
**NATIONAL ANTIBIOTIC RESISTANCE
CONTROL PROGRAMME FOR THE PERIOD
2019-2021**

FEBRUARY 2019
REPUBLIC OF SERBIA

1. BACKGROUND

The National Antibiotic Resistance Control Programme (hereinafter: the Programme) represents support in fulfilling the social care for health and providing the conditions for the people to be healthy and constitutes the basis for decision-making on actions to improve the health and quality of life of the population of the Republic of Serbia.

The programme lays down the objectives, the activities and procedures to be carried out in Serbia in order to stop the spread of antibiotic resistance (hereinafter referred to as ABR), in human and veterinary medicine.

The general objective of the Programme is to improve the health and the quality of life of the population of the Republic of Serbia through the reduction of ABR.

The Programme is the basis for developing an action plan for the implementation of the set general objective as well as specific ones, which is an integral part of this programme.

The Programme and the Action Plan reflect the needs, concerns and priority objectives relevant to the situation in the Republic of Serbia, rely and are in compliance with the Global Action Plan for AMR.

The discovery of antibiotics and their successful and widespread use marked a turning point in the fight against bacteria and inspired hope that communicable diseases would be eradicated. It soon became clear, however, that bacteria were able to develop various defence mechanisms and become resistant to the effects of antibiotics, in which case the drugs lose their ability to kill microbes or prevent their growth and reproduction.

ABR is not a new phenomenon. It existed long before people discovered how to use antibiotics in medicine. However, under selective pressure due to the excessive use of antibiotics, resistant clones are favoured, which accelerates the emergence and spread of resistance. Bacteria can be intrinsically resistant to certain antibiotics but can also acquire resistance to antibiotics via mutations in chromosomal genes and by horizontal gene transfer.

Antibiotics used for treating and preventing bacterial infections in animals belong to the same groups as those used for the treatment of humans, so bacteria resistant to the same antibiotics may also be present in animals. Such bacteria can be spread by means of food, water and contact and cause infections in people who have not been taking an antibiotic.

Resistance is a global problem. It knows no geographical or biological boundaries and poses a significant threat to public health. The situation is aggravated through the emergence of new multidrug-resistant strains of bacteria (simultaneously resistant to 3 or more groups of antibiotics). Such bacteria can become resistant to all available antibiotics and threaten to take us back to the "pre-antibiotic era", when organ transplants, chemotherapy in cancer treatment, intensive care and other state-of-the-art medical procedures were not possible. Serious healthcare-associated infections (HAI) are caused by multidrug resistant, extensive drug resistant or pandrug resistant strains, therapeutic options are significantly reduced, there is an increasing morbidity, mortality, length of hospital stay and costs. Inappropriate use of antibiotics contributes to patients becoming colonized or infected with bacteria resistant to drugs, such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), multiresistant Gram-negative bacilli (*Acinetobacter* spp., *Pseudomonas aeruginosa*, *Enterobacteriaceae*; especially *Klebsiella pneumoniae*), and it is considered to be related to the increased incidence of infections caused by *Clostridium difficile*.

The Republic of Serbia is among the European countries with a high antibiotic consumption rate, and understandably, among countries with high resistance rates. The emergence of ABR limits the options for treatment of communicable diseases because of which it poses a growing global issue in health care programmes, in both human and animal medicine.

1.1. Public Debate on the Draft Programme

A public debate for representatives of health care facilities, the expert public and other interested parties on the draft national programme for the antibiotic resistance control, was organized and conducted in the period from 30 March 2018 to 22 November 2018.

The draft national antibiotic resistance control programme was presented at the following conferences: in Niš on 30 March 2018 at the expert meeting organized by the Surgical Section of Serbian Medical Society, in collaboration with the Nis Clinical Centre, Clinic for Digestive Surgery and the University of the Nis Medical School; in Belgrade on 22 April 2018 at the Respiratory Association of Serbia symposium; in Belgrade on 11 May 2018 at the Congress of the Association of Microbiologists of Serbia; on 31 May 2018, at the seminar on the occasion of the publication of the results of the Fourth National Survey of the prevalence of healthcare-associated infections and antibiotic consumption; on Mt. Zlatibor on 8 June 2018, at the seminar of the Serbian Medical Society's Surgical Section; on Mt. Zlatibor on 27-30 September at the Ninth General Practice Congress with international participation; on Lake Bor on 2 November 2018 at the symposium of the Association of Serbian Infectologists; in Belgrade on 15 November 2018 at an expert conference organized by the Ministry of Health; in Belgrade on 22 November at the Congress of the Association of Cardiovascular Surgeons of Serbia; in panel discussions organised for parents in cooperation with the Association of Nurses and Technicians of Serbia's Preschool Institutions and non-governmental organizations, the *Parent* and *Nest* parent associations and the National Association of Pharmacy Students NAPSer (on 24 March in Novi Sad, in Kragujevac on 21 April and in Nis on 26 May 2018).

The following remarks, proposals and suggestions were given to the Programme, which have been accepted and incorporated into the text:

- to consider the issue of ABR also from the aspect of the imprudent use of antibiotics in the veterinary field, as well as the influence on environmental pollution and that the activity must be implemented in parallel in all these areas;
- to clearly define the authority that will oversee the implementation of the National Programme and Action Plan;
- to follow the example of introducing the EUCAST standard in microbiology laboratories, and introduce VetCAST standards in the veterinary medicine;
- to strengthen cooperation with international institutions, particularly participation in the World Health Organization's AMC network¹ and, later, in the GLASS²;
- to pay special attention to raising awareness among prescribers, those who dispense and use antibiotics and especially to participation in the WHO³ AMC network⁴.

The work of the Ministry of Health as the proponent of the Programme was positively assessed in these events, as it represents the harmonisation with the resolution of the European Parliament (2011), the Strategic Action Plan for the control of antibiotic resistance of the WHO Regional Office for Europe (2014) and the conclusions of the United Nations General Assembly (2016), as well as with state-of-the-art professional attitudes and achievements, but in the context of the obligations of the Republic of Serbia, pursuant to chapter 28 of the negotiating

¹ Medicines Antimicrobial Consumption Network (a group to monitor the consumption of antimicrobial drugs)

² Global Antimicrobial Resistance Surveillance System (Surveillance of antimicrobial resistance at the global level)

³ The World Health Organization

⁴ Antimicrobial Medicines Consumption Network (a group to monitor the consumption of antimicrobial medicines)

process for Serbia's EU accession, the document has been discussed and adjusted pursuant to the opinions of the experts of the World Health Organization and the European Centre for Disease Prevention and Control.

2. SITUATION ANALYSIS AND ASSESSMENT

The Programme is a document which sets out a general plan of action the purpose of which is the accomplishment of clearly defined ABR control objectives in the period 2019-2021.

This document is in conformity with the Protection of Population from Communicable Diseases Act ("Official Gazette of the RS", No. 15/2016), the Public Health Act ("Official Gazette of the RS", No. 15/2016), The Healthcare Programme to Protect the Population against Communicable Diseases ("Official Gazette of the RS", No. 22/16), the Public Health Strategy of the Republic of Serbia ("Official Gazette of the RS", No. 61/18), the Veterinary Care Act ("Official Gazette of the RS, Nos. 91/05, 30/10 and 93/12), the Ordinance on the List of Particularly Dangerous Communicable Diseases in Animals and the List of Communicable Diseases in Animals Which Should be Reported, as well as the Method of Reporting their Onset and End ("Official Gazette of the RS, No. 49/06), the Ordinance on the Types and Manner of Conducting Epidemiological Surveillance of Communicable Diseases and Special Health Issues ("Official Gazette of the RS , No. 3/17), the Ordinance on Reporting Communicable Diseases and Special Health Conditions ("Official Gazette of the RS, nos. 44/17 and 58/18), as well as with the World Health Organization (WHO) Global Strategy for the containment of antimicrobial resistance (WHO/CDS/CSR/DRS/2001.2) and WHO Regional Office for Europe's Strategic Action Plan on Antibiotic Resistance (EUR/RC61/14), the European Council Recommendation on prudent use of antimicrobial agents in human medicine (2002/77/EC), the Council Recommendation on patient safety, including the prevention and control of healthcare (2009/C 151/01/EC), the Decision No 1082/2013/EU of the European Parliament and of the Council of 22 October 2013 on serious cross-border threats to health, the Regulation (EC) No 1831/2003 of the European Parliament and of the Council of 22 September 2003 on additives for use in animal nutrition, the European Parliament resolution of 27 October 2011 on the public health threat of ABR.

2.1. Healthcare-associated infections and outbreaks of healthcare-associated infections in health care facilities

Surveillance of HAI began to be implemented at the national level as early as 2001. Four national prevalence studies were carried out, in 1998, 2005, 2010 and 2017, in which the prevalence of HAI was 7.4%, 3.5%, 5.3 %, and 4.6% respectively.

Much lower prevalence level found in the survey performed in 2005 than in other surveys can be explained by the difference in the time period when it was carried out. In fact, all the surveys, including the last one, were conducted in November, while only the second one was conducted in May 2005. It is known that healthcare-associated infections show seasonal variations. For this reason, the last survey implemented in the framework of the European survey, was conducted in November, like the first and the third one. It is the recommendation of the European Centre for Disease Prevention and Control to carry out the surveys of healthcare-associated infections prevalence in April-May or October-November. Comparing the results of the fourth survey with the first and third one, a slight decrease is noted in the prevalence of healthcare-associated infections.

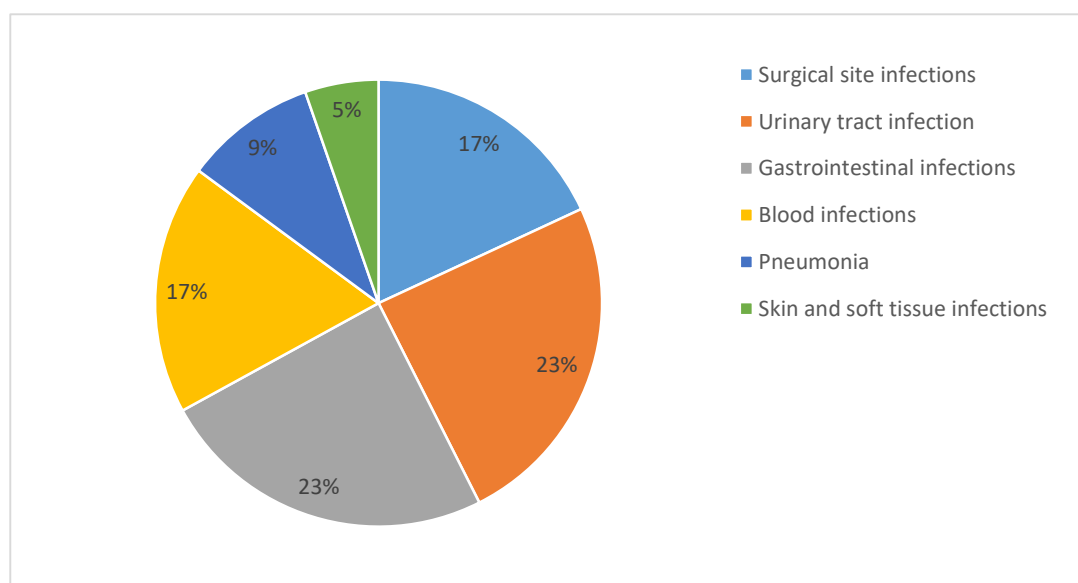
In addition, HAI surveillance by monitoring incidence takes place in HAI high-risk wards (intensive care units, surgery, orthopaedics and trauma department, urology,

gynaecology and obstetrics department and neonatology departments), or by conducting prevalence studies in individual wards, in accordance with the provisions of the Protection of Population from Communicable Diseases Act, the Ordinance on Reporting Communicable diseases, and the Ordinance on the Prevention, Early Detection and Control of Healthcare-associated Infections. Namely, hospitals provide to the regional institutes of public health annual data on the incidence of HAI collected through epidemiological surveillance, as well as information on HAI pathogens and their resistance to antibiotics. The regional institutes process these data and provide them to the Institute of Public Health of Serbia. The aggregate data for the territory of the Republic of Serbia are published annually. Reporting the onset and the end of HAI epidemics is carried out in accordance with the Ordinance on Reporting Communicable Diseases and Special Health Conditions ("Official Gazette", Nos. 44/2017 and 25/2018).

All inpatient health care institutions have set up the commissions in charge of HAIs which convened on average six times a year in 2016.

Relative to the type of department, the highest rates of HAI in Serbia, as well as in other countries are registered in the intensive care units. Prevalence in these departments amounted to 5.5% in 2005, 11.6% in 2010 and 16.4% in 2017. The highest rates of incidence in the last five years (2012-2016) ranged from 5.1% to 35.0%.

In the Republic of Serbia, based on the results of the prevalence studies carried out in 2005 and 2010, as well as based on the results of surveillance by monitoring incidence, the most common HAIs were urinary tract infections, as registered also in other developed countries. The distribution of HAI according to the localizations in 2014 is shown in Figure 1.



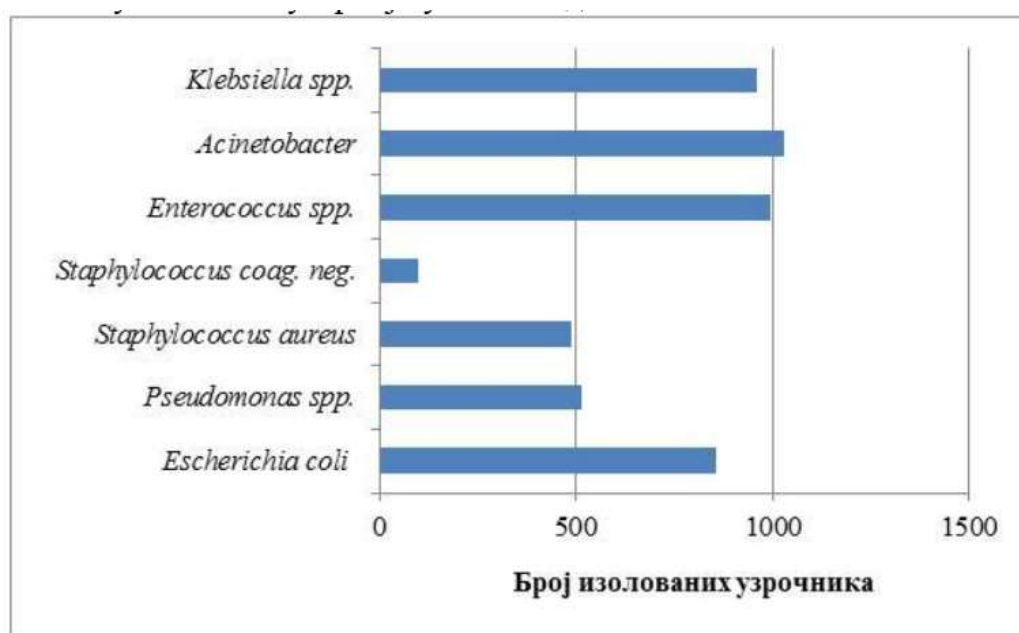
Source: Institute of Public Health of Serbia. The Annual Report on Communicable Diseases in the Republic of Serbia for 2016. Belgrade, 2017

Figure 1. Distribution of healthcare-associated infections in Serbia in 2016 according to the anatomic localization

In the last five-year period, Gram-negative bacteria prevailed as the cause of HAIs, as their share ranged from 51% in 2012 to 61.4% in 2013.

In 2016, the seven most commonly isolated bacteria were *Enterococcus spp* (18.7%), *Staphylococcus aureus* (9.2%) and *coagulase-negative Staphylococcus spp* (8.5%) of Gram-positive bacteria, and, in a group of Gram-negative bacteria, *Acinetobacter spp* (19.5%),

Klebsiella spp (18.2%), *Escherichia coli* (16.2%), *Pseudomonas aeruginosa* (9.7%), (Figure 2).



Source: Institute of Public Health of Serbia. Annual Report on Communicable Diseases in the Republic of Serbia for 2016. Belgrade, 2017

Figure 2. Number of epidemiologically significant pathogens (N=3311) of healthcare-associated infections in health care facilities in Serbia in 2016

Resistance to antibiotics of the seven most frequent causes of HAI has also been monitored in the past few years. However, the absence of a common and comprehensive method of registering resistant HAI pathogens in health care institutions prevents their in-depth analysis at this point. In terms of the type of HAI, the most commonly reported outbreaks of HAI in 2014 were those of colitis caused by the *Clostridium difficile* bacterium.

2.2. ABR Surveillance

2.2.1. ABR Surveillance of in medicine

Serbia has a system for the registration and monitoring ABR made up of the National Reference Laboratory (hereinafter referred to as the NRL) for the Registration and Monitoring of Bacterial Strains Resistance to Antimicrobial Agents and the national network of 22 clinical laboratories, established on a voluntary basis in 2012 and 2015, which monitor the susceptibility to antibiotics of invasive isolates from blood and cerebrospinal fluid using the same methodology as the one used by the European Union countries, in accordance with applicable international standards. Serbia is part of the CAESAR network (*Central Asian and Eastern European Surveillance of AMR*) on the basis of the cooperation agreement of January 2013, which was signed by the IPH of Vojvodina – the National Reference Laboratory as the national coordinator of supervision over ABR in Serbia and the World Health Organisation (hereinafter referred to as the WHO) - Regional Office for Europe. Data on bacterial resistance to antibiotics from Serbia are part of the first CAESAR annual report for 2014, 2015, 2016 and 2017 and the *WHO Antimicrobial resistance: global report on surveillance for 2014*).

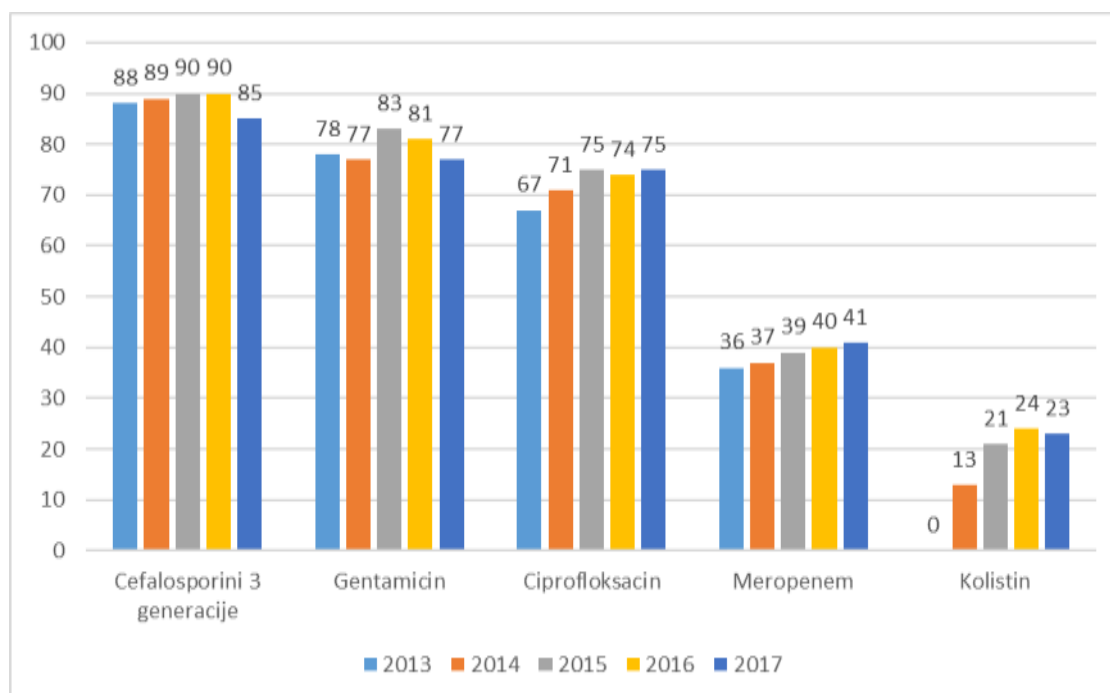
The high level of resistance, similar to that in the countries of Southern and Eastern Europe was found in all tested bacteria species in Serbia and to all types of antibiotics tested. Of special concern is the high level of resistance to carbapenems, antibiotics that were

considered the last line of defence against infections with resistant bacteria.

A matter for concern is also the finding of a very high level of resistance of *K. pneumoniae* and *E. coli* to III generation cephalosporins, resistance of *K. pneumoniae* to carbapenem, multiresistance in isolates of *Pseudomonas aeruginosa*, the proportion of resistance of over 90% to all tested drugs in *Acinetobacter spp*, high level of resistance of *Enterococcus faecium* isolates to vancomycin.

Resistance of certain types of bacteria included in the surveillance for the period 2013-2017 (Source: World Health Organization, Central Asian and Eastern European Surveillance of Antimicrobial Resistance. Annual report 2017 (2018)) are presented graphically (Figures 3-8)

Figure 3. *Klebsiella pneumoniae* - antibiotic resistance in the Republic of Serbia, 2013-2017



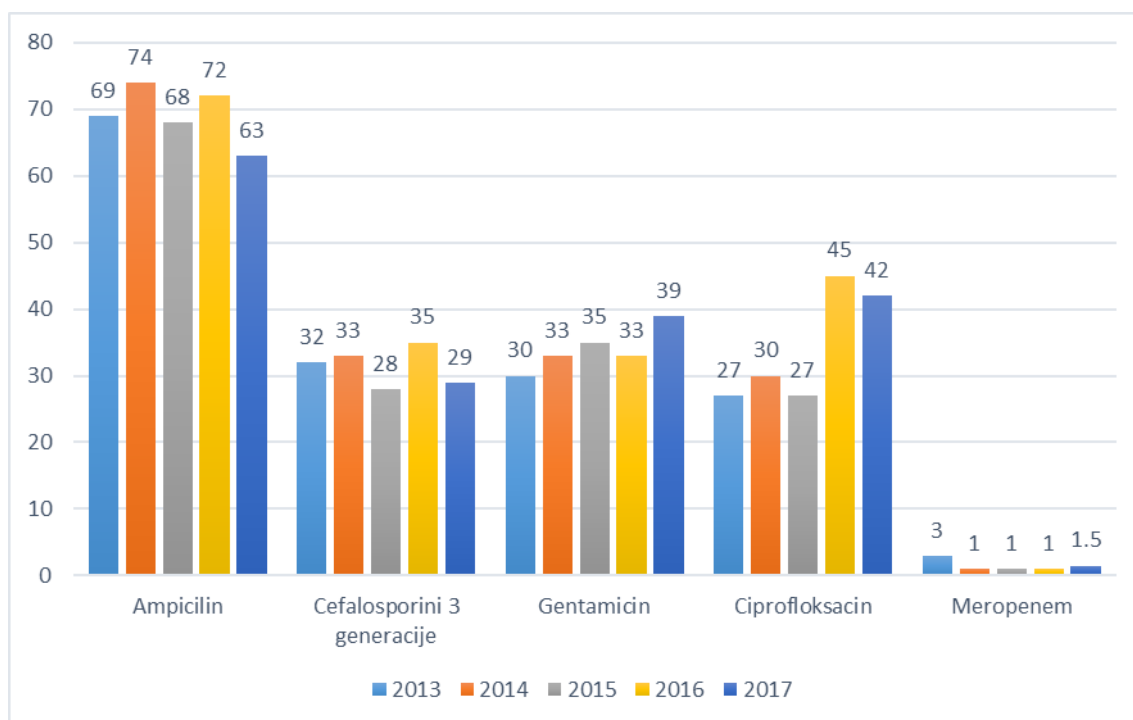


Figure 4. *Escherichia coli* - antibiotic resistance in the Republic of Serbia, 2013-2017

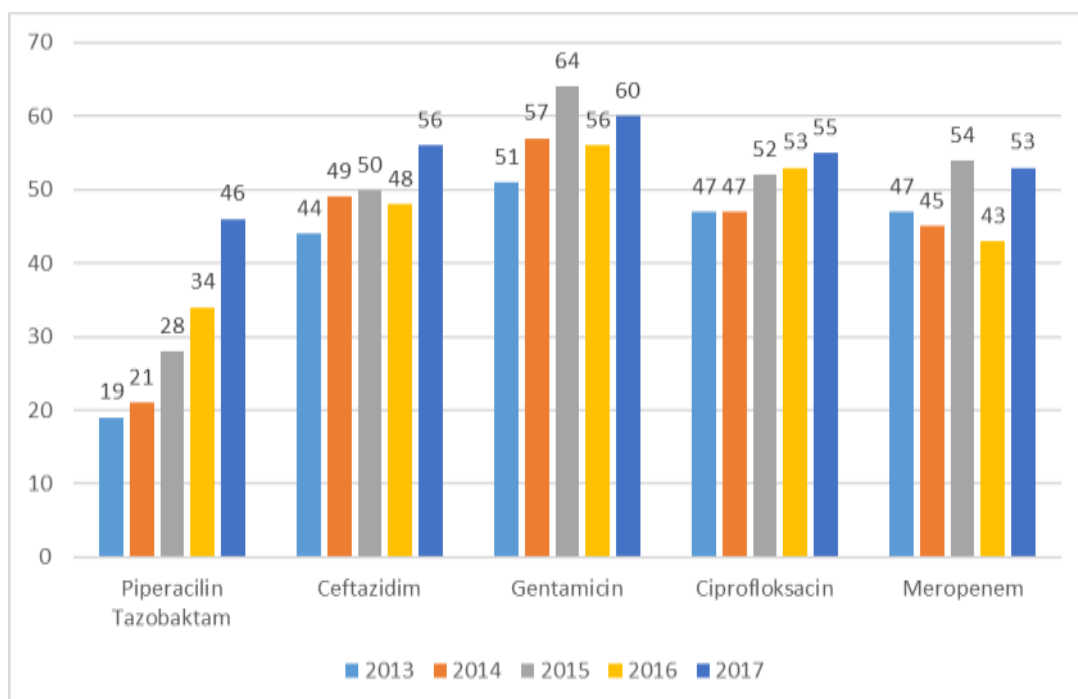


Figure 5. *Pseudomonas aeruginosa* - antibiotic resistance in the Republic of Serbia, 2013-2017

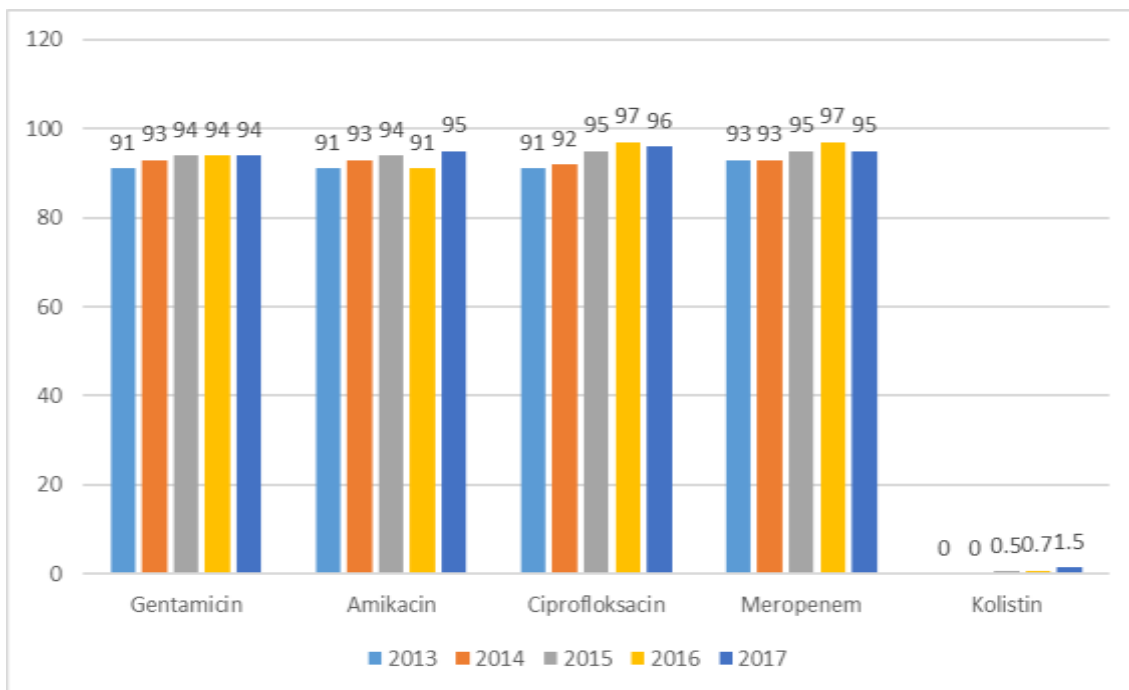


Figure 6. *Acinetobacter* spp. - antibiotic resistance in the Republic of Serbia, 2013-2017

