CHILEAN NATIONAL PLAN ON ANTIMICROBIAL RESISTANCE 2021–2025

















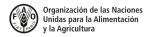
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Acknowledgements

"Working Together to fight Antimicrobial Resistance" Project, coordinated by the Pan American Health Organiza- tion (PAHO), United Nations Food and Agriculture Organization (FAO), World Organization for Animal Health (OIE), and financed by the European Union.









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GLOSSARY

ACHIPIA: (Agencia Chilena para la Inocuidad y la Calidad Alimentaria) - