Strategy on Antibiotic Resistance
StAR

SWISS ANTIBIOTIC RESISTANCE REPORT 2026

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Swiss Antibiotic Resistance Report 2026

The surveillance of antibiotic use and antimicrobial resistance (AMR) in humans, livestock, companion animals and the environment is a central element of the Swiss Strategy on Antimicrobial Resistance (StAR) and the One Health Action Plan StAR 2024–2027. Since 2016, the results of this surveillance have been summarised every two years in the Swiss Antibiotic Resistance Report (SARR).

The Swiss Antibiotic Resistance Report 2026 provides an assessment of the current situation in Switzerland. It summarises the most relevant developments in antibiotic use and resistance and places them in context. The report does not aim to reproduce all available surveillance data. Instead, it highlights overarching trends, important changes, areas where the situation remains stable or favourable, and signals that require continued attention.

Surveillance is not an end in itself. Its purpose is to support action by providing relevant data as a basis for decision-making and response. This includes identifying where antibiotic use can be further optimised, where relevant resistant bacteria are emerging or spreading, and where existing measures in stewardship, infection prevention and control (IPC), animal health, food safety or environmental protection may need to be strengthened. It also helps assess whether measures already implemented are reflected in changes in antibiotic use or in stabilising or declining resistance levels.

The report follows a One Health perspective. The assessment brings together data from multiple surveillance and monitoring systems across the One Health sectors, reflecting differences in data sources, indicators and surveillance approaches. It aims to support a shared understanding of where Switzerland stands today, which developments are most relevant, and where further attention, action, surveillance, monitoring or research may be needed.

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In-depth reports

The Swiss Antibiotic Resistance Report is complemented by reports that provide more in-depth coverage of selected topics related to antibiotic use and antimicrobial resistance.

- Antibiotic prescribing in retirement and nursing homes in Switzerland
- Benchmarking antibiotic use in cats and dogs to support prudent prescribing in veterinary practices in Switzerland
- Antibiotics and antimicrobial resistance in the water cycle: the role of wastewater treatment
- One Health Analysis: Comparison of antibiotic use in humans and animals 2023–2025

1 Antibiotic use in human and veterinary medicine

Antibiotic use is one of the main drivers of antimicrobial resistance and therefore a central focus of surveillance and stewardship. The aim is not simply to reduce antibiotic use in all situations, but to ensure that antibiotics are used appropriately: only when needed, and with the right substance, dose and duration.

This section summarises the most relevant developments in antibiotic use in human and veterinary medicine. It highlights what is changing, how these changes can be interpreted, and what they imply for antibiotic stewardship programmes, surveillance strategies and further action. The focus is on overall trends, changes in the types of antibiotics used, and areas where targeted improvements remain possible. The assessment draws on complementary systems and data sources and should be interpreted in the context of each sector. Human and veterinary medicine differ in populations, treatment contexts and reporting systems; the findings are presented side by side to identify relevant developments and antibiotic stewardship priorities. Detailed data are available through the corresponding dashboards provided by the Swiss Centre for Antibiotic Resistance (ANRESIS) and the Information System on Antibiotics in Veterinary Medicine (IS ABV).

1.1 Antibiotic use in human medicine

Antibiotic use in Switzerland appears comparatively low relative to other European countries. In 2024, total antibiotic use in human medicine reached a mean of 11.1 defined daily doses per 1,000 inhabitants per day (DID) based on sales data, which is below the reported European mean of 20.4 DID in 2024. In 2025, Swiss antibiotic use reached 9.9 DID, already surpassing the StAR Action Plan target for 2027 by falling below the target level of 10.2 DID, which corresponds to a 4% reduction from the 2019 baseline. Overall, antibiotic use has followed a downward trend since 2015, although this trend was temporarily interrupted by the COVID-19 pandemic. Antibiotic use showed a marked dip during the pandemic, mainly because respiratory infections became less frequent due to prevention measures such as mask-wearing and reduced social contact. As respiratory infections returned, including infections with Group A streptococci, *Bordetella pertussis* and *Mycoplasma pneumoniae*, antibiotic use rebounded temporarily, before declining again in the most recent years (Jaboyedoff et al., 2025; Schöbi et al., 2024).

These observations place Switzerland in a favourable position in international comparison and are consistent with relatively restrained antibiotic use. However, low overall use does not necessarily imply optimal prescribing. Further attention is therefore needed to the quality of antibiotic prescribing, including the choice of antibiotic and the settings or indications where improvement may still be possible.

One important aspect of prescribing quality is the choice of antibiotic. Because antibiotic classes differ in their role in treatment and in their potential to select for resistance, the WHO Access, Watch and Reserve (AWaRe) classification provides antibiotic stewardship guidance by distinguishing antibiotics according to their preferred role in clinical use and their potential impact on resistance. In 2025, Access antibiotics accounted

for 67.2% of total antibiotic use in Switzerland, slightly below the StAR Action Plan's 2027 target of at least 69%. The 2024 UN Political Declaration on antimicrobial resistance set a global target of at least 70% by 2030. At the same time, Watch antibiotic use decreased by 27.4% over the last decade, mainly due to reduced use of fluoroquinolones and cephalosporins. These changes reflect a shift in prescribing patterns, with increased use of Access antibiotics and reduced use of Watch antibiotics, although further improvement in antibiotic choice remains needed.

Most antibiotic use occurs outside hospitals. In 2025, outpatient care accounted for 85.9% of total antibiotic use, confirming it as the main setting contributing to overall antibiotic use. For the first time, claims data have been analysed to describe outpatient prescribing in more detail by specialty and canton. They show that general practitioners (general internal medicine specialists and practising physicians) account for the largest share of prescriptions (36.1%; paediatricians 4.8%), while physicians in hospital-affiliated outpatient structures (21.1%) and group practices (19.5%) also contribute substantially. These patterns suggest that efforts to improve outpatient use should address high-prescribing providers and settings. In addition, these new analyses provide valuable insights for targeted measures and communication by medical societies and cantonal authorities. The proposed revision of the Epidemics Act could further support this approach by enabling existing health-insurer data to be used for tailored feedback and benchmarking without additional reporting by prescribers. The proposed revision of the Therapeutic Products Act could complement these measures through unit dispensing of antibiotics, supporting accurate duration of treatment.

A closer look at outpatient prescribing reveals substantial regional differences. Outpatient antibiotic use varies strongly by linguistic region. In 2025, use was more than 1.5 times higher in French-speaking Switzerland than in German-speaking Switzerland. Against this background, the StAR Action Plan sets, based on the same sales data, a target of reducing outpatient antibiotic use to below 11.5 DID in all linguistic regions. Claims data provide additional detail at cantonal level but are based on a different methodology from the sales data used to define the StAR target and are therefore not directly comparable with the 11.5 DID target. The highest rates were observed in Geneva (11.8 DID), Neuchâtel and Vaud, and the lowest in Appenzell Innerrhoden (4.5 DID), Uri and Nidwalden (figure 1). These differences may reflect several factors, including primary care physician density, access to healthcare, and cultural factors (Filippini et al., 2006). As regional disparities have persisted over time, higher-use regions and cantons remain relevant for further analysis and targeted action.

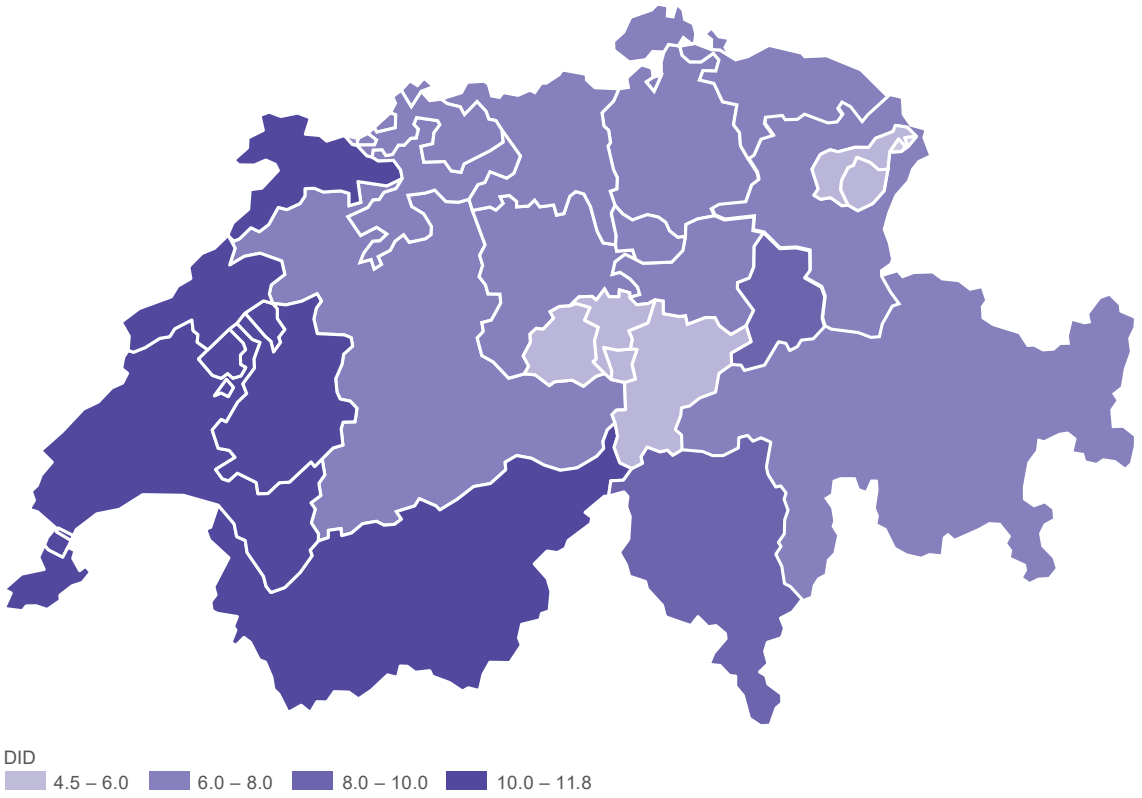


Figure 1. Cantonal outpatient antibiotic use based on claims data, expressed as age- and gender-standardised defined daily doses per 1,000 inhabitants per day, 2025.

Antibiotic use increases markedly with age, with higher prescribing among older patients than for younger age groups. This pattern likely reflects the higher burden of infections and healthcare needs associated with multimorbidity and increased vulnerability in older age groups. In Swiss retirement and nursing homes, the proportion of residents receiving antibiotic treatment is below the European average, but substantial differences remain between linguistic regions and individual facilities. Measures to promote appropriate antibiotic use are already in place, but vary in scope and implementation.

Gender differences in antibiotic prescribing vary across the life course. In adults aged 16–60, antibiotic use is higher among women. This persists even after excluding antibiotics typically prescribed for urinary tract infections (UTI), suggesting that UTI treatment alone does not explain the observed pattern. In older age groups, antibiotic use is slightly higher among men.

Overall, these age- and gender-specific patterns highlight that antibiotic use is strongly shaped by demographic factors that influence both infection risk and healthcare-seeking behaviour. From a stewardship perspective, they suggest that interventions aiming to optimise prescribing may benefit from considering age- and gender-specific clinical contexts rather than relying on uniform strategies across the population.

Respiratory tract infections are the most commonly reported indications for antibiotic prescribing in primary care, although many are caused by viruses and therefore do not benefit from antibiotic treatment (Charton et al., 2025). In 2025, they

accounted for almost half of antibiotic prescriptions by general practitioners; pneumonia, sinusitis, acute bronchitis and pharyngitis were the most frequently reported respiratory indications. The FOPH Sentinella surveillance system adds a quality perspective by showing how often in-person consultations for infection-related symptoms result in an antibiotic prescription and whether the antibiotic chosen is recommended by clinical guidelines. Overall, 38.1% of such consultations resulted in an antibiotic prescription. Antibiotics were prescribed in 45.0% of consultations for sinusitis in adults and in 61.4% of consultations for acute otitis media in children. Both prescribing rates exceeded the ESAC recommended range of 0–20% (Adriaenssens et al., 2011).

Guideline concordance also varied considerably by indication. Around one fifth of antibiotic prescriptions in both adults and children were not recommended by clinical guidelines (Dunaiceva et al., 2025). In adults, the proportion of not-recommended antibiotics ranged from 8.2% for pneumonia to 42.8% for pharyngitis; in children, from 0% for sinusitis to 32.7% for pharyngitis. Over time, the proportion of non-recommended antibiotics in adults remained broadly stable for most indications, while it decreased for pneumonia and increased for pharyngitis.

Among adults, the most common not-recommended antibiotic classes included a beta-lactamase inhibitor in combination with penicillin for pharyngitis (34.8%) and a macrolide for sinusitis (25.3%). In addition, second-line antibiotics were used frequently, and first-line antibiotics accounted for less than 50% of prescriptions for the majority of assessed indications. These findings indicate room for improvement through greater awareness of prescribing guidelines, shared decision-making, use of point-of-care tests, and delayed prescribing strategies, as well as continued promotion of first-line prescribing with Access antibiotics and limiting unnecessary use of Watch antibiotics.

These improvement areas are supported by practical measures that help translate evidence and recommendations into outpatient care. The Antimicrobial Stewardship in Ambulatory Care Platform (ASAP) serves as a network and transfer platform, helping relevant knowledge, tools and messages reach family physicians and other outpatient prescribers. Clinical guidelines of the Swiss Society for Infectious Diseases provide concrete recommendations for most infections seen in outpatient care. Recent updates include when to test, when antibiotic treatment is indicated, which antibiotic to use and for how long, when to involve patients in shared decision-making, and how to weigh the benefits and risks of treatment. Infection prevention and control (IPC) messages for the general population and patients, including good hand, respiratory and food hygiene, complement these prescribing-focused measures.

Antibiotic use in hospitals remained stable in 2025. Inpatient consumption was 1.4 DID, similar to 2024 and below the reported European mean of 1.7 DID in 2024. To account for hospital activity, antibiotic use is expressed per 100 bed-days. Although antibiotic consumption expressed in defined daily doses (DDD) per 100 bed-days (DBD) increased by 5.1% between 2016 and 2025, this apparent rise mainly reflects a decrease in the average length of hospital stay (a 7% decrease in bed-days despite a 14% increase in admissions), rather than an actual increase in antibiotic use, as the total number of DDDs remained stable among hospitals participating in both years. In contrast to the outpatient setting, hospital antibiotic consumption in the French-speaking region was similar to that in

the German-speaking region, suggesting that cultural factors may play a less significant role in hospitals.

With overall hospital antibiotic use remaining broadly stable, attention increasingly shifts to evaluating prescribing practices and identifying opportunities for antimicrobial stewardship. At an aggregate level, ANRESIS data support this by allowing benchmarking across hospitals and regions and by tracking trends in antibiotic use over time. These data can identify differences in use patterns and areas that may warrant further attention, but they provide only limited information on the quality of individual prescriptions. Patient-level indicators derived from electronic medical records are still emerging and could allow more detailed assessment of prescribing quality, e.g. the proportion of patients with de-escalation. Complementary data sources such as point prevalence surveys (PPS), which provide a cross-sectional snapshot of antimicrobial use in hospitalised patients on a given day, and targeted prescription audits provide additional information on prescribing practices. In the national PPS coordinated in 2025 by Swissnoso, around 30% of hospitalised patients were receiving at least one antimicrobial on the survey day, a proportion that has remained broadly stable since 2022 (Sonpar et al., 2026). However, the proportion of prescriptions for both surgical and medical prophylaxis has increased slightly. This identifies prophylactic antibiotic use as a potential area for targeted antimicrobial stewardship interventions. A major success is the 53% reduction in fluoroquinolone use over the past ten years. This decline was attributed to heightened awareness of their adverse effects and more restrictive recommendations for their use in prescribing guidelines, particularly for urinary tract infections.

Several hospital prescribing issues require continued attention. Carbapenems are closely monitored because their broad spectrum of activity is associated with substantial selective pressure for resistance, while their important role in treating severe infections caused by multidrug-resistant bacteria makes prudent use particularly important. In recent years, carbapenem use has remained stable in hospitals in the German- and French-speaking regions, while use in the Italian-speaking region was higher than in the other regions (3.1 DBD versus 2.2 DBD). This difference may partly reflect the higher levels of cephalosporin resistance observed in the Italian-speaking region, which could lead prescribers to select carbapenems.

Overall use of Reserve antibiotics used for multidrug-resistant organisms remained stable in hospitals over the last decade. However, an upward trend in the use of Reserve antibiotics in the intensive care units at larger hospitals should be monitored closely.

More generally, the prudent use of antibiotics, particularly Watch and Reserve antibiotics, remains important. Key antibiotic stewardship measures include systematic re-evaluation of antibiotic treatment after 48–72 hours, with de-escalation or discontinuation where appropriate, timely intravenous-to-oral switching, and limiting treatment duration to what is clinically indicated.

Hospital stewardship programmes provide an important basis for these improvements. According to a Swissnoso survey (Eder et al., 2025), most hospitals report stewardship activities and around half have established a formal antimicrobial stewardship programme. Treatment guidelines and monitoring of antibiotic use are widely implemented, while

dedicated staff resources for stewardship are available in fewer hospitals. The Swissnoso handbook on antimicrobial stewardship supports hospitals in implementing measures including hospital management support, adherence to prescribing guidelines, training in best practice, treatment review and de-escalation, diagnostic stewardship, audit and feedback, and restrictions on selected Watch and Reserve antibiotics.

1.2 Antibiotic use in veterinary medicine

Antibiotic use in veterinary medicine has traditionally been monitored using sales data. In recent years, monitoring has been expanded to include prescription data, which provide more detailed information on antibiotic use across animal species and production systems. Veterinary antibiotic use is therefore assessed using two complementary data sources: sales and prescription data.

Sales data show a substantial long-term decline in veterinary antibiotic sales. In livestock, sales have decreased markedly since 2008. Over the past three years, however, sales relative to livestock biomass have remained stable at around 30 mg per population correction unit (PCU). This indicates that part of the recent decrease in total antibiotic sales may reflect changes in livestock numbers rather than a further reduction in sales relative to animal biomass. In European comparison, Switzerland remains among the countries with the lowest antibiotic sales for livestock per PCU, ranking eighth in 2024 (figure 2; European Medicines Agency (EMA), 2025).

For products intended only for companion animals, year-to-year changes are less consistent, but the longer-term trend is also downward, with sales decreasing by 17% between 2016 and 2025 despite an increasing companion-animal population. However, sales data for companion animals should be interpreted with caution, because many products authorised for both farm and companion animals are classified under livestock in this analysis. The actual amount of antibiotic used in companion animals is therefore likely underestimated.

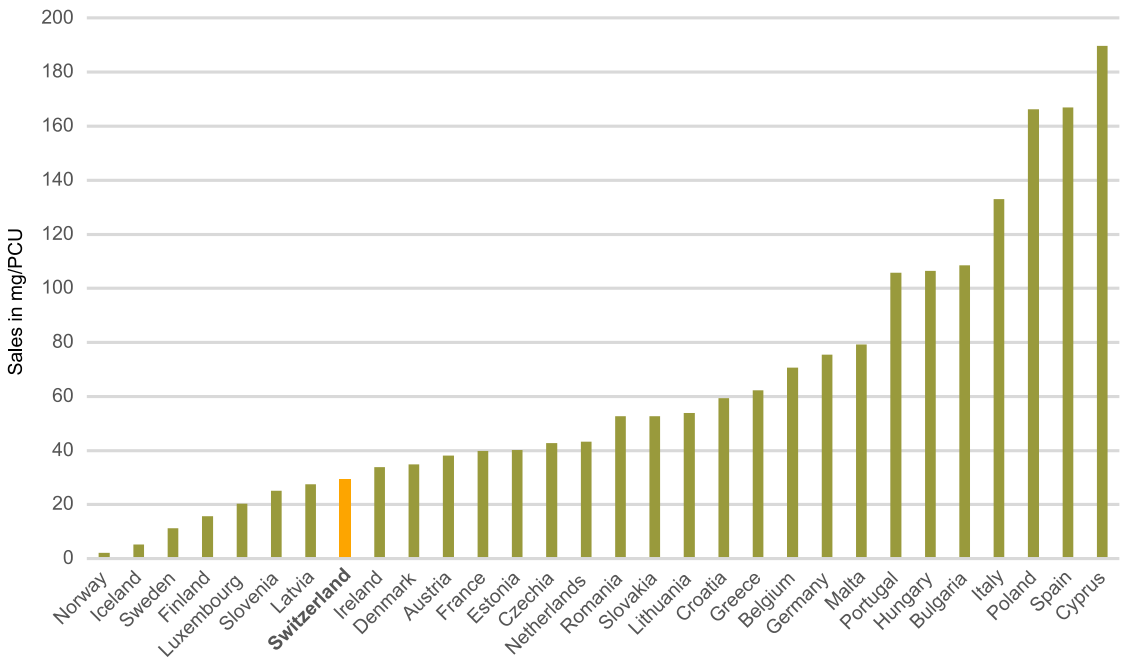


Figure 2. Veterinary antibiotic sales in European countries, 2024. Sales for livestock are expressed as milligrams of active substance per population correction unit (mg/PCU), which adjusts for differences in the size of the food-producing animal population (adapted from EMA, 2025).

Sales data describe the overall development of veterinary antibiotic use, while prescription data provide a more detailed view of how antibiotics are used across animal species and production systems. They show that the overall favourable trend is not uniform and help to identify where antibiotic use is concentrated, where recent changes require closer attention, and where targeted improvements may be most relevant.

Cattle remain a key priority for targeted improvements in veterinary antibiotic use. They account for the largest absolute amount of antibiotic used and for the largest amount of critical antibiotics (third- and fourth-generation cephalosporins, fluoroquinolones and macrolides) used in veterinary medicine. The highest numbers of treatments per 1,000 animals are recorded for dairy cows, followed by rearing and fattening cattle. In 2025, most cattle categories showed a slight decrease across the main indicators of antibiotic use. This might indicate that the increase observed in previous years has now come to an end. That increase was influenced by the reclassification of unspecified animal categories into cattle categories following changes to reporting from 2023, as well as by the shift from 'dispensing antibiotics for stock' to 'treatment-based reporting'. In summary, a slight decrease in total use and treatment numbers in cattle is recorded for the first time, but use remains high overall. Dairy cattle and veal calves therefore remain particularly relevant for targeted reduction strategies that preserve animal health and welfare.

In **pigs**, most categories showed a slight increase in the amount of antibiotic used, including critical antibiotics, as well as in treatment numbers between 2023 and 2025, interrupting the downward development observed in previous years. Treatment numbers per 1,000 animals also increased in particular in fattening pigs and breeding animals. The amount of penicillins increased by 25.2% and that of macrolides, classified as critical antibiotics, by 53% over the same period. However, the absolute amount of macrolides remained low, meaning that the relative change can be disproportionately affected by a small number of

prescriptions. At the same time, the number of treatments with critical antibiotics decreased, particularly in piglets. The recent increases should therefore be monitored before being interpreted as a reversal of the previous downward trend. Overall antibiotic use remains below the levels observed in previous years. At the same time, the decrease in the number of treatments with critical antibiotics, alongside increased penicillin use, may indicate a change in prescribing patterns.

In **poultry**, the total amount of active substances remains far lower than for cattle and pigs although it increased slightly in 2025. In contrast, within the livestock categories considered, the proportion of critical antibiotics remains higher in poultry than in cattle and pigs. Therefore, the main focus remains the reduction in the use of critical antibiotics rather than a general reduction in antibiotic use. The amount of critical antibiotics has decreased by 56% since 2021, while the number of treatments with critical antibiotics per 1,000 broilers has fallen by 80%. In contrast, the total amount of antibiotic use and overall treatment numbers fluctuate without a clear trend. The decline in critical antibiotic use may partly reflect a shift towards sulfonamides, which require larger amounts of active substance for equivalent treatment. Poultry therefore illustrates why changes in antibiotic choice, and not only total active substance amounts, are important when assessing progress in antibiotic use.

In **companion animals**, treatment numbers are generally stable or declining, while changes in antibiotic amounts partly reflect shifts in the substances used. In equines, the total amount of antibiotics increased despite stable treatment numbers in 2024, decreased again in 2025 but remained slightly above the total amount recorded in 2023. This was mainly due to greater use of first-line antibiotics such as sulfonamides, which are used in larger quantities by weight, while the use of other antibiotics declined. The increase in total amount of antibiotics therefore does not indicate more frequent treatment, but rather a change in the antibiotics used. In dogs, both the amount of critical antibiotics and the number of treatments with critical antibiotics show a slight downward trend. In cats, the amount of antibiotics increased while the number of treatments remains broadly stable. This was driven by greater use of penicillins alongside a decline in critical antibiotics, particularly third- and fourth-generation cephalosporins. As in equines, the increase in total amount therefore appears to reflect a shift in antibiotic choice rather than an increase in treatment frequency. Since 2024, companion animal practices have received annual reports on antibiotic use in dogs and cats, allowing them to review their prescribing patterns and compare their use with that of other practices. This supports practice-level benchmarking and targeted improvement.

Overall, sales and prescription data indicate a favourable long-term development in veterinary antibiotic use, including a reduction in the use of critical antibiotics. Recent patterns nevertheless differ between animal species and production systems. The observed developments are consistent with the effects expected from national measures to promote prudent antibiotic use, although they cannot be attributed to individual measures on the basis of surveillance data alone. Further progress will therefore depend on targeted improvements in areas where use remains high or recent developments require attention. Dairy cattle and veal calves are particularly important because they combine high treatment numbers with large amounts of antibiotics used. In poultry and pigs, efforts should focus on maintaining the progress achieved. In pigs, the slight increase in the total amount of

antibiotics used over the last two years should be monitored closely, while in poultry the priority is to maintain the substantial reduction achieved in the use of critical antibiotics.

1.3 Summary from a One Health perspective

Taken together, human and veterinary data show a broadly favourable development in antibiotic use in Switzerland, with antibiotic use remaining comparatively low by international standards and evidence of more prudent use over time. As an additional One Health perspective, antibiotic use in both sectors was examined through the WHO AWaRe framework (WHO, 2022). Although AWaRe was developed for human medicine and is not specifically designed for veterinary use, applying the same framework to veterinary data provides an indication of how the use of antibiotics that are particularly important for human medicine is evolving in animals. In both sectors, Access antibiotics account for the largest share of use, while the share of Watch antibiotics has declined over time. In veterinary medicine, this decline indicates that the use of antibiotics of particular importance to human medicine is being progressively reduced. This development is consistent with the reduction in critical antibiotic use seen in the veterinary indicators and is favourable from a One Health and human-health perspective.

Further reductions remain an important goal wherever they can be achieved without compromising appropriate treatment, patient safety, animal health or welfare. Progress will increasingly depend on targeted improvements: avoiding unnecessary antibiotic use, improving antibiotic choice and limiting critical antibiotics to situations where they are needed, while addressing specific priorities in different healthcare settings, animal species and production systems.

2 Antimicrobial resistance in human and veterinary medicine

Antimicrobial resistance (AMR) is monitored for specific combinations of bacteria and antibiotics. The relevance of a pathogen causing an infection depends not only on its level of resistance to various antibiotics, but also on the remaining treatment options, the severity of infection and on how easily the organism or its resistance genes can spread. Resistance data therefore need to be interpreted together with information on incidence, clinical relevance, reservoirs and transmission pathways.

Surveillance approaches differ between human and veterinary medicine. In human medicine, resistance data reflect pathogens causing clinical infections. In veterinary medicine, monitoring primarily covers commensal indicator bacteria and zoonotic bacteria from healthy slaughter animals and meat from retail, providing information on reservoirs and resistance patterns potentially relevant to human health. Additionally, resistance data in veterinary pathogens for livestock and companion animals are collected to support appropriate empirical treatment decisions.

This section summarises the most relevant developments in antimicrobial resistance in human and veterinary medicine. It highlights which resistance patterns are changing or remain of concern, how their relevance differs between pathogens and sectors, and what they imply for treatment, surveillance, infection prevention, prudent antibiotic use and One Health action.

2.1 Antimicrobial resistance in human medicine

In human medicine, resistance trends differ substantially between distinct bacteria-antibiotic combinations. For several major pathogens, resistance levels have stabilised in recent years and remain low compared with most other European countries. However, resistance proportions in pathogens causing clinical infections alone do not fully describe the public-health relevance of the respective pathogen. Some resistant bacteria, such as broad-spectrum cephalosporin-resistant *Escherichia coli (E. coli)*, cause a high burden because the underlying infections are frequent. Others, such as carbapenemase-producing *Enterobacterales* or carbapenem-resistant *Acinetobacter* species, remain rare but are particularly important in healthcare settings because treatment options are more limited and prevention of healthcare-associated transmission requires early containment.

In addition, surveillance indicators based on invasive isolates may only capture the “tip of the iceberg” and may therefore not reflect overall epidemiology. Developments occurring primarily outside invasive disease, such as community-associated methicillin-resistant *Staphylococcus aureus* (MRSA), or the burden of vancomycin-resistant enterococci (VRE), may therefore be underestimated.

Methicillin-resistant *Staphylococcus aureus* (MRSA) illustrates why resistance levels should be interpreted together with incidence. *S. aureus* is a common cause of human infections, ranging from skin infections to invasive bloodstream infections. In Switzerland, MRSA proportions decreased from 13% in 2004 to around 4–5% in 2015 and have since stabilised. These proportions compare favourably to the EU/EEA average MRSA proportion of 14.2% in 2024, also declining since 2020 (ECDC, 2025). In Switzerland this decline is a success story and was mainly driven by decreases in western Switzerland and Ticino, while proportions in German-speaking Switzerland remained more stable (Olearo et al., 2016). Intensified infection prevention and control efforts, including early screening and isolation as well as hand hygiene, probably contributed to this development. In Switzerland, the incidence of MRSA bloodstream infections also remained low, at 1.08 per 100,000 inhabitants in 2024, around 10% lower than the 2017–2021 average of 1.2 per 100,000 (Renggli et al., 2023, EU/EEA 4.43 per 100,000 in 2024). However, there are two caveats: First, the overall incidence of *S. aureus* infections, including infections by methicillin-susceptible *S. aureus* (MSSA), has increased over time, especially in German-speaking Switzerland. Second, increases have been observed in severe community-associated infections with Panton-Valentine leukocidin (PVL) toxin-producing MRSA strains. Future monitoring should therefore consider both resistance levels and incidence and should distinguish between hospital-associated and community-associated infections when assessing the public-health relevance of MRSA.

Vancomycin-resistant enterococci (VRE) represent a different type of challenge. In Switzerland, the proportion of VRE among invasive *Enterococcus faecium* isolates remains relatively low at 2%, compared with an EU/EEA average of 16.5% in 2024. Resistance proportions vary substantially across European countries: 35% in Italy, 11% in Germany, 3.2% in Austria, and 1% in France, which is important in assessing the risk of introduction of VRE into Swiss healthcare settings from abroad. VRE frequently occur as colonising organisms in healthcare settings or as part of mixed infections, where their clinical relevance and the need for targeted treatment can be difficult to assess. Even when invasive infections remain uncommon, VRE can spread within and between healthcare institutions and can contribute substantially to infection-prevention burden through screening, isolation measures and outbreak management. Since a large outbreak was detected in Switzerland at the end of 2017 (Piezzi et al., 2022), repeated outbreaks have occurred. These have usually been limited to certain regions, but some have been prolonged and affected multiple regions (Vuichard-Gysin et al., 2025; Bosetti et al., 2025). Surveillance has therefore been intensified: ANRESIS included non-invasive and screening isolates in surveillance, clusters of VRE became notifiable to the FOPH, and national recommendations for the prevention and control of multidrug-resistant organisms have been adapted. Specifically, Swissnoso issued guidance to support containment of these strains and continues to monitor the situation. Continued monitoring, including at institutional level, remains important to detect and control outbreaks early.

Recent survey data suggest that Swiss hospitals have improved screening practices for multidrug-resistant organisms (MDROs)» since 2018, including for VRE (Büchler et al., 2025). Admission screening for patients previously hospitalised abroad is now widely implemented, while gaps remain in certain high-risk situations, such as transfers from healthcare facilities with ongoing MDRO outbreaks and active surveillance in wards caring for highly vulnerable patients. Updated Swissnoso guidelines for the prevention and control of MDRO outbreaks are expected soon and should be considered when developing or revising local screening guidelines, particularly in view of the proposed revision of the Epidemics Act, which strengthens the role of systematic screening and information transfer for resistant pathogens in healthcare settings.

Gram-negative bacteria, especially *Enterobacterales* such as *Escherichia coli* and *Klebsiella pneumoniae*, are among the pathogens of greatest relevance to antimicrobial resistance in human medicine. *E. coli* is a common commensal bacterium of the intestinal tract in humans and animals, but it is also a frequent cause of urinary tract infections, including bladder and kidney infections, and can lead to bloodstream infections. Because *E. coli* causes around 75% of bladder infections in the outpatient setting, resistance in this species is highly relevant for empirical treatment decisions and for antibiotic prescribing in both outpatient and hospital care.

In Switzerland, quinolone resistance in *E. coli* increased markedly between 2004 and 2010, from 10% to 19%, but has since stabilised. In 2025, the resistance proportion was 17%, compared with the EU/EEA average of 22.5% in 2024. This stabilisation may partly reflect efforts to restrict quinolone prescribing for bladder infections. The situation is less favourable for resistance to third- and fourth-generation cephalosporins, reported here as extended-spectrum cephalosporin resistance (ESCR). In *E. coli,* ESCR largely reflects extended-spectrum beta-lactamase (ESBL) production. The proportion of ESCR *E. coli*

isolates increased continuously from 1% in 2004 to 14% in 2025. A similar increase has been observed in the EU/EEA, where the average reached 16% in 2024. Because *E. coli* infections are frequent, this increase contributes substantially to the overall burden of antimicrobial resistance. This is also reflected in incidence data: ESCR *E. coli* bloodstream infections tripled from 3.05 to 9.2 infections per 100,000 inhabitants between 2010 and 2024. Containment of ESCR *E. coli* is challenging because these bacteria are already widely present not only in hospitals, but also in the food chain and outpatient settings. Knowledge of local resistance data is therefore essential to guide empirical treatment decisions and support appropriate antibiotic use.

Increasing ESCR proportions are also observed in *K. pneumoniae*, but the public-health interpretation differs from that for *E. coli*. *K. pneumoniae* can cause pneumonia and accounts for about 7% of bloodstream infections. Compared with *E. coli*, these infections more often affect hospitalised patients and patients with underlying conditions. ESCR *K. pneumoniae* is therefore particularly relevant for infection prevention and control, as it is more often associated with healthcare-associated transmission and hospital outbreaks.

Carbapenem-resistant *Enterobacterales* (CRE) remain rare in Switzerland, but they require particular attention because treatment options are even more limited and early containment is essential. Although resistance proportions remain low, they increased from 0.06% in 2010 to 0.5% in 2025. Their contribution to the overall AMR burden is therefore still limited compared with more frequent resistant pathogens, such as ESCR *E. coli*. Nevertheless, even small increases are relevant because CRE are often difficult to treat and can signal a risk of healthcare-associated spread.

Among CRE, **carbapenemase-producing *Enterobacterales* (CPE)** are of particular concern because they are often multidrug-resistant and can spread rapidly, including through the transfer of resistance genes between bacteria. Carbapenemases are enzymes that can degrade most of the beta-lactam antibiotics including carbapenems, and the epidemiological situation needs to be interpreted by bacterial species and carbapenemase type. CPE have therefore been subject to mandatory reporting to the FOPH since 2016, with molecular surveillance supported by the National Reference Centre for Emerging Antibiotic Resistance (NARA). Together, these structures support early detection, genomic characterisation and detailed interpretation of CPE epidemiology.

The number of carbapenemases reported in Switzerland increased substantially, from 124 in 2016 to 837 in 2025. This increase should be interpreted with caution because awareness, screening and testing for these organisms have also increased during the same period. However, the change is not limited to higher reporting numbers: the distribution of bacterial species and carbapenemase types has also shifted. In 2017, *K. pneumoniae* producing OXA-48 was the most frequently reported combination, whereas in 2025 *E. coli* producing OXA-244 (an OXA-48-like enzyme) dominated. Ticino had previously shown an increased prevalence of KPC-producing isolates, mirroring the situation in Italy (Ramette et al., 2021), but recent trends suggest increasing alignment with the carbapenemase distribution patterns observed across the rest of Switzerland. Among these developments, the emergence and spread of NDM-producing *Enterobacterales* is of particular concern because they are often resistant to multiple antibiotic classes, including several newer antibiotics, which can severely limit available treatment options.

This need for continued vigilance is reinforced by developments in the EU/EEA, where the incidence of carbapenem-resistant *K. pneumoniae* bloodstream infections increased in almost all countries between 2019 and 2023 (ECDC, 2025). Although carbapenem resistance in *Enterobacterales* remains rare in Switzerland, the increasing number of reported CPE and the shift in species and carbapenemase types call for sustained surveillance and coordinated containment. Detailed analysis of species, carbapenemase type, genotype and, where relevant, sequence-type distribution at institutional and national levels remains important to better understand transmission pathways and guide targeted control measures.

Other carbapenem-resistant Gram-negative bacteria also require continued attention. Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) and carbapenem-resistant *Acinetobacter* spp. (CRACI) – especially from the *Acinetobacter baumannii* complex (CRAB) – are internationally important and included in the WHO Bacterial Priority Pathogens List 2024. These infections occur primarily in hospitals. In Switzerland, resistance proportions in 2025 remained lower compared with EU/EEA averages in 2024: 7% versus 16% for CRPA and 6% versus 32% for CRACI. No relevant increase in resistance proportions has been observed over the last 20 years in Switzerland, but deadly outbreaks particularly involving CRAB are feared, because of the very limited treatment options.

Overall, carbapenem-resistant Gram-negative bacteria remain rare in Switzerland compared with many other European countries. The main current concern is the increase in CPE, even though absolute levels remain low. For CPE, CRPA and CRAB alike, early detection, detailed microbiological characterisation, timely and rigorous screening and infection-prevention measures are essential to identify transmission pathways and prevent healthcare-associated spread.

These pathogen-specific trends show why resistance needs to be interpreted not only by resistance proportions, but also by its contribution to infections, deaths and overall health impact. The estimated burden of antimicrobial resistance adds an important perspective beyond resistance rates (Cassini et al., 2019; Gasser et al., 2023). Based on resistance data, ANRESIS estimated the number of infections (figure 3) and deaths attributable to resistance for 16 clinically relevant highly resistant pathogen–antibiotic combinations up to 2024. These data show that the estimated number of deaths attributable to these resistant pathogens increased from 135 in 2010 to 258 in 2024.

In 2024, the largest share of the estimated burden was attributable to third-generation cephalosporin-resistant *E. coli* (30.2 estimated infections per 100,000 inhabitants / 135 estimated attributable deaths). This reflects the combination of frequent *E. coli* infections and increasing ESCR resistance. MRSA, third-generation cephalosporin-resistant *K. pneumoniae* and carbapenem-resistant *P. aeruginosa* were the next largest contributors. The estimated burden was higher in the French- and Italian-speaking regions of Switzerland than in the German-speaking region. It was also higher in university hospitals than in non-university hospitals, likely reflecting higher patient complexity, referral patterns and differences in the case mix. These differences show that the burden of AMR is driven

not only by the level of resistance, but also by how frequent the underlying infections are and which patient groups are affected.

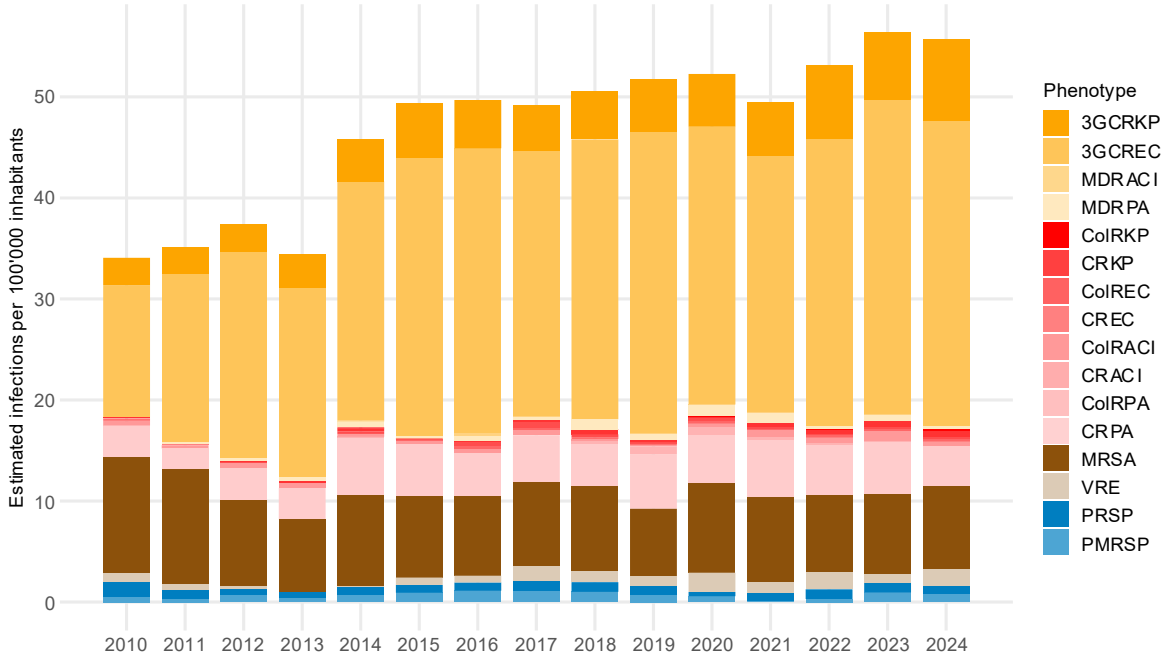


Figure 3. Estimated number of infections per 100,000 inhabitants attributable to antimicrobial resistance for a selection of 16 highly resistant pathogen–antibiotic combinations in Switzerland. Estimates include bloodstream and non-bloodstream infections, using the adapted methodology of Cassini et al. (2019). To estimate non-bloodstream infections, conversion factors derived from the European Centre for Disease Prevention and Control (ECDC) point prevalence survey were applied. Complete results, including additional burden indicators, are available at anresis.ch.

Abbreviations: ColRACI: colistin-resistant *Acinetobacter* spp.; CRACI: carbapenem-resistant *Acinetobacter* spp.; MDRACI: multidrug-resistant *Acinetobacter* spp.; VRE: vancomycin-resistant *Enterococcus faecalis* and *Enterococcus faecium*; ColREC: colistin-resistant *Escherichia coli*; CREC: carbapenem-resistant *E. coli*; 3GCREC: third-generation cephalosporin-resistant *E. coli*; ColRKP: colistin-resistant *Klebsiella pneumoniae*; CRKP: carbapenem-resistant *K. pneumoniae*; 3GCRKP: third-generation cephalosporin-resistant *K. pneumoniae*; ColRPA: colistin-resistant *Pseudomonas aeruginosa*; CRPA: carbapenem-resistant *P. aeruginosa*; MDRPA: multidrug-resistant *P. aeruginosa*; MRSA: methicillin-resistant *Staphylococcus aureus*; PRSP: penicillin-resistant *Streptococcus pneumoniae*; PMRSP: penicillin- and macrolide-resistant *S. pneumoniae*.

These estimates help prioritise action. For common resistant pathogens such as ESCR *E. coli*, local resistance data and appropriate empirical treatment are particularly important. Appropriate empirical treatment needs to be carefully balanced against the overuse of broader-spectrum antibiotics, which may further accelerate the spread of resistance. This supports the need for antimicrobial stewardship efforts. For organisms with limited treatment options or outbreak potential, such as CPE, VRE, CRPA and CRAB, early detection, molecular surveillance, infection prevention and control, as well as coordinated containment in hospitals remain essential. The burden perspective therefore confirms the need for a differentiated response: reducing the impact of frequent infections by resistant pathogens while preventing the spread of rarer but highly resistant organisms.

2.2 Antimicrobial resistance in veterinary medicine

Antimicrobial resistance in bacteria from animals is monitored from two complementary perspectives. Zoonotic and indicator bacteria isolated from healthy food-producing animals at slaughter and from meat samples are monitored because resistant bacteria or resistance genes may be transmitted to humans through food or animal contact.

In addition, pathogenic bacteria from diseased livestock and companion animals are monitored because resistance proportions directly affect treatment options in veterinary medicine. The sampling strategy used for animal pathogens and the resulting sample sizes are not designed to estimate overall resistance prevalences in these pathogens in Switzerland. Although transmission of certain (resistant) animal pathogens to humans is possible, the risk of transmission to humans cannot be assessed based on the data collected.

As in human medicine, resistance findings in animals need to be interpreted in context. Their relevance depends not only on resistance levels, but also on the bacterial species, animal reservoir, possible transmission pathways, and consequences for treatment or food safety. This section therefore summarises the most relevant resistance patterns in bacteria from animals, focusing on interpretation and implications for surveillance, prevention and One Health action.

Antimicrobial resistance in zoonotic and indicator bacteria from food-producing animals

For **zoonotic bacteria**, *Campylobacter jejuni (C. jejuni)* remains of particular concern. **Campylobacteriosis** is the most frequently reported food-borne zoonosis in the European Union, with 168,396 cases in 2024, corresponding to 55.3 cases per 100,000 inhabitants (EFSA and ECDC, 2025). In Switzerland, 8,654 cases were reported in 2025, corresponding to 95.2 cases per 100,000 inhabitants (FSVO and FOPH, 2026). Human infections are mainly caused by *C. jejuni*, and contaminated broiler meat is considered an important source of exposure. Monitoring resistance in *C. jejuni* from poultry meat therefore provides information on resistance patterns relevant to potential human exposure. Ciprofloxacin resistance is very high in human *C. jejuni* isolates (66% in 2025), and resistance is also high in isolates from Swiss broilers at slaughter (48% in 2024). By contrast, resistance to macrolides in Swiss broiler isolates remains very low (0% in 2024; maximum 3.6% over the last 15 years). This is reassuring because macrolides remain important treatment options for severe human infections including campylobacteriosis.