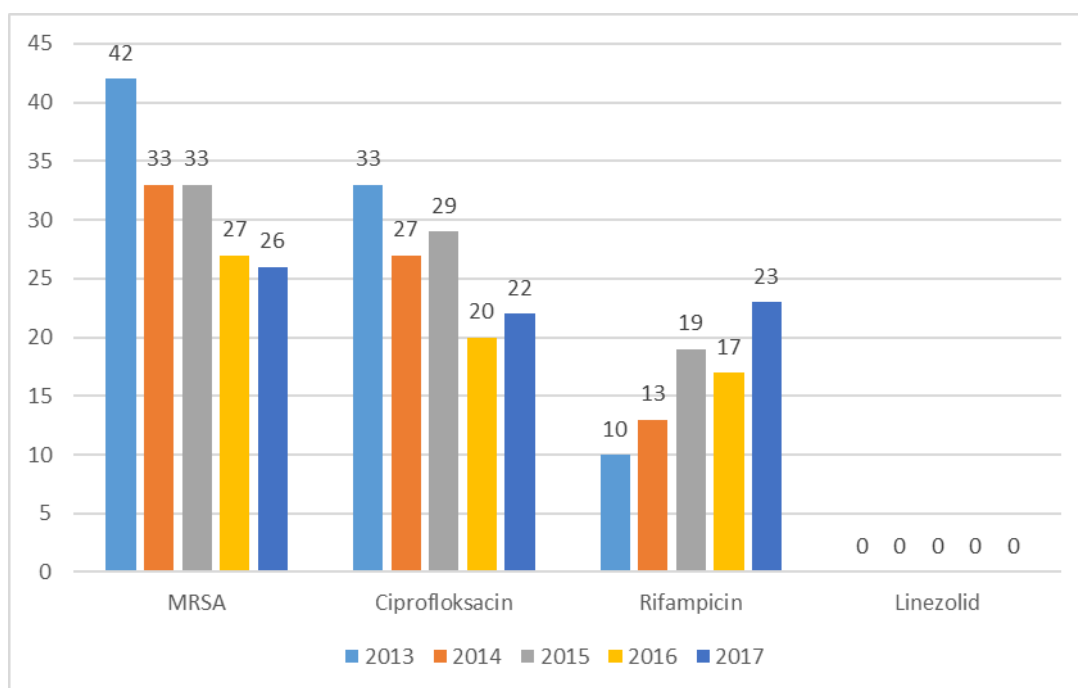


Figure 7. *Staphylococcus aureus* - antibiotic resistance in the Republic of Serbia, 2013-2017

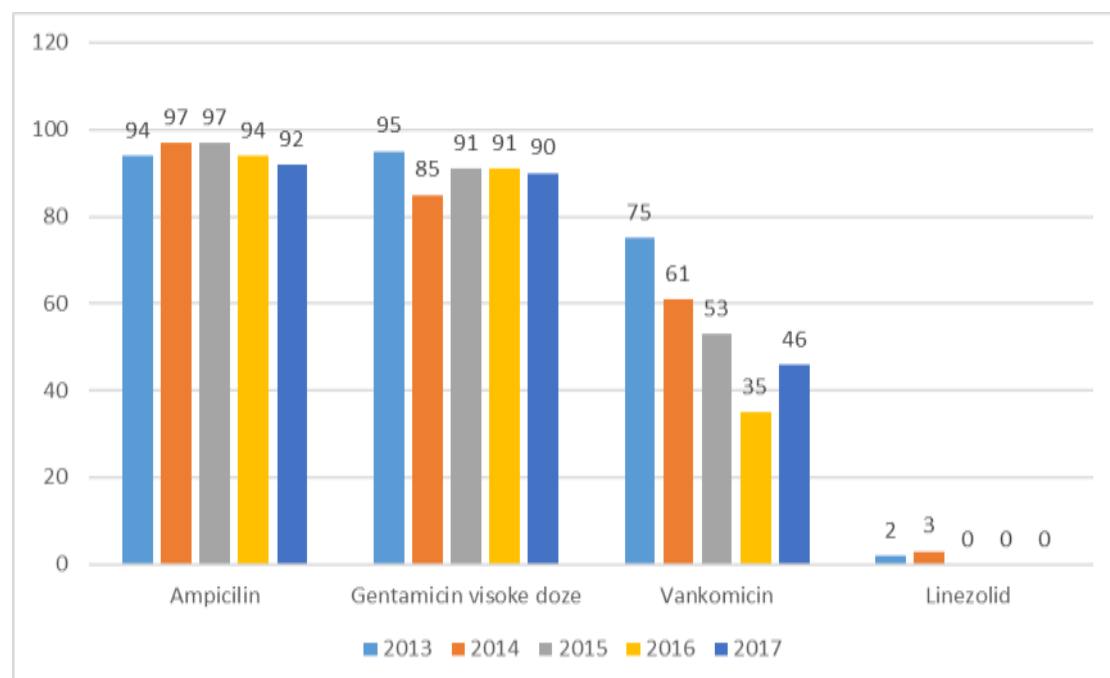


Figure 8 *Enterococcus faecium* - antibiotic resistance in the Republic of Serbia, 2013-2017

2.2.2. ABR surveillance in veterinary medicine

The laboratory diagnostics system in Serbia has a network of laboratories in the specialist and scientific institutes of veterinary medicine (a total of 12 institutes) responsible for laboratory testing and support in the implementation of epidemiological surveillance. The main tasks of the veterinary institute are defined by the Veterinary Care Act ("Official Gazette of the RS, Nos. 91/05, 30/10 and 93/12). The institutes participate and provide technical assistance for the systematic monitoring of diseases and disease diagnostics and contribute to the prevention of the onset, detection, containment and control of diseases, participate in epidemiological surveillance and perform laboratory diagnostics (bacteriological, serological, viral, parasitic, chemical, biochemical, pathological and radiological). They perform laboratory testing of safety of animal origin food and animal feed. All laboratories within the Institute have been accredited. The accreditation is granted by the Accreditation Authority of Serbia (hereinafter AAS) which is member of the European Accreditation organisation. The accreditation granted by AAS is accepted in the European Union as well as laboratory results issued by our laboratories. All methods for the diagnosis of communicable diseases of animals, microbiological analysis of the safety of food of animal origin and animal feed, as well as the bio-security procedures are prescribed by international and national standards and these methods have been recommended by the World Organization for Animal Health (hereinafter referred to as OIE) and by the reference laboratories of the European Union. All laboratories are accredited in accordance with ISO quality standards (ISO 9001: 2000, 17025). Reporting the onset and the end of communicable diseases in animals is performed in line with the the Ordinance on the List of Particularly Communicable Diseases in Animals and the List of Communicable Diseases in Animals Which Should be Reported ("Official Gazette of the RS, No. 49/06) and the Veterinary Care Act.

Regarding monitoring ABR, laboratories in institutes perform the analysis in the scope of their daily activities, as well as in the scope of scientific research in their laboratories, but they do not have accredited methods.

What follows is the report on isolated pathogenic and potentially pathogenic bacteria from the biological material originating from animals, as well as on their susceptibility to

antibiotics in the Republic of Serbia in 2015 (Figures 9-14). *Data source: Veterinary Directorate, aggregate data from 10 specialist veterinary institutes (SVI) and 2 scientific institutes of veterinary medicine, as follows: SVI "Niš" SVI "Šabac" SVI "Kraljevo" SVI "Požarevac" SVI "Jagodina" , SVI "Zaječar" SVI "Sombor" SVI "Subotica" SVI "Zrenjanin" SVI "Pančevo", Scientific Veterinary Institute of Serbia- Belgrade, Scientific Veterinary Institute "Novi Sad".*

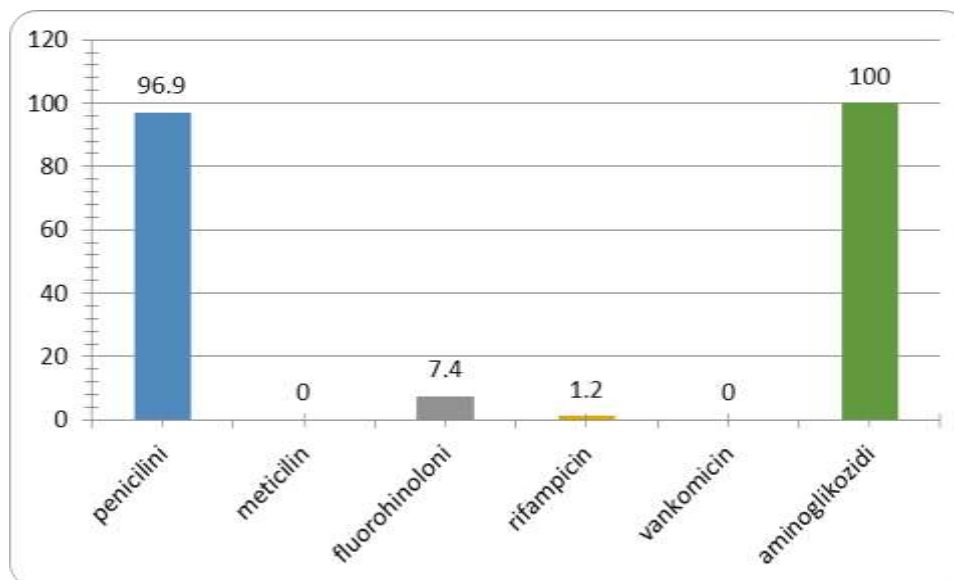


Figure 9. Percentage of resistant isolates of *Staphylococcus aureus* in 2015 (162 isolates)

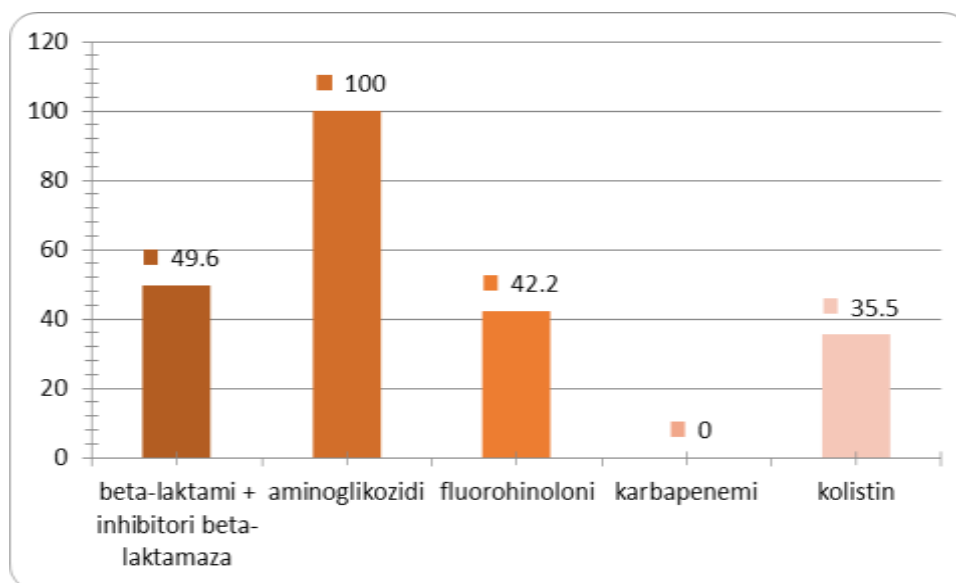


Figure 10. Percentage of resistant isolates of *Escherichia coli* in 2015 (405 isolates)

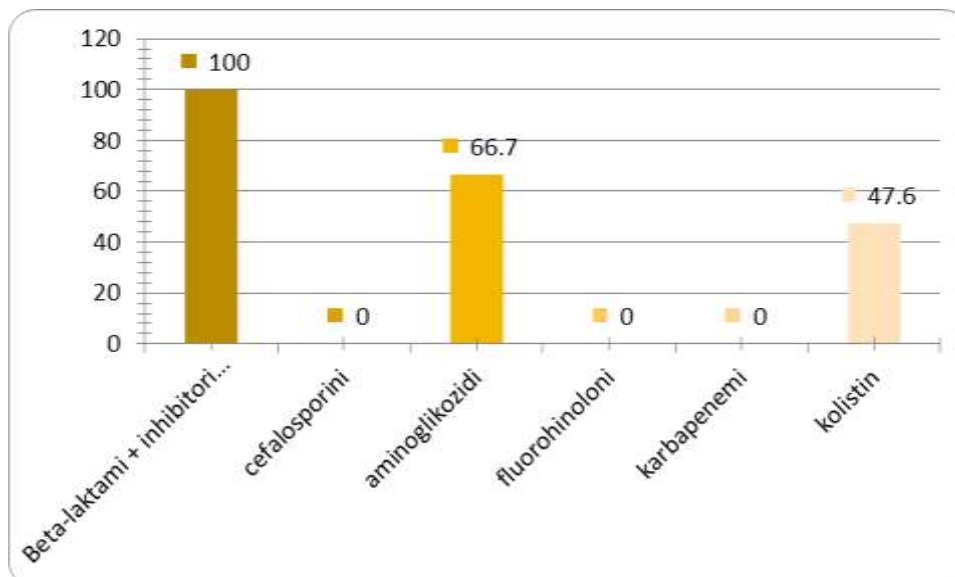


Figure 11. Percentage of resistant isolates of *Klebsiella spp* in 2015 (21 isolates)

