant Infections: A Threat to Our Economic Future (2017)

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4 European Commission: HERA, Health Union, identifying 3 priority health threats (2022)

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