The situation for *Salmonella* spp. differs from that of *Campylobacter* spp. **Salmonellosis** remains the second most frequently reported food-borne gastrointestinal zoonosis in Europe, with 79,703 cases in 2024 (18.6 cases per 100,000 inhabitants) and in Switzerland, with 2,280 cases in 2025 (25.1 cases per 100,000 inhabitants). In Switzerland, human cases are mostly associated with *S.* Enteritidis and *S.* Typhimurium and its monophasic variant. However, some of the main food sources of outbreaks in the EU, such as eggs, pork and other meat products, appear to be less important in Switzerland: *Salmonella* prevalence in laying hens is comparatively low (<2%) and while there is no surveillance programme for *Salmonella* in Swiss cattle and pigs, Salmonellosis is a reportable disease

for all animal species in Switzerland. The number of reported cases in cattle in 2025 was 33 and no cases in pigs were reported (FSVO and FOPH, 2026). *Salmonella* isolates from Swiss poultry and cattle continue to show high to very high rates of full susceptibility to the antimicrobials tested. The current situation is favourable, but continued monitoring is needed to detect changes early and preserve treatment options for severe human infections.

Resistance findings in animals may be relevant for human health through different routes of exposure and transmission. Different monitoring programmes therefore provide complementary information on these potential links. While *Campylobacter* and *Salmonella* illustrate food-borne exposure, **livestock-associated MRSA in pigs** represents another potential pathway of transmission: direct contact between animals and humans. The prevalence of MRSA in nasal swabs from fattening pigs at slaughter has increased continuously and significantly since monitoring began, from 2% in 2009 to 69% in 2025. As described in more detail in the SARR 2024, almost all MRSA isolates from pigs belong to the livestock-associated clonal complex 398 (CC398), which emerged in the 2000s, likely through adaptation to livestock from a human-associated methicillin-susceptible *S. aureus* lineage. While people in close contact with livestock have a higher risk of carrying livestock-associated MRSA, infections in humans without contact with livestock have been reported and a genetic re-adaptation to humans has been described (van Duijkeren et al., 2026; Fernandez et al., 2024). A recent study on MRSA collected in Swiss human hospitals illustrates this development as it did not detect any MRSA belonging to CC398 in 451 historical isolates collected between 1965 and 1987 but identified 93 CC398 isolates (7.7%) among 1,207 more recent MRSA isolates collected between 2007 and 2022 (Benvenga et al., 2024). This shows that livestock-associated MRSA CC398 is present among human MRSA isolates in Switzerland. MRSA screening and infection prevention measures for risk patients in human clinical settings, together with biosecurity measures in high-risk animal-contact settings, can help limit further spread.

Gram-negative bacteria, especially *E. coli*, are monitored as indicator bacteria in food-producing animals because they can act as reservoirs of transferable resistance genes and because resistant strains may be relevant to both animal and human health. In commensal *E. coli* from healthy broilers, pigs and calves under one year, the proportion of fully susceptible isolates has increased in recent years, reaching 49% in broilers in 2024, 60% in pigs and 65% in calves in 2025. Resistance proportions in Swiss livestock are generally lower than European averages. However, resistance in commensal *E. coli* to ampicillin, sulfamethoxazole, trimethoprim and tetracycline is still frequently observed, with the highest levels observed for calves. In commensal *E. coli* from broilers, ciprofloxacin resistance remains high at 31% in 2024, although a decreasing trend has been observed since 2018.

Monitoring of ESBL/AmpC-producing *E. coli* shows a differentiated picture across livestock species (figure 4) and stages of the food chain. In the past, broilers had the highest prevalence of ESBL/AmpC-producing *E. coli* in Switzerland and Europe, but in Switzerland prevalence in broilers has decreased markedly, from 52% in 2016 to 5% in 2024. This decline is an important positive development and is most likely linked to the use of ESBL/AmpC-free day-old breeding stock in European broiler production. In fattening pigs, prevalence also decreased between 2015 and 2025, reaching 7% in 2025. In contrast, the prevalence in calves under one year has remained high, at 33% in 2025 compared with

around 38% in 2015. Calves therefore remain an important reservoir requiring continued monitoring.

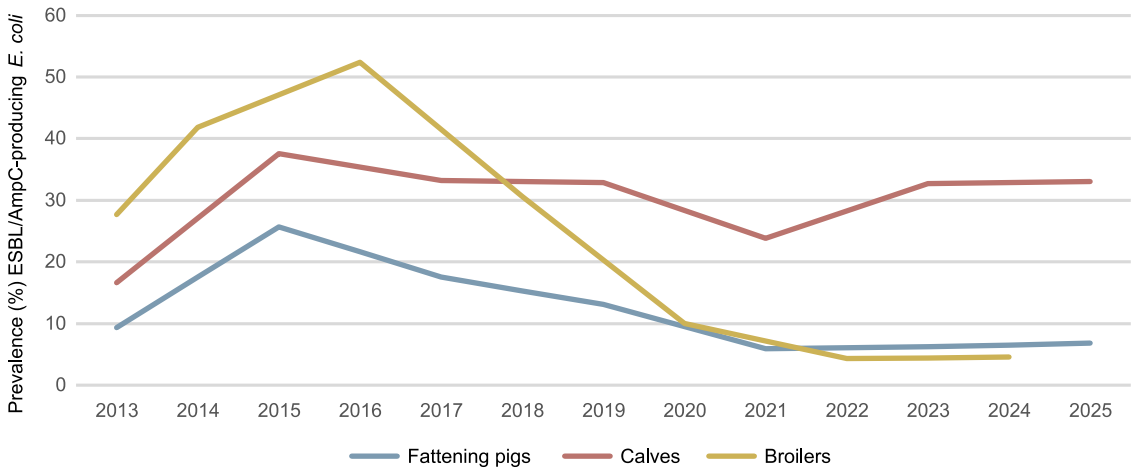


Figure 4. Prevalence of ESBL/AmpC-producing *E. coli* in cecal content samples from Swiss calves under one year (yellow line), fattening pigs (dark blue line) and broilers (light blue line) at slaughter over time. Samples from fattening pigs and calves under one year are analysed in odd-numbered years and samples from broilers are analysed in even-numbered years.

At European level, prevalence of ESBL/AmpC-producing *E. coli* is higher in many countries, reaching around 40% in fattening pigs and around 40% in calves under one year (EFSA and ECDC, 2026). Prevalences in Swiss beef and pork meat have remained very low since 2015 (<1%) while the prevalence in Swiss chicken meat decreased to 4% in 2024.

Several studies have shown that, despite high prevalences of ESBL/AmpC-producing *E. coli* in European livestock, no close epidemiological linkage of ESBL/AmpC genes and plasmid replicon types between livestock farms and the general human population could be demonstrated (Dorado-García et al., 2018). These findings suggest that livestock reservoirs are not major contributors to the occurrence of ESBL/AmpC-producing *E. coli* in the general human population, although transmission between animals and humans can occur in settings with close animal contact.

Carbapenem-resistant *Enterobacterales* (CRE) require particular attention because they are often multidrug-resistant and treatment options are limited. In contrast to the situation in human medicine, where CRE and detections of carbapenemase producing *Enterobacterales* (CPE) have increased, carbapenem resistance has not been detected in Swiss livestock or raw meat since specific monitoring began. This remains a favourable finding for food-producing animals and the food chain.