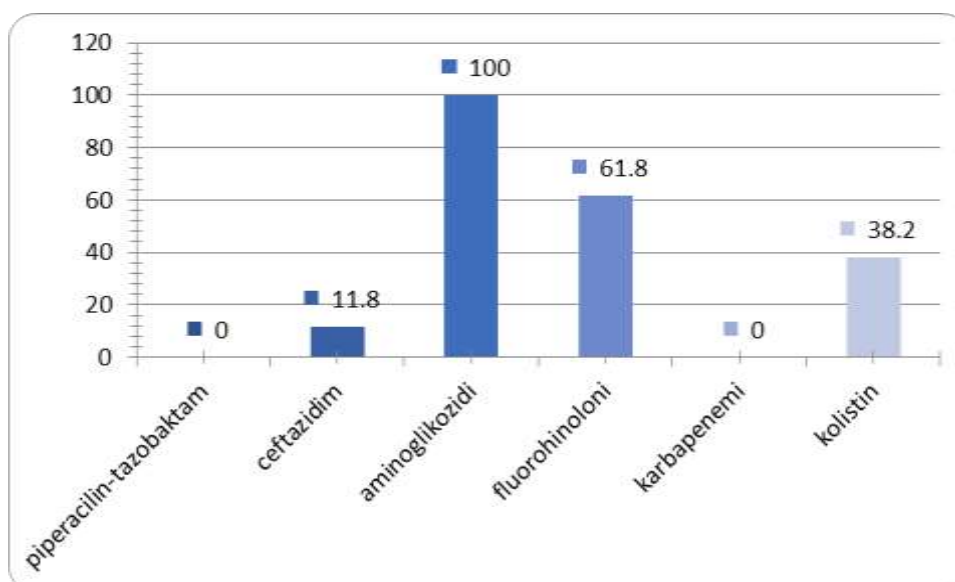


Figure 12. Percentage of resistant isolates of *Pseudomonas spp* in 2015 (34 isolates)

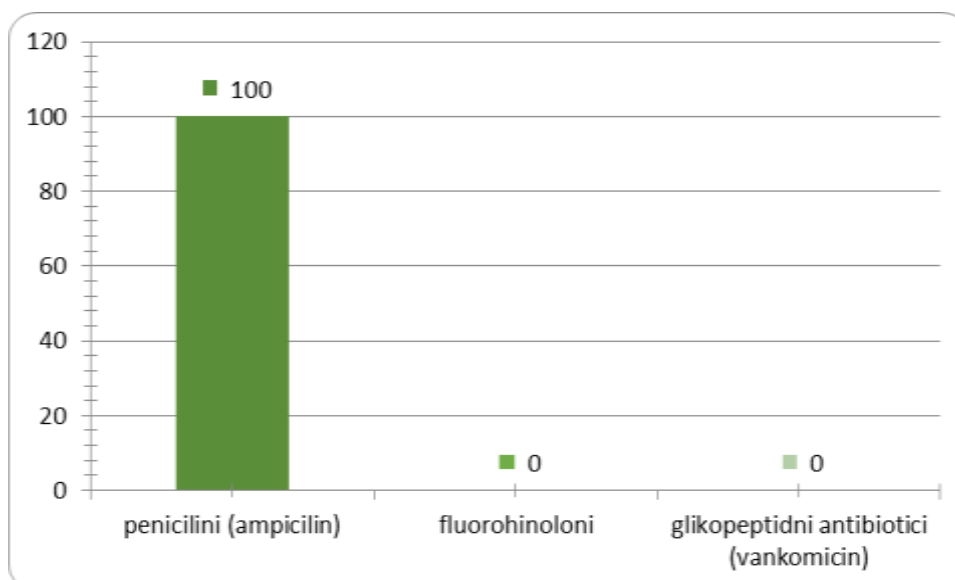


Figure 13. Percentage of resistant isolates of *Enterococcus spp* in 2015 (14 isolates)

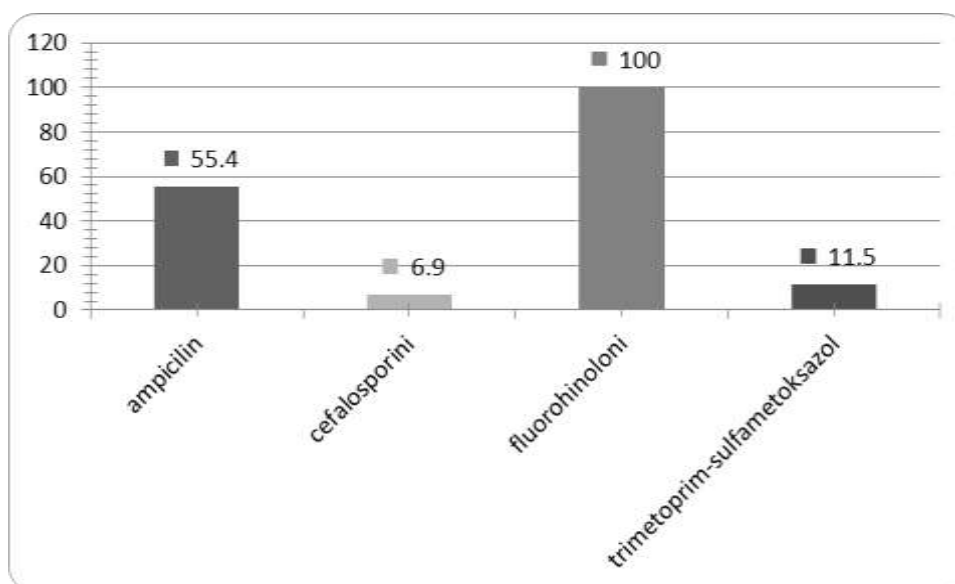


Figure 14. Percentage of resistant isolates of *Salmonella spp* in 2015 (21 isolates)

2.3. Antibiotics trade and consumption

2.3.1. Trade and consumption of antibiotics in medicine

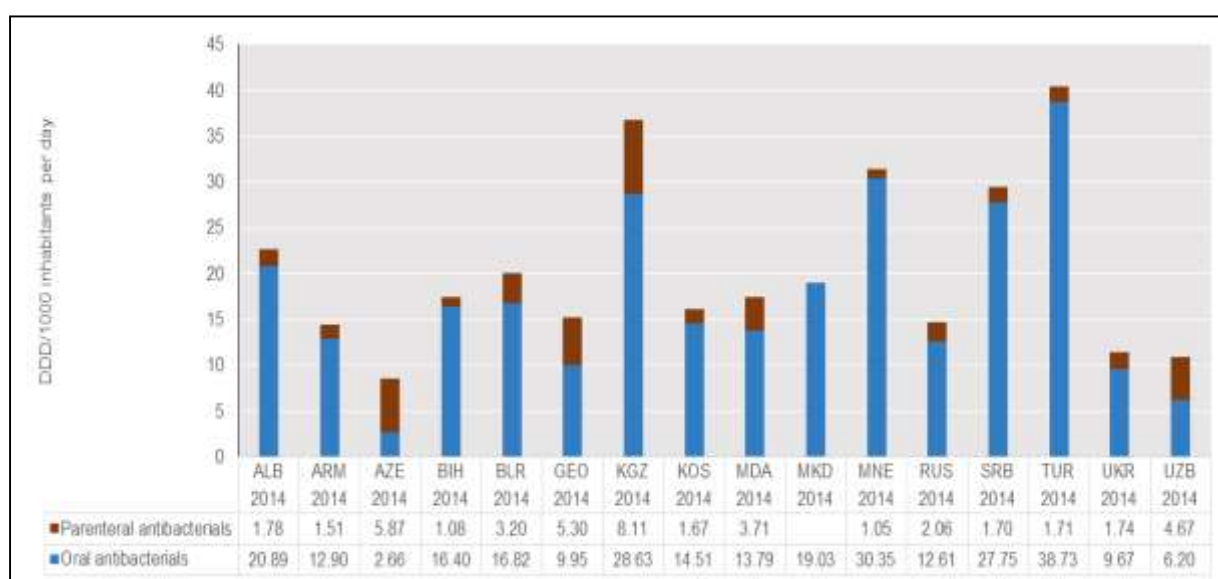
Monitoring medicines trade and use in a community enables the improvement of pharmacotherapy in addition to providing other population health status parameters.

The Agency for Medicines and Medical Devices of Serbia (AMMD), pursuant to its responsibilities, which are provided by the Law on Medicines and Medical Devices ("Official Gazette" No. 30/2010 and 107/12) collects and processes data on the trade of medicines, in order to provide an insight into the extent and types of medicines used in Serbia. Data on attained total sales of drugs for human use are obtained from the medicine license holders, or from manufacturers or their authorized representatives or agents and include the trade in outpatient and inpatient care in the public and private sector

The use of the recommended ATC/DDD (anatomical therapeutic chemical classification-ATC and the common quantitative statistical measure of medicines consumption – the defined daily dose-DDD) methodology recommended by the WHO. The volume of medicines consumption is converted into the number of DDD/1000 inhabitants per day, according to the internationally established methodology. The number of DDD/1000 inhabitants per day provides an insight into how many inhabitants (out of 1000) used the observed medicine and were exposed to its effect during one day.

In the framework of the European Strategic Action Plan on Antibiotic Resistance, WHO Europe has established a compatible network (Antimicrobial Medicines Consumption network, AMC) to monitor the consumption of antibiotics also for non-EU countries which include Serbia, thus enabling comparison with other countries.

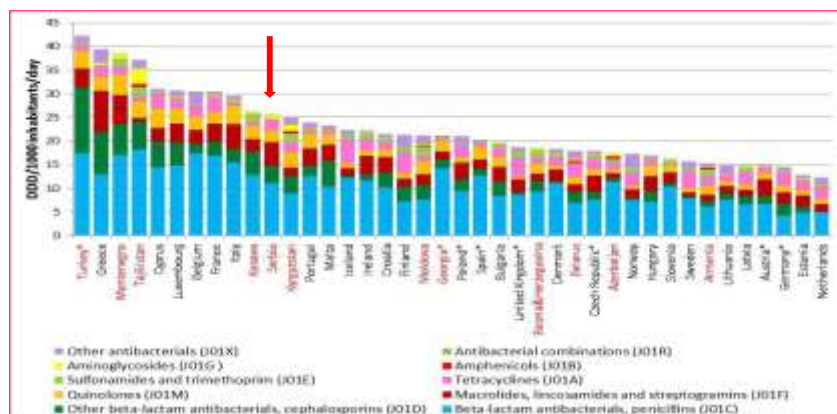
With regard to total consumption, the Republic of Serbia ranked 4th among the AMS member countries - with 29.47 DDD per 1,000 inhabitants in 2014.



Source: Antimicrobial Medicines Consumption (AMC) data from 2011 to 2014. WHO Regional Office for Europe. World Health Organization 2017

Figure 15. Total consumption of antibiotics for systemic use in relation to the method of administering in the WHO AMS member countries in 2014

The antibiotics consumption in systemic use, expressed as the number of DDD/1000 inhabitants per day in 11 countries included in the AMC network (marked red), Kosovo (UN Security Council Resolution 1244, 1999) and Croatia (2011) compared to the 27 countries that belong to the ESAC-Net (European Surveillance of Antimicrobial consumption Network - monitoring of antimicrobial drugs consumption in Europe), have pointed out the existence of a large difference in the extent of consumption, as well as in the presence of different groups of antibiotics. (2010).



* Countries reporting only outpatient antibiotic use
* In accordance with Security Council resolution 1244 (1999)

Goossens et al,
Lancet Infect Dis 2014 May;14(5):381-7.

Source: Antimicrobial Medicines Consumption (AMS). WHO Regional Office for Europe. World Health Organization 2017

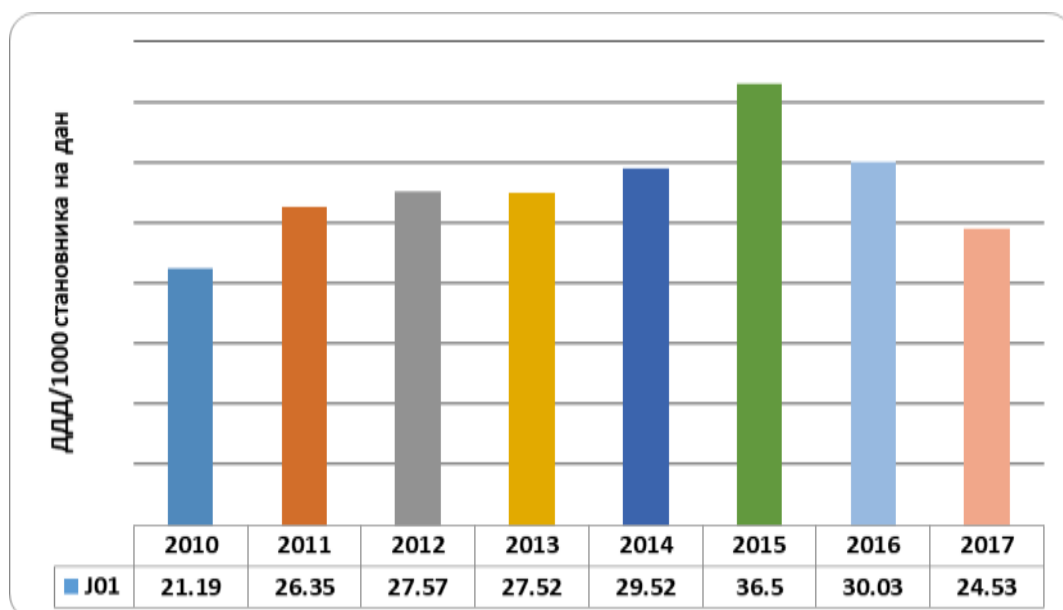
Figure 16. Consumption of antibiotics in Serbia compared to other countries in the AMS network member countries and the EU-member countries

The thus processed data on antibiotic consumption enabled the comparison with other countries and indicated that the Republic of Serbia was among the European countries with a high consumption of antibiotics, and, consequently, the need for antibiotic consumption to be reduced to the lowest possible level in accordance with the principles of rational use of these drugs.

The results indicate the good prescribing practice for antibiotics (such as e.g., high consumption of amoxicillin), but also the need for a qualitative improvement of the antibiotics use: it is necessary to reduce the overall consumption of antibiotics; the reduction of the use of certain groups of drugs (macrolides, quinolones, and amoxiclav); the increase in the consumption of penicillin-sensitive narrow-spectrum β -lactamase (phenoxymethylpenicillin), which were not available in the Republic of Serbia, while phenoxymethylpenicillin was re-registered in 2018.

Considering the period 2010-2017, there was a continued increase in the consumption of antibiotics in the Republic of Serbia from 2010 to 2015, when the total consumption of antibiotics for systemic use reached 36.5 DDD/1000 inhabitants. Data for 2016 and 2017 show a significant decrease compared to 2015 by a total of 32.79% (17.72% for 2016 and 2015 18:31% 2017: 2016), which is the result of systemic policies and activities undertaken by the Ministry of Health in November 2015 in launching the campaign for rational use of antibiotics.

The results presented here refer to quantitative analysis, which provides data on the extent of exposure of citizens to a particular medicine. Performing a more detailed analysis of their efficient use requires additional parameters such as the indication for which the drug is prescribed, the data on the patient to whom the drug is prescribed (age, co-morbidities) which are included in the prescription, on the basis of the data of the National Health Insurance Fund (hereinafter NHIF), so it would be good to carry out a qualitative analysis with the necessary elements and according to the indicators for the qualitative use.



Source: Agency for Medicines and Medical Devices of Serbia

Figure 17. Total consumption of antibiotics for systemic use in Serbia (J01) (2010 to 2017)

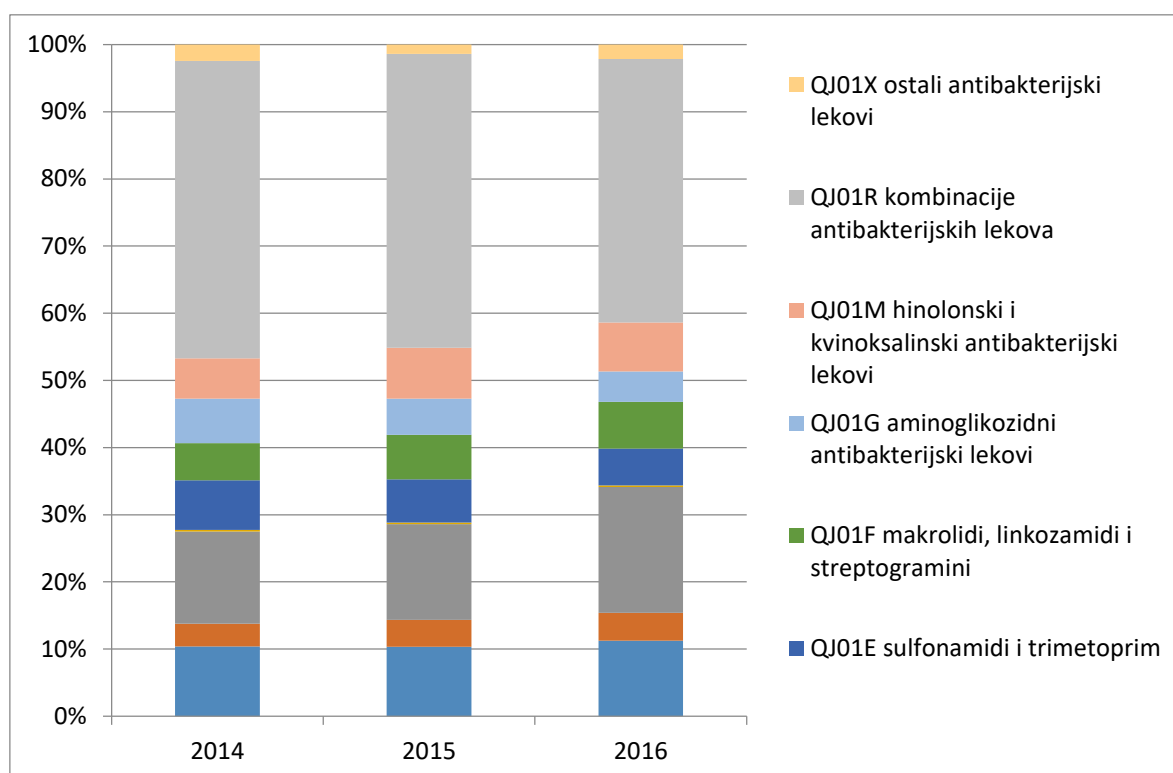
Antibiotic consumption monitoring is a component of the ABR control in the Republic of Serbia in order to rationalize the consumption of this important group of medicines.

2.3.2. Trade and consumption of antibiotics in veterinary medicine

Monitoring medicines trade and consumption in a community enables the improvement of pharmacotherapy, among other parameters of the health status of the population.

The Agency for Medicines and Medical Devices of Serbia (ALIMS), pursuant to its responsibilities which are provided by the Medicines and Medical Devices Act ("Official Gazette of the RS" No. 30/2010 and 107/12, 105/17-A state law and 113/17-state law) collects and processes data on the trade of medicines (at www.alims.gov.rs) in order to provide an insight into the extent and types of medicines used in Serbia. Data on attained total sales of medicines for animal use are obtained from the medicine license holders, or from manufacturers or their authorized representatives or agents.

According to the Agency, it is evident that anti-infective drugs for systemic use are the ones most commonly used.



Source: Agency for Medicines and Medical Devices of Serbia

Figure 18. Share of the QJ01 subgroups - antibacterial drugs for systemic use in the trade of veterinary medicines

2.4. Microbiological diagnostics

2.4.1. Microbiological diagnostics in medicine

The analysis of the previous work of the NRL in the Republic of Serbia (RS-DILS-7510YF-CS-13-IC-A.1.4.1.c-1/MoH) established the activity of 24 NRLs for communicable diseases in all fields of microbiology, which are organized within the health care, educational and scientific institutions: institutes of public health (8 NRLs); the Belgrade University School of Medicine (9 NRLs, 4 independent NRLs and 5 associated with the Clinical Centre of Serbia - National Reference Centres/NRC) and research institutions (7 NRLs). Of these NRLs, 9 examine the susceptibility of bacteria to antibiotics.

Due to the lack of a planned evaluation of the NRL operation and sustainable financing mechanisms for the functioning of the NRL, highly specialized services were provided to a limited extent, they were not available at the local level and in the context of primary health care and information on particular communicable diseases and/or groups of diseases in the Republic of Serbia were unavailable and/or inadequate.

There is a network of microbiology laboratories (MBL) which needs to be brought into line with the activities of the NRLs through the application of good laboratory practice standards and with the help of an efficient laboratory information system.

2.4.2. Microbiological diagnostics in veterinary medicine

Currently there are not many requests for testing the susceptibility of bacteria to antibiotics in animal food and feed, or they are performed on a voluntary basis, given that it has not been provided as an obligation. Only the monitoring of susceptibility, or resistance to

antibiotics and chemotherapeutics in bacteria of the *Salmonella* species in broiler chickens, laying hens, turkeys and pigs for slaughter are currently regulated. For the purpose of continuous monitoring of the susceptibility, that is, bacterial resistance to certain antibiotics, bacteria isolates are being collected and tested for the presence of resistance and multiresistance for monitoring purposes. It is regulated by the Ordinance on Establishing the Programme of Animal Health Care Policies for 2018 ("Off. Gazette of the RS, No. 11/18). This area can be improved and better regulated through the implementation of the good laboratory practice standards and with the help of efficient laboratory information system, human and material resources.

In order to ensure an appropriate and effective implementation of the measures for systematic monitoring (monitoring) of zoonoses, zoonotic agents and their antimicrobial resistance, as well as epidemiological research on the emergence of diseases transmitted by food and exchange of information related to zoonoses and zoonotic agents, the Ministry of Agriculture and Environmental Protection - Veterinary Directorate, in December 2016, in cooperation with the European Union, started the *Enhancing the capacities of the Serbian authorities and zoonoses and food borne disease control* project - IPA 2013) which will assist in the harmonization of regulations, the development of programmes for the monitoring of zoonoses, zoonotic agents and monitoring their resistance to antimicrobial agents, the education and raising awareness of all the participants in this chain.

2.5. Governance

Recognizing the importance of the problem of ABR, the Minister of Health, in accordance with the European Union Strategy, established a special working group for the rational use of antibiotics, which supports and monitors the continuous programme for the antibiotic resistance control.

3. NATIONAL RESPONSE TO ABR - OBJECTIVES

The general objective of the National Programme and Action Plan for the control of ABR 2019-2021 is to improve the health and quality of life of the population of the Republic of Serbia through the reduction of ABR.

The indicator at the level of the general objective (the effects indicator) is the bacterial resistance included in the surveillance of antimicrobial resistance in the countries of Central Asia and Eastern Europe (CAESAR- WHO), as follows:

- resistance of *Escherichia coli* to the third-generation cephalosporins
- methicillin-resistant *S. aureus* (MRSA)
- Resistance of *Klebsiella pneumoniae* to the third-generation cephalosporins

The general objective will be achieved through the implementation of the following specific objectives:

- Specific objective 1: Strengthening the monitoring of antibiotic resistance and providing evidence-based data on ABR
- Specific objective 2: Rational use of antibiotics
- Specific objective 3: Prevention and reduction of outbreaks and infection spread control

The specific objectives will be achieved through the implementation of the defined policies and activities for the implementation of policies, which are an integral part of the action plan.

4. PLAN AND SCOPE OF ACTION

4.1. MONITORING ABR

4.1.1. Monitoring the ABR in human medicine

In the field of human medicine, the system of ABR surveillance comprises the Reference Laboratory for the Registration and Monitoring of Bacterial Resistance Isolates to Antimicrobial Agents and the National Network of Microbiology laboratories, which collect data on the susceptibility of invasive isolates of bacterial species to individual antibiotics in accordance with the recommendations of the European Centre for Disease Prevention and Control (ECDC) and the CAESAR international network (*Central Asian and Eastern European Surveillance of Antimicrobial Resistance*). The microbiology laboratories send the data collected in their routine work on ABR of invasive isolates of certain types of bacteria to the reference laboratory, which consolidates and analyzes the data and prepares an annual report on the state of resistance in Serbia, which is sent to the Ministry of Health and the Institute of Public Health of Serbia.

WHO recently launched the Global Antimicrobial Resistance Surveillance System (GLASS) which is currently inviting countries to enrol. Through participation in CAESAR, Serbia can be linked to the global ABR community and provide data to GLASS.

Systematic resistance monitoring will enable the following:

1. An overview of the ABR rates and their changes;
2. Registering levels and trends of antibiotic resistance;
3. Detecting the emergence of new mechanisms of resistance and quickly reducing the spread of strains with such characteristics;
4. Comparing and establishing links between the levels of antibiotic resistance and consumption of antibiotics in human medicine;
5. Reviewing and/or drafting the national guidelines for the rational use of antibiotics, which are based on the national data on the levels of resistance of certain types of bacteria to certain groups of antibiotics;
6. Monitoring the effectiveness of interventions in the control and prevention of the spread of ABR;
7. Exchanging data on the ABR levels with the European countries and globally.

4.1.2. Monitoring the ABR in the veterinary medicine

In the field of veterinary medicine, the system of control over the bacterial resistance to antibiotics will be made up of the National Reference Laboratory for the registration and monitoring of antibiotic resistance to antimicrobial agents and the network of microbiology laboratories that collect data on the susceptibility of the bacterial strains isolates to individual antimicrobial drugs in accordance with the recommendations of the *World Organization for Animal Health*, (OIE) and the *European Food Safety Authority* (EFSA). Microbiology laboratories will send the data collected from routine work on the ABR of isolates of certain bacteria types to the Reference Laboratory that brings together and analyzes the collected data and prepares an annual report on the situation on the resistance in the Republic of Serbia, which it sends to the Ministry of Agriculture,

Systematic resistance monitoring will enable the following:

1. Noticing of ABR rates and their changes;

2. Detecting the emergence of new mechanisms of resistance and quickly reducing the spread of strains with such characteristics;
3. Comparing and establishing links between the levels of antibiotic resistance and consumption of antibiotics in veterinary medicine;
4. Monitoring the effectiveness of interventions in the control and prevention of the spread of bacterial resistance to antimicrobial drugs
5. Exchanging data on the level of antibiotic resistance with the European countries and globally.

4.1.3. Improving the quality of work and diagnostic capabilities in microbiology laboratories in the field of medicine

The improvement of the quality of performance and diagnostic capacities in microbiology laboratories could increase the number of laboratories which collect data on ABR in the framework of the National Network to and deliver them to the reference laboratories, with the aim of having all laboratories on the territory of Serbia report reliable data, which would significantly increase their representativeness.

The following is required in this regard:

1. introduction of the international standard microbiological procedures for microbiological diagnosis for all microbiology laboratories;
2. application and continuous testing of susceptibility to antibiotics in all microbiology laboratories, according to the European Committee on Antimicrobial Susceptibility Testing - EUCAST;
3. continuous implementation of internal and external quality control of microbiology laboratories;
4. improving the knowledge and skills - continuous professional development;
5. improving laboratory infrastructure and introduction of new and rapid diagnostic methods;
6. improving information and communication infrastructure of microbiology laboratories in order to facilitate collection, processing and quick disclosure of the results of monitoring bacterial resistance;
7. Defining legal regulations on the NRL and recognising NRL activities that are of importance to the health care system in the Republic of Serbia;
8. Regulating the rights and obligations between the NRL and the Ministry of Health and the system for reporting on the results of the NRL
9. Defining the NRL budgets with the obligation of their financing
10. Strengthening the capacity of individual NRLs.

4.1.4. Improving the quality of work and diagnostic capabilities in veterinary microbiology laboratories

The improvement of the quality of operation and diagnostic capacities in microbiology laboratories would create the conditions for collecting data on bacterial resistance and submitting them to the reference laboratory (which should be established), with the aim of making all laboratories on the territory of the Republic of Serbia capable of providing reliable data, which would significantly increase their representativeness.

The following is required in this regard:

1. Introduction of the standard microbiological procedures for microbiological diagnosis and antibiotic susceptibility testing for all microbiology laboratories;
2. Introduction of internal and external quality control of microbiology laboratories' operation;

3. Upgrading the equipment and knowledge of employees, introducing new and rapid diagnostic methods, regular training of employees;
4. Improving information and communication infrastructure of microbiology laboratories in order to facilitate collection, processing and quick disclosure of the results of monitoring bacterial resistance
5. Defining the regulations on NRL and identifying the activities of the NRL that are important for animal health care in the Republic of Serbia;
6. Regulating the rights and obligations between the NRL and Ministry of Agriculture, Forestry and Water Management - Veterinary Directorate and the system for reporting on the results of NRL;
7. Defining the NRL budget with the obligation of their financing;
8. adopting precise regulations, promoting and controlling the responsible use of antibiotics in animal husbandry and veterinary medicine;
9. Research and development of alternative methods for use in veterinary medicine instead of antibiotics.