At European level, sporadic detections of carbapenem-resistant *E. coli* in food-producing animals have increased in recent years, although still at a low level. Positive findings have been reported by several countries, mainly in pigs, followed by calves under one year, and less frequently in poultry (EFSA and ECDC, 2026). Continued monitoring is therefore important to detect possible introduction into Swiss livestock or food products early.

Antimicrobial resistance in pathogenic bacteria from diseased animals

Resistance monitoring in bacterial animal pathogens supports empirical treatment decisions in veterinary practice, particularly when treatment needs to begin before susceptibility testing results are available. In bovine mastitis pathogens, methicillin resistance remains rare in *S. aureus* and coagulase-negative staphylococci (CoNS). Penicillin resistance was detected in 15% of *S. aureus* isolates and 38% of CoNS in 2024, while overall resistance proportions in these mastitis pathogens appear stable.

The interpretation of resistance patterns in bovine *streptococci* is more difficult because few clinical breakpoints are available. Using epidemiological cut-off values (ECOFFs) to interpret susceptibility testing data, the proportion of *Streptococcus uberis* with non-wild-type phenotypes to penicillin was clearly higher in 2025 than in 2021, and an increasing trend was also observed for *Streptococcus dysgalactiae* subsp. *dysgalactiae*. These findings should therefore be followed closely, but interpreted cautiously in relation to clinical treatment decisions, as ECOFFs data solely represent the *in vitro* presence or absence of resistance mechanisms.

In companion animals, canine *Staphylococcus pseudintermedius* requires attention. In 2025, 8.5% of isolates were methicillin-resistant. Resistance to penicillin decreased compared with 2024 but remained very high at 73%. After a steady decline in resistance proportions to marbofloxacin since 2020, resistance increased from 20% in 2024 to 49% in 2025. Resistance proportions to clindamycin and trimethoprim-sulfamethoxazole had reached their lowest level in 2023, but the increasing trend seen in 2024 continued in 2025. These patterns are relevant for empirical treatment choices and support prudent antibiotic use and susceptibility-guided therapy where possible.

As part of the monitoring of animal pathogens in cats, dogs, pigs and poultry, no carbapenem-resistant *E. coli* were detected in 2025.

2.3 Summary from a One Health perspective

Taken together, the human and veterinary data show a generally favourable resistance situation in Switzerland compared with many European countries, while also highlighting resistance patterns that require continued attention. Several findings are relevant across sectors. High ciprofloxacin resistance in *Campylobacter jejuni* in humans and broilers underlines the importance of the food chain interface. Livestock-associated MRSA provides another One Health example: its prevalence in pigs has increased markedly, and CC398 is also found among human MRSA isolates, particularly in the context of close livestock contact. It remains to be determined how much the rise in livestock-associated MRSA among healthy pigs contributes to the presence of this pathogen in humans, as pigs are not the only reservoir of this particular group of MRSA and as transmission among humans seems to be possible as well.

At the same time, resistance detected in animals cannot be directly translated into the burden of resistance in humans. For ESBL/AmpC-producing *E. coli*, available evidence suggests that livestock are not major contributors to the occurrence in the general human population, although transmission can occur in settings with close animal contact.

Carbapenem resistance provides a further contrast: it is an increasing concern in human medicine, while it has not been detected in *E. coli* or *Klebsiella* from monitored Swiss livestock or raw meat.

Continued One Health surveillance is therefore important to detect emerging resistance, identify relevant transmission pathways and target prevention and control measures where links between human and animal populations are most relevant.

3 Antibiotics and antimicrobial resistance in the environment

The environment is an important part of the One Health perspective on antimicrobial resistance. Within the StAR strategy, the environmental focus is on the water cycle, where antibiotics used in human and veterinary medicine, as well as resistant bacteria and resistance genes (referred to here collectively as antimicrobial resistance, AMR), can enter the environment through different pathways.

Wastewater represents an important pathway for both antibiotics and AMR into the aquatic environment. Relevant inputs include effluent from wastewater treatment plants (WWTPs) and, during heavy rainfall, discharges of untreated wastewater through combined sewer overflows. The latter is particularly relevant for AMR. Within StAR, measures along this pathway focus on improving wastewater treatment, while the basis for assessing and potentially reducing emissions from untreated discharges is currently being developed.

WWTPs act as an important barrier between wastewater and receiving waters. Conventional biological treatment reduces bacteria, including resistant bacteria, by more than 90%. However, conventional treatment is only partly effective in removing antibiotics, with removal rates varying considerably between substances. Additional treatment for the removal of micropollutants can substantially improve the elimination of antibiotics. Depending on the treatment process, it can further reduce AMR. Since 2016, Switzerland has been upgrading WWTPs with such an additional treatment step; by 2040, around 140 plants are expected to be upgraded, covering around 70% of domestic wastewater. As of January 2026, 42 WWTPs had implemented measures for micropollutant reduction, covering around 24% of domestic wastewater, with a further 35 plants under construction.

The contribution of wastewater treatment to reducing environmental emissions also depends on whether the wastewater reaches the treatment plant. During heavy rainfall, combined sewer systems and/or WWTPs can reach their hydraulic capacity, resulting in the direct discharge of diluted but untreated wastewater. Such events can be relevant entry pathways for antibiotics and AMR. Cumulative AMR loads can be of similar magnitude to those from treated WWTP effluent.

Wastewater from healthcare facilities is of particular relevance in this context, as certain pharmaceuticals, including some Reserve antibiotics, are predominantly used in inpatient care, and AMR, particularly multidrug-resistant bacteria, is more prevalent in hospital wastewater than in domestic wastewater (Wunderlin et al, in preparation). Reducing these discharges,

for example through retention basins at hospitals or other sites, involves temporarily storing wastewater until sufficient capacity is available in the sewer system and at the WWTP.

Antibiotic residues in surface waters are systematically monitored through the National Surface Water Quality Monitoring Programme (NAWA TREND), providing information on their occurrence and trends across Switzerland. In contrast, there is currently no national monitoring programme for AMR and current knowledge is largely based on targeted studies and research activities.

NAWA data show that antibiotic residues are still present in Swiss rivers in concentrations that cause ecotoxicological risks for aquatic life. For example, in 2024, the legal limits for azithromycin were exceeded 34 times in four of the 38 monitored water bodies, while five exceedances of clarithromycin occurred in two water bodies. These exceedances occurred mainly in rivers with a high proportion of treated wastewater from WWTPs without additional micropollutant removal. At the same time, long-term measurements demonstrate the effectiveness of treatment upgrades: in the Glatt in the canton of St. Gallen, concentrations of several antibiotics declined markedly after additional micropollutant-removal treatment became operational.

Despite ongoing measures, antibiotics, resistant bacteria and resistance genes are present in the water cycle, and their emissions should be minimised in line with the precautionary principle. The ongoing upgrade of wastewater treatment and measures to limit untreated wastewater discharges contribute to reducing these emissions. At the same time, knowledge gaps remain regarding the occurrence, spread and relevance of AMR in the aquatic environment. Continued monitoring of antibiotic residues and complementary research on AMR are therefore important to assess the effects of wastewater treatment measures, identify relevant trends and support the further development of targeted measures for precautionary water protection.

4 Publication details

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Interpretation and validation — human medicine
The interpretations and conclusions relating to human medicine in this report were discussed and validated by the Core Team StAR-M, the scientific advisory body of StAR in human medicine. The team comprised Alessandro Cassini, Adrian Egli, Stephan Harbarth, Andreas Kronenberg, Nicolas Müller, Yolanda Müller Chabloz, Patrice Nordmann, Laurent Poirel, Jacques Schrenzel, Laurence Senn and Danielle Vuichard-Gysin.

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