4.2. Monitoring antibiotics consumption

4.2.1. Monitoring antibiotics consumption in medicine

The collected data will be analyzed and used to monitor the trends in outpatient and inpatient trade and consumption of antibiotics. Given the observed trends, further direction of activities will be provided in monitoring antibiotic consumption, monitoring bacterial resistance to antibiotics, as well as training of health professionals.

The results of the monitoring of antibiotic consumption will enable the following:

1. Correlation between the level of bacterial resistance to antibiotics and consumption of antibiotics in human medicine,
2. Exchange of data on antibiotics consumption with other European countries and globally;
3. Identification and monitoring of indicators on the rational prescribing of antibiotics;
4. Assessment of the impact of certain interventions on the rationalization of prescribing antibiotics.

4.2.2. Monitoring the consumption of antibiotics in veterinary medicine

Given the analysis of data on the consumption of antibiotics in animal medicine, resistance to antibiotics in animals and their correlations further direction of activities will be provided in monitoring antibiotic consumption, monitoring bacterial resistance to antibiotics and the training of veterinarians, since animals can be a reservoir of resistant microorganisms that can cause diseases in humans.

4.3. Encouraging good clinical practice in administering antibiotics

4.3.1. Development of the guidelines for the rational use of antibiotics

National guidelines on the rational use of antibiotics for different clinical entities shall be adopted and periodically reviewed as well as expert instructions which rely on national data on the level of bacterial resistance to certain antibiotics. Certain regulatory authorities established by the Ministry of Health and the Ministry of Agriculture, Forestry and Water Management will encourage their use in clinical practice, through the promotion of the guidelines.

4.3.2. Setting up the indicators for the rational prescribing of antibiotics

The Ministry of Health, in cooperation with the Ministry of Agriculture, Forestry and Water Management, shall define a set of indicators for monitoring the rational prescribing of antibiotics, in accordance with the action plan and the relevant international recommendations.

4.3.3 Antibiotics management

Antibiotics management implies coordinated interventions designed to improve and monitor the proper use of antibiotics. This is achieved by promoting the choice of the optimal antibiotic, regime of its administration, dose, duration of treatment and mode of administration. Antibiotics management programmes (hereinafter referred to as AMP) are aimed at achieving optimum clinical results in the use of antibiotics, the minimization of toxicity and other adverse events, limiting the development of resistant strains and reducing the health care costs related to the infection. For the purpose of successful implementation of AMP, it is necessary to establish antibiotic management teams in health care facilities (wherever possible, from existing staff), which would be led by communicable diseases specialists or clinical pharmacologists with additional expertise in treating infections.

With regard to the social value of antibiotics and the threatening loss of their effectiveness because of the increase in antibiotic resistance, international organizations (WHO, ECDC etc.) support the broad application of AMP in health care facilities (e.g., hospitals, extended care facilities, facilities for prolonged treatment of chronic patients, outpatient surgery centres, dialysis centres, as well as private practice facilities).

4.3.3.1. Antibiotics management programme in hospitals

Antibiotics are essential for effective treatment. When used improperly, antibiotics offer little benefit to patients and expose them to the risk of adverse events such as, for example, *C. difficile* infection and the development of antibiotic resistant infections. Hospital antibiotics management programmes were developed in response to these challenges. The task of the programme is to ensure that the patient in need of antibiotic therapy receives an optimal choice of the drug and its dose, duration of treatment and the route of administration with minimal risk of development of toxic and side effects and the emergence of resistance. Appropriate implementation requires the development of guidelines. The preparation of this programme includes the development of the guidelines for antimicrobial use. The guidelines provide information on antibiotics (e.g. indications for use, dosage and monitoring, the facility-specific limitations), microbiological information (e.g., pathogens, rapid diagnostics, antibiogram) and recommendations that are specifically related to a syndrome (e.g., suspected pathogens, recommendations of therapeutic agents, the duration of treatment and information management). In addition to promoting the optimal use of antibiotics to patients, the AMP has the aim to improve technical knowledge in the field of ABR and control of the use of antibiotics.

The programme, through the Action Plan, envisages the development of a guideline for the development of AMP in health facilities at the primary, secondary and tertiary health care level, as well as in other institutions where antibiotic therapy is administered.

4.3.4. Control of dispensing antibiotics

In accordance with regulations governing the field of medicines, the method of dispensing medicines is part of the authorization for a medicine, which defines the method of dispensing antibiotics in human and veterinary medicine only by prescription.

The Ministry of Health, in cooperation with the Ministry of Agriculture, Forestry and Water Management – Veterinary Directorate and health facilities, health professionals' chambers, health professionals' professional associations, non-governmental organizations, as well as electronic and print media, shall conduct training of the population and monitor the implementation of the control of dispensing of antibiotics in private and public pharmacies, as well as in specific cases for the needs of the veterinary practice through the competent services (the Ministry of Health Inspection and the Ministry of Agriculture, Forestry and Water Management - Veterinary Directorate inspection).

4.4. Education on the rational use of antibiotics

4.4.1. Training of health professionals

Training of health professionals on the rational use of antibiotics implies raising awareness and the level knowledge about the rational use of antibiotics, primarily raising awareness on the importance of the issue of antibiotic resistance at the undergraduate and graduate levels. The training of doctors, dentists, pharmacists and veterinarians on the principles of rational antibiotic therapy would be carried out continuously. In addition, non-medical factors that may affect the prescribing and use of antibiotics need to be constantly pointed out to the health professionals.

In addition to educating health professionals on the principles of rational antimicrobial pharmacotherapy, it is necessary to encourage them to educate their patients about the importance of the proper use of antibiotics. In order to improve the competence and raise the level of knowledge in this field, it is necessary to organize professional and scientific meetings of health professionals to deal with this issue.

4.4.2. Education for the general population on the harmfulness of excessive use of antibiotics

Patient expectations affect the frequency of antibiotics use, and the scope of use of antibiotics in individual countries depends on the cultural and social habits of the population. The Ministry of Health, in cooperation with the Ministry of Agriculture, Forestry and Water Management and the media, will organize and encourage the organizing of promotional and educational activities to raise awareness on the rational use of antibiotics among citizens as a way of preserving the effectiveness of antibiotics. The special working group will regularly initiate and support activities marking the Antibiotics Awareness Day.

4.5. Control of healthcare-associated infections and control of the resistant strains' spread

The National Expert Commission for the control of healthcare-associated infections coordinates activities in the field of control of the spread of multi-drug resistant strains with the activities related to the rational use of antibiotics.

4.6. Improving the information technology

The main objective of the establishment and improvement of information technology in the fields of bacterial resistance is reaching the level of communication that allows the rapid exchange of results on antibiotic resistance, which is of great importance for the targeted treatment of infections and reduced number of unsuccessful or extended antibiotic therapies.

The importance of quality and timely information on bacterial resistance to antibiotics comprises:

1. Targeted treatment of infections which will reduce the incidence of unsuccessful antibiotic therapies, as well as the too broad antibiotic therapies by resident physicians/clinicians due to rapid and timely availability of microbiological results
2. Timely monitoring of local data on antibiotic resistance
3. Exchanging local data on antibiotic resistance
4. Centralized data collection on antibiotic resistance at the national level
5. Undertaking measures to prevent and control the spread of resistant strains, monitoring and evaluation of measures
6. Creating a basis for participation in international surveillance systems, such as EARS-CAESAR and the WHO Europe Antimicrobial Resistance Monitoring Programme, as well as a basis for international and intersectoral cooperation in this field.

For these reasons, the Ministry of Health will advocate for the introduction and development of an appropriate information technology (computer programmes) in health care institutions.

4.7. Encouraging scientific research in the field of antibiotic resistance

One of the Programme's tasks is also the encouragement of scientific and research work at the international level (scientific research papers, PhD studies, research projects, etc.) in the field of bacterial resistance to antibiotics. At the same time, it is necessary to encourage cooperation and multidisciplinary approach to research in the field of antibiotic resistance to (the Serbian Universities' curricula, the Institute of Public Health of Serbia with a network of regional institutes, scientific and specialist veterinary institutes, clinical centres/and the Serbian Agency for Medicines and Medical Devices, the National Health Insurance Fund, the Ministry of Health, the Ministry of Agriculture, Forestry and Water Management, the Ministry of the Environment, the Ministry of Education, Science and Technological Development).

4.8. International cooperation

In Europe, the two key strategic documents on combating antibiotic resistance are the European Commission's Action plan against the Rising Threats from Antimicrobial Resistance and the WHO Regional Office for Europe's Strategic Action Plan on Antibiotic Resistance. These two plans are comprehensive and fully compatible with other European Commission documents. To ensure their successful implementation, close cooperation has been established between the European Commission, including its specialized agencies: ECDC, the European Food Safety Authority (EFSA), the European Medicines Agency (EMA), and the WHO Regional Office for Europe, the World Organization for Animal Health (OIE) and Food and Agriculture Organization of the United Nations, FAO).

The European Antibiotic Resistance Surveillance Network, (EARS-Net), the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) and Healthcare Associated Infections Network (HAI-Net), as established by the ECDC, currently cannot cover countries which are not members of the European Union.

In the framework of implementing the European Strategic Action Plan on Antibiotic Resistance, WHO Europe has established compatible networks for monitoring antibiotic consumption (AMC) and bacterial resistance to antibiotics (CAESAR) for countries that are not members of the European Union.

ABR information from the Republic of Serbia are part of the first and second 2014 and 2016 CAESAR reports, as well as the 2014 WHO Global Report on Resistance Surveillance.

Participation in these networks will provide a regional overview of the consumption of antibiotics and ABR, allow targeted action, access to key networks and initiatives, as well as the smooth transition from the WHO network to the European Union networks for candidate countries as they accede to the European Union.

Other networks, initiatives and associations from which Serbia will benefit by linking with the activities determined by the European Strategic Plan on Antibiotic Resistance include: the European Surveillance of Veterinary Antimicrobial Consumption, (ESVAC) project led by EMA, the European Society of Clinical Microbiology and Communicable diseases, (ESCMID) the WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR WHO), and the Global Infection Prevention and Control Network (GIPC Network) and the Global Antimicrobial Resistance Surveillance System (GLASS). There is also continuous cooperation with the World Health Organization.

5. INSTITUTIONAL FRAMEWORK

The Ministry of Health is responsible for the implementation and coordination of activities in various fields relevant to the control of ABR. A multidisciplinary approach is essential for the achievement of the goals, which is why equal representation of all stakeholders was ensured in the preparation of the Programme and Action Plan.

After the adoption of the Programme, the Ministry of Health will establish a multi-sector national coordination Group (MCG) for antibiotic resistance control.

The task of national MCG for antibiotic resistance control is to oversee and coordinate all activities related to ABR in all sectors (monitoring ABR, encouraging good clinical practice, education on the rational use, conducting campaigns for the rational use of antibiotics aimed at professionals, general public, improving the information technology, fostering scientific research, international cooperation), to ensure a systematic and comprehensive approach in accordance with the defined public health goals related to the ABR and the Global AMR Action Plan.

The national MCG to control antibiotic resistance, through the Ministry of Health, Government of the Republic of Serbia shall report annually on the accomplishment of the objectives of the Programme and activities.

6. FINANCING ACTIVITIES PLANNED IN THE PROGRAMME

Funds for the implementation of this act have been allocated in the budget of the Republic of Serbia for 2019, in section 27 - Ministry of Health Programme 1807 - Development of infrastructure of health facilities, Project 4009 – Second Serbia Health Project - Additional Financing in the amount of RSD 8,124,600, in the following economic classifications: 421-recurring costs in the amount of RSD 755,100, 422- travel costs, in the amount of RSD 873,100, economic classification 423-services under the contract, in the amount of RSD 5,741,300, 426-material, in the amount of RSD 755,100.

In 2020, it is necessary to allocate funds in section 27 - The Ministry of Health, Programme 1807 - Development of infrastructure of health facilities, Project 4009 – Second Serbia Health Project - Additional Financing in the amount of RSD 8,123,500 dinars in the

following economic classifications: 421-recurring costs in the amount of RSD 754,100 dinars, 422 travel costs, in the amount of RSD 873,100, economic classification 423-services under the contract, in the amount of RSD 5,741,200, 426 - material in the amount of RSD 755,100 dinars.

In 2021 it is necessary to allocate funds under the said programme in the amount of RSD 19,211,900, in economic classifications: 421-recurring costs in the amount of RSD 1,613,200, 422- travel costs, in the amount of RSD 1,734,600 economic classification 423-services under the contract, in the amount of RSD 12,246,500, 426-material, in the amount of RSD 1,617,600 and 515-Intangible assets, in the amount of RSD 2,000,000.

The funds will be provided in accordance with the limits set by the Ministry of Finance.

Funds for the implementation of this act have been allocated in the budget of the Republic of Serbia for 2019, in section 24 – Ministry of Agriculture, Forestry on Water Management, Chapter 24.2 – Veterinary Directorate, Function 760 - Health elsewhere unclassified, Programme 0109 - Food safety, veterinary and phytosanitary policy, programme activity/project 0001- Animal Health Care, Economic Classification 451 - Subsidies to non-financial public enterprises and organizations in the amount of RSD 6,000,000.00.

For 2020 and 2021 the funds will be provided in accordance with the limits set by the Ministry of Finance.

ACTION PLAN		
General objective: Improving the health and quality of life of the population of the Republic of Serbia through the reduction of ABR.		
Current related planning document planning/public policy document		
The indicator at the level of the general objective (effects indicator): Bacterial resistance included in the surveillance of antimicrobial resistance in the countries of Central Asia and Eastern Europe (CAESAR- WHO), as follows: 1. The resistance of Escherichia coli to third-generation cephalosporins 3rd generation 2. methicillin-resistant S. aureus (MRSA) 2. Resistance of Klebsiella pneumoniae to third-generation cephalosporins	Baseline value: 1. 30% 2. 26% 3. 85%	Target value: 1. 25% 2. 22% 3. 78%
	Base year: 2017	Year of accomplishment of the general objective: 2021
Verification source: WHO web site; Website of the Institute of Public Health of Vojvodina		
Specific objective 1: Strengthening the monitoring of antibiotic resistance and providing evidence-based data on ABR		
Specific objective indicator (Outcome indicator): Increased coverage of microbiology laboratories and hospitals included in the control of ABR	Baseline value: 20 microbiology laboratories and hospitals	Target value: 25 microbiology laboratories and hospitals
	Base year: 2017	Year of accomplishment of the general objective: 2021
Verification source: WHO web site; Website of the Institute of Public Health of Vojvodina		
Policy 1.1: Developed functions and tasks of the National multi-sector coordinating group (MCG) for the antibiotic resistance control.		
Policy-level indicator (Result indicator): MCG formed with functions and duties approved		
Baseline value: 0	Target value: MCG Formed	
Base year 2019	Date of policy implementation 2019	

Verification source: MoH website ⁵					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
1.1.1.Setting up the MCG with the approved tasks and functions	MoH	MAFWM, MEP	The decision on the establishment of the MCG	MoH website	Q2 2019
1.1.2. Monitoring of the implementation of the National Programme and Action Plan	MoH	MAFWM, MEP	Annual MCG reports	MoH website	continuously
1.1.3. Evaluation of implemented activities and adjustment to the current needs	MoH	MAFWM, MEP	Annual MCG reports	MoH website	continuously
Policy 1.2 .: Monitoring the bacterial resistance to antibiotics					
Policy-level indicator (Result indicator): Increase in the number of bacterial isolates analyzed					
Baseline value 2336		Target value: 3000			
Base year: 2017		Date of policy implementation: 2021			
Verification source: WHO web site; Website of the Institute of Public Health of Vojvodina					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
1.2.1.Providing (collecting and analysing) data on bacterial resistance in accordance with the CAESAR methodology in medicine	MoH	NRL ⁶ for monitoring and recording of bacterial resistance to antibiotics	- Annual reports on resistance of certain bacteria - Increased coverage of microbiology laboratories and hospitals - Increased number of isolates to be analyzed - More precise case definitions for sampling - Increased number of sampled sets of blood cultures	WHO website	continuously

⁵ Ministry of Health

⁶ National Reference Laboratory

1.2.2. Providing (collecting and analysing) data on bacterial resistance in accordance with the global system for monitoring the ABR on the primary, secondary and tertiary levels in the public and private sector.	MoH	MoD-MHD ⁷ , NRL involved in the control of ABR, IPHS ⁸ with its network of institutes	- Published reports in accordance with the system of global surveillance of antimicrobial resistance	WHO website	continuously
1.2.3. Providing (collecting and analysing) data on bacterial resistance isolated from animals	MAFWM	NRL	- Published reports on bacterial resistance isolated from animals	EFSA website ⁹	Q4 2021
1.2.4. Providing (collecting and analysing) data on bacterial resistance strains isolated from food of animal origin, in accordance with the current legislation	MAFWM		- Published reports on bacterial resistance isolated from food of animal origin in accordance with the legislation	EFSA website	Q4 2021
1.2.5. Implementing the software solution for monitoring resistance and connecting it to the existing databases in medicine (from laboratories and hospitals)	MoH	IPHS with its network of institutes	- Information on the prepared software - Start of implementation	WHO website	Q2 2020
1.2.6. Developing the software solutions for monitoring resistance in animals and connecting it to existing databases in veterinary medicine (scientific and specialist veterinary institutes).	MAFWM		- Information on the prepared software - Start of implementation	MAFWM website-VD	Q4 2021
Policy 1.3 : Capacity building and improving the work of microbiology laboratories in medicine					

⁷ Ministry of Defence - Directorate of Military Health

⁸ Institute of Public Health of Serbia "Dr Milan Jovanovic Batut"

⁹ European Food Safety Authority (the European Food Safety Authority)

Policy-level indicator (Result indicator): Building the capacity and possibilities of microbiology laboratories					
Baseline value index 6.1 (medium capacity)			The target value index 7.0 (medium capacity)		
Base year: 2017			Date of policy implementation: 2021		
Verification source: European Centre for Disease Prevention and Control (ECDC) website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
1.3.1. Establish a database of microbiology laboratories in the public and private sectors	MoH	ME, MoD-MHD, NEC for Microbiology, IPHS with its network of institutes, associations, private health care facilities in Serbia, IT experts, external experts, NRL, NHIF ¹⁰	-Central database of microbiology laboratories in the public and private sector	IPHS website	Q2 2019
1.3.2. Mapping and assessment of laboratory capacity in the public and private sector	MoH	ME, MoD-MHD, NEC for Microbiology, IPHS with its network of institutes, associations, private health care facilities in Serbia, IT experts, external experts	- Database of microbiology laboratories in the public and private sector established	IPHS website	Q2 2019
	MoH	IPHS with its network of institutes, NEC for Microbiology,		IPHS website	Q2 2019

¹⁰ Republican Fund for Health Insurance

1.3.3. Define gaps and discrepancies between standards and the current situation in microbiology laboratories		university medical schools, professional associations of microbiologists, the association of private health facilities in Serbia, external experts	- Estimate of discrepancies with conclusions and recommendations for improvement completed		
1.3.4. Produce a development direction for upcoming activities	MoH	IPHS with its network of institutes, NEC of Microbiology, university medical schools, professional associations of microbiologists, the association of private health facilities in Serbia, external experts	- Detailed plan of future activities drawn up	IPHS website	Q2 2019
1.3.5. Evaluation of basic functions/activities in NRL (interdisciplinary strategic audit of the NRL) (including ABR)	MoH	IPHS with its network of institutes, other relevant partners/experts, NRL	- Report on the assessment of the NRL with the recommendations completed	IPHS website	Q1 2020
1.3.6. Periodic re-nomination of NRL and ensuring appropriate funding.	MoH	IPHS with its network of institutes, other relevant partners/experts, NRL	- Report on the assessment of the NRL with the recommendations completed	IPHS website	Q1 2021

1.3.7. Strengthening internal quality assessment and improvement and implementation of the external quality assessment (EQA) (including ABR)	MoH	IPHS with its network of institutes, National Expert Commission for Microbiology, NRL, NHIF ¹¹	- Participation in the system of control in ECDC ¹² ENLABCAP ¹³ . - Organization and implementation of EQA in laboratories - % of laboratories applying EQA	IPHS website	Q4 2020
1.3.8. Implementation of the EUCAST ¹⁴ methodology in all microbiology laboratories	Microbiology laboratories	MoH - Commission for the methodology of testing susceptibility of bacteria to antibiotics	- Annual laboratory reports with introduced EUCAST methodology - 80% of laboratories with the EUCAST methodology introduced by 2020 - Over 90% of laboratories with the EUCAST methodology introduced by 2022	IPHS website	continuously
1.3.9. The introduction of the WHONET ¹⁵ database which monitors susceptibility in microbiology laboratories	Microbiology laboratories	MoH - Commission for the methodology of testing susceptibility of bacteria to antibiotics	- Annual reports on the number of laboratories that apply WHONET	IPHS website	Q4 2020
Policy 1.4 .: Capacity building and improvement of the operation of microbiology laboratories in veterinary medicine					
Policy-level indicator (Result indicator): Number of appointed laboratories which apply the VetCAST¹⁶ or OIE¹⁷ standards					
Baseline value: 1		Target value: 3			
Base year 2018		Year of implementation: 2021			

¹² European Center of Disease Prevention and Control (European Centre for Disease Prevention and Control)

¹³ Tool monitoring capacity microbiology laboratory

¹⁴ European Committee on Antimicrobial Susceptibility Testing (European Commission for testing sensitivity to antimicrobial drugs)

¹⁵ WHO Collaborating Center for Surveillance of Antimicrobial Resistance (WHO Center for control of antimicrobial resistance)

¹⁶ The EUCAST Veterinary Subcommittee on Antimicrobial Susceptibility Testing (EUCAST Veterinary Subcommittee on susceptibility testing to antimicrobial drugs)

¹⁷ World Organization for Animal Health (World Organization for Animal Health)

Verification source: websites MAFWM VD					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
1.4.1. Appointment of laboratories that will carry out the ABR testing using reference methods, defining their activities and capacity building	MAFWM		- The list of appointed laboratories and activities defined	MAFWM VD laboratory registry	Q4 2020.
1.4.2. Authorization of NRL, that is, NRL determination	MAFWM		- Decision on authorization and determining the NRL	"Official Gazette of the RS"	Q4 2021
1.4.3. Implementation of VetCAST or OIE ¹⁸ standards which concern all aspects of testing antimicrobial susceptibility of bacterial pathogens of animal origin and animal bacteria with zoonotic potential in all microbiology laboratories in the veterinary sector	Microbiology laboratories appointed		- Report from laboratories applying the VetCAST or OIE standard	MAFWM VD Website	Q4 2021
Policy 1.5.: Strengthening/improvement of cooperation with international institutions dealing with ABR: WHO, ECDC, OIE, FAO ¹⁹ and others					
Policy-level indicator (Result indicator): Improvement of cooperation through international educational activities held in our country					
Baseline value: 0		Target value: 3			
Base year 2018		Date of policy implementation 2021			
Verification source:					

¹⁹ Food and Agriculture Organization of the United Nations (Food and Agriculture Organization of the United Nations United Nations)

Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
1.5.1. Improving cooperation with the European/global network for monitoring ABR in medicine	MoH	NRL, MCG, IPHS with its network of institutes	- Reports on cooperation with the European/global monitoring network for ABR, CAESAR ²⁰ and GLASS	MoH website, ECDC website	continuously
1.5.2. Cooperation with European networks/global networks for monitoring ABR/ OIE in veterinary medicine	MAFWM	MCG	- Reports on cooperation with European/global networks for monitoring ABR	OIE website, EFSA website	continuously
1.5.3. Data collection and reporting on the antibiotic trade according to the WHO Regional Office for Europe (WHO/ EURO Antimicrobial Medicines Consumption (AMC) network)	AMMD, IPHS with its network of institutes	MoH-MCG	- Report on the trade	AMMD, IPHS and MoH websites, ECDC website	continuously
1.5.4. Data collection and reporting on ABR to EFSA	MAFWM	The designated national reference laboratory for AMR	- Report on ABR data in EFSA databases	OIE website, EFSA website	Q4 2022
Specific objective 2: Rational use of antibiotics					
Specific objective indicator (Outcome indicator): The total consumption of antibiotics for systemic use (J01) expressed in DDD/1000 persons/day	Baseline value: 24.53		Target value: 20.00		
	Base year: 2017		Year of accomplishment of the specific objective: 2021		
Verification source: AMMD Website, MoH website					
Policy 2.1 : Improvement and continuous monitoring of the trade and consumption of antibiotics in human and veterinary medicine					
Policy-level indicator					

²⁰ Central Asian and Eastern European Surveillance of AMR (Control consumption of antimicrobial drugs in Central Asia and Eastern Europe)

(Result indicator): The number of reports on the consumption of antibiotics at the primary, secondary and tertiary level of the public and private sectors					
Baseline value: 0			Target value: 1		
Base year 2018			Date of policy implementation 2021		
Verification source: IPHS website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.1.1. A common system for registration of antibiotic consumption (with a software electronic system for health care facilities) prepared	NHIF, IPHS	MoH	- Report for MoH /MCG for the system for recording consumption - Software	IPHS website	Q4 2021
2.1.2 Collection of data on the use of antibiotics in medicine at the primary, secondary and tertiary levels in public and private sectors	IPHS with its network of institutes	MH, NHIF, E-Government	- Joint MoH /MCG report antibiotic consumption at all HC levels	IPHS website	Q4 2021
2.1.3 Collection of data on the trade in antibiotics (sales data) in human medicine. Development of the software (electronic system for monitoring of the antibiotics trade in medicine)	AMMD ²¹	MoH, E-Government	- MoH/MCG report on the trade - Information about the software installed	AMMD website	continuously
2.1.4. Strengthening/improvement of participation in the AMC ²² WHO ²³ network and, eventually, GLASS ²⁴	MoH, AMMD	AMMD, IPHS with its network of institutes	- Report on the use of antibiotics in the outpatient and hospital sector	AMMD website, IPHS website	Q4 2021
2.1.5. Collecting data on the trade of antibiotics (sales data) in veterinary medicine. Development of the software (electronic system for monitoring the antibiotics		MAFWM	- Information about the installed software	AMMD website	Q4 2020

²¹ Agency for Medicines and Medical Devices Agency of Serbia

²² Medicines Antimicrobial Consumption Network (a group to monitor the consumption of antimicrobial drugs)

²³ The World Health Organization

²⁴ Global Antimicrobial Resistance Surveillance System (Surveillance of antimicrobial resistance at the global level)

trade in veterinary medicine)			- Report for the MAFWM and MoH/MCG prepared		
2.1.6. Improving the collected data (sales data) by type of animal	AMMD	MAFWM	- Report for the MAFWM and MoH/MCG prepared	AMMD website	Q4 2021
Policy 2.2 .: Building the capacity for the rational use of antibiotics					
Policy-level indicator (Result indicator): 1. Harmonisation of the Formulary of the Prescription Medicines Covered by the Compulsory Health Insurance with the current guideline (e-control system) 2. Establishment of antibiotic management teams in hospitals					
Baseline value: 1 0 2. 1		Target value: 1 1 2. 20			
Base year 2018		Date of policy implementation 2021			
Verification source: NHIF, MoH					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.2.1. Harmonizing the NHIF Formulary of Dispensed Medicines Covered by Compulsory Health Insurance in accordance with the national guidelines and protocols	MoH/MCG, NHIF	National expert commission and professional associations	- Formulary updated at least once a year	NHIF Website	Q4 2019.
2.2.2. Strengthening cooperation between clinicians (primary, secondary and tertiary care) and microbiologists	MoH/MCG, MoD	Professional associations, health care facilities and microbiology laboratories, IPHS with its network of institutes	- Percentage of hospitals with an antibiotics management team - Information on implemented joint activities include educations and trainings held.	MoH website	continuously
2.2.3. Defining the list/group of veterinary medicines for animals used for food production, in	MAFWM		- Defined list/group of veterinary medicines	MAFWM VD Website	Q4 2019

accordance with the OIE recommendations					
2.2.4. Improving regulations to prevent environment pollution with antibiotics	MEP, MoH		- By-law (Ordinance on Pharmaceutical Waste Management) adopted	"Official Gazette of the RS"	Q4 2021
2.2.6. Establishing the system and strengthening the capacity for the removal/disposal of unused antibiotics used in veterinary medicine, according to the special rules	MAFWM, MEP		- Adopted regulations and procedures for the storage of unused/residual antibiotics used in veterinary medicine	"Official Gazette of the RS " MAFWM VD Website	Q4 2021
Policy 2.3 .: Promotion of the rational use of antibiotics in medicine					
Policy-level indicator (Result indicator): 1. Number of hospitals with established antibiotics management programmes 2. Number of developed hospital-specific antibiotics administration protocols 3. Development of the guideline for the antibiotics management at the primary health care level					
Baseline value: 1 0 2. 1 3 0		Target value: 1. 10 2. 10 3 1			
Base year 2018		Date of policy implementation 2021			
Verification source: websites of health care facilities and MoH					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.3.1.Review and adaptation of the existing national guidelines for the treatment of communicable diseases, as well as the national good clinical practice guidelines for the rational use of antibiotics	MoH	MCG, professional associations, medical sciences universities, the National Expert Commissions, IPHS with its network of institutes	- Number of new, revised and adapted guidelines	MoH website	Q1 2019

2.3.2. Introduction of the Antibiotics Management Programme (AMP)in hospitals 2.3.2.1. Establishing antibiotics management teams in each hospital	Hospitals in collaboration with the MoH		- Professional methodological instruction for AMP developed - Teams established - Report on the activities of teams	Health care facilities and MoH websites	Q3 2020
2.3.3. Preparation of the basis for the introduction AMP at the primary level HC 2.3.3.1. Forming teams for management of antibiotics at the primary level HC facilities	Health facilities at the primary level, MoH	IPHS with its network of institutes	- Professional methodological instruction for AMP developed - Teams established - Report on the activities of teams	Health care facilities and MoH websites	Q4 2021
2.3.4. Hospital protocols specific to each hospital for prescribing antibiotics	Hospitals in collaboration with the MoH	IPHS with its network of institutes	- Number of hospitals with specific protocols introduced within the AMP - Number of specific protocols	Health care facilities and MoH websites	Q4 2020
2.3.5. Strengthening the hospital budgets for the implementation of the patient care and nursing protocol, the recommended use of diagnostic procedures and facilitating their application	MH, NHIF, hospitals	IPHS with its network of institutes	- Report on the extended budget - Report on the protocol implementation and control	Health care facilities and MoH websites	2019-2022
Policy-level indicator (Result indicator): Developed national guideline for the responsible use of antibiotics in veterinary medicine					
Baseline value: 0		Target value: 1			
Base year 2019		Date of policy implementation 2021			
Verification source: website MAFWM					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.4.1. Preparation of the national guidelines for the responsible use of antibiotics in veterinary medicine	MAFWM	Professional associations, faculties of veterinary science	- National guidelines prepared	MAFWM website	Q4 2021

Policy 2.5 .: Investment in new medicines, diagnostic tools, vaccines and other interventions					
Policy-level indicator (Result indicator): Number of international research projects in the field of rational use of antibiotics					
Baseline value: 0			Target value: 3		
Base year 2018			Date of policy implementation 2021		
Verification source: AMMD, HCF websites					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.5.1. Participation of facilities from Serbia in international clinical studies and research in the field of medicine and veterinary medicine.	Health care facilities, scientific research centres	Medical and veterinary science universities	- List of clinical trials and laboratory research to develop new medicines, diagnostic tools, vaccines and other interventions. - Number of papers published as a result of the research	AMMD website, health care facilities' websites	continuously
Policy 2.6 .: Raising awareness, changing behaviour and understanding ABR among those who prescribe, dispense and use antibiotics					
Policy-level indicator (Result indicator): 1. Number of trainings 2. Number of updated curricula of the medical sciences universities 3a. Percentage of people familiar with the fact that the cold and flu are not treated with antibiotics 3b. Percentage of people familiar with the term antibiotic resistance					
Baseline value: 1. 35 2 0 3a. 32% 3b. 60%		Target value: 1. 65 2. 2 3a. 42% 3b. 70%			
Base year 2018		Date of policy implementation 2021			
Verification source: MoH website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.6.1. Continuous education of health professionals in medicine and veterinary medicine on policies for prescribing, dispensing and using antibiotics, policies of prevention and control of infections	MoH, MAFWM, VCS and chambers of health professionals in collaboration with universities,		- Type and number of educational activities (workshops, lectures, symposia) conducted, - Number of participants	MoH website, MAFWM website	continuously

	professional associations and IPHS				
2.6.2. Education and regular communication with managers of health care facilities and those responsible for the development and monitoring of health policies	MoH-MCG		<ul style="list-style-type: none"> - Type and number of educational activities - Number of participants 	MoH website	continuously
2.6.3. Updating university curricula to include rational use of antibiotics and ABR	ME	MoH-MCG, MAFWM, MoD, medical and veterinary science universities	<ul style="list-style-type: none"> - Report on the amendments of the curricula - Information on the number of hours in the updated curricula 	MoH website	Q4 2021
2.6.4. Marking the World Antibiotic Awareness Week on the (WAAW) and European Antibiotic Awareness Day (EAAD)	MoH - MCG, MAFWM	Professional associations, civil society organizations	<ul style="list-style-type: none"> - Number and list of activities - Number of participants in activities (trainers and participants) - Number of partners (institutions, associations) -Type and number of promotional materials distributed -Media coverage - number of media reports - Number of media outlets included (TV, web, radio, print) 	MoH website, MAFWM website	continuously
2.6.5. The campaign for the rational use of antibiotics – continuous informing of the expert and general public on the rational use of antibiotics in human and veterinary medicine	MoH - MCG, MAFWM	Professional associations, civil society organizations	<ul style="list-style-type: none"> - Number and list of activities - Number of participants in activities (trainers and participants) - Number of partners (institutions, associations) -Type and number of promotional materials distributed -Media coverage - number of media reports 	MoH website, MAFWM website	continuously

			- Number of media outlets included (TV, web, radio, print)		
2.6.6. Marking the International Hand Hygiene Day	MoH - MCG, IPHS with its network of institutes	NEC for healthcare-associated infections, professional associations	<ul style="list-style-type: none"> - Number and list of activities - Number of participants in activities (trainers and participants) - Number of partners (institutions, associations) -Type and number of promotional materials distributed -Media coverage - number of media reports - Number of media outlets included (TV, web, radio, print) 	MoH website, IPHS website	continuously
2.6.7. Campaign on hand hygiene -Continuously informing and educating the general and expert public about hand hygiene	MoH - MCG, IPHS with its network of institutes	NEC for healthcare-associated infections, professional associations	<ul style="list-style-type: none"> - Number and list of activities - Number of participants in activities (trainers and participants) - Number of partners (institutions, associations) -Type and number of promotional materials distributed -Media coverage - number of media reports - Number of media outlets included (TV, web, radio, print) 	MoH website, IPHS website	continuously
2.6.8. Setting up websites	MoH - MCG		<ul style="list-style-type: none"> - Website set up - Number of web banners with a link to the site 	MoH website	Q2 2019
2.6.9. Continuous provision of information and education for doctors of veterinary medicine, farm owners, animal breeders on the responsible use of antibiotics	MAFWM	VCS, CCS, FVM, associations	<ul style="list-style-type: none"> - Number of prepared educational materials for different categories announced on the MAFWM website - Number of trainings 	MAFWM VD website	continuously
2.6.10. Study for the evaluation of knowledge and awareness among different population groups about	MoH	IPHS with its network of institutes	- The report on the study with a knowledge assessment	IPHS website	Q3 2021

the use of antibiotics			- The recommended policies based on the findings of the study		
Policy 2.7 .: Promoting the importance of waste management					
Policy-level indicator (Result indicator): Number of Educations Held					
Baseline value: 0		Target value: 2			
Base year 2018		Date of policy implementation 2021			
Verification source: MoH website, MAFWM website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
2.7.1. Education of pharmacists and distribution of promotional material (posters), regarding the disposal of unused/remaining antibiotics in households	MoH	PCS, PU, IPHS with its network of institutes and professional associations	- Educational and promotional material prepared	MoH website	Q4 2021
2.7.2. Education of veterinarians, animal owners and breeders about the importance of proper disposal of unused antibiotics and antibiotics after their expiry	MAFWM	VCS, FVM, associations	- Report on implemented activities	MAFWM website	Q4 2021
Specific objective 3: Prevention and reduction of outbreaks and infection spread control					
Specific objective indicator (Outcome indicator): 1a.Incidence of infections on the wards with an increased risk-intensive care unit 1b. The incidence of infections on the wards with an increased risk - surgery 2. Prevalence of infections	Baseline value: 1a. 24% 1b. 6% 2. 4.6%		Target value: 1A.22% 1b. 5% 2. 4.0%		
	Base year: 2017		Year of accomplishment of the specific objective: 2021		

Verification source: MoH websites, web pages IPHS					
Policy 3.1 .: Prevention and control of infections in hospitals and extended care facilities					
Policy-level indicator (Result indicator) Increased number of hospitals and extended care facilities with active infection surveillance					
Baseline value: a) hospitals: 42 b) extended care facilities: 5		Target value: a) hospitals: 65 b) extended care facilities: 25			
Base year 2017		Date of policy implementation 2021			
Verification source: IPHS website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
3.1.1. Define specific targets for HAI surveillance	MoH	NEC for HAI surveillance/ IPHS with its network of institutes	- Law Rules on reporting communicable diseases and special health issues - Ordinance on the Prevention, Early Detection and elimination of Healthcare-Associated Infections - HAI prevalence surveys carried out and results analysed	- "Official Gazette of the RS" - MoH website - IPHS website	Q3 2019
3.1.2. Establish an operational team for the prevention and suppression of HAI in every hospital	MoH	NEC for HAI surveillance / MoD-MHD / health care facilities	- Operational team with the recommended number of staff established	- hospitals' websites	Q4 2020
3.1.3. Improve surveillance of HAI in primary health care, social protection institutions that provide health care services and in private practice	MoH	NEC for HAI surveillance / MoD-MHD / health care and social protection institutions/ IPHS with its network of institutes	- A nurse already working in primary health and social protection institutions trained in HAI surveillance (part of their working hours)	- websites of primary health care facilities - websites of social protection intuitions / nursing homes	Q4 2020
3.1.4. Define a minimum set of data that hospitals submit to the competent institute of public health	MoH	NEC for HAI surveillance/ MoD-MHD/ IPHS with its	- Number of annual reports with a defined set of data submitted by the hospitals to the institute of public health	- IPHS website	Q1 2019

		network of institutes			
3.1.5. Integrate laboratory activities in HAI prevention, suppression and surveillance	MoH	NEC for HAI surveillance / MoD-MHD / IPHS with its network of institutes/ all health care and social protection institutions	- Adopted Ordinance on Reporting Laboratory Results and the National Reference Laboratory	- "Official Gazette of the RS "	Q4 2020
3.1.6. Establish a system of HAI surveillance in all health care and social protection institutions based on EU definitions and methods (direct, timely reporting of all micro-organisms identified in the laboratory)	MoH	NEC for HAI surveillance/ operational teams	- Percentage of hospitals, other health care and social protection institutions that provide health services with the established system of HAI surveillance	- "Official Gazette of the RS" - IPHS website	Q4 2019
3.1.7. Establish a system to monitor the implementation of policies to prevent and suppress HAI	MoH	NEC for HAI surveillance/ operational teams	- Prepare a situation analysis	IPHS website	Q1 2020
3.1.8. Establish the use of standardized electronic reporting of HAI	MoH	NEC for HAI surveillance/ MoD-MHD / IPHS with its network of institutes/all health care and and social protection institutions	- Standardized electronic HAI reports prepared	- IPHS website - website of the Institute of Public Health of Vojvodina	Q4 2020
3.1.9. Conduct data analysis on HAI surveillance collected through monitoring the incidence and follow the incidence rate trend	MoH/MoD-MHD	IPHS with its network of institutes/all health care facilities	- Incidence rate and incidence density rate (stratified by HAI site and risk factor) for each year	- IPHS website - website of the Institute of Public Health of Vojvodina	Q1 2019 – and onwards

3.1.10 Prepare reports on the data analysis on the HAI surveillance at national and regional level	MoH/MoD-MHD	IPHS with its network of institutes/all health facilities	- Number of reports	- MoH website - IPHS website - website of the Institute of Public Health of Vojvodina	Q1 2019 – and onwards
3.1.11. Prepare guidelines/manuals for prevention and suppression of HAI	Medical School/MoH	NEC for HAI surveillance / IPHS with its network of institutes	- Number of prepared guidelines/manuals	- IPHS website	Q4 2019 – and onwards
3.1.12. Training of health professionals in accordance with the guidelines/manuals for the prevention and suppression of HAI	University Medical School/ MoH	NEC for HAI surveillance / IPHS with its network of institutes	- Number of CME educations in different areas of healthcare-associated infections	IPHS website	Q1 2020 - continued
3.1.13. Implementation of the Fifth National Healthcare-Associated Infections and Antibiotic Consumption Prevalence Survey within the European survey	MoH	NEC for HAI surveillance/ IPHS with its network of institutes	- Prevalence survey conducted and the results analyzed	- MoH website - IPHS website - MoH website	Q4 2021
Policy 3.2 .: Prevention and control of infection in animals					
Policy-level indicator (Result indicator): Number of educations					
Baseline value: 0		Target value: 6			
Base year 2019		Date of policy implementation: 2021			
Verification source: MAFWM-VD website					
Activities for the implementation of policies	Implementing institution	Partners in the implementation of activities	Activity level indicator	Verification source	Deadline for implementation of activities
3.2.1. Education on the application of methods for the prevention of disease and promotion of vaccination	MAFWM		- Information on the implemented activities	MAFWM VD Website	continuously
3.2.2. Education on the application of biosecurity policies on farms	MAFWM		- Information on the implemented activities	MAFWM VD Website	continuously

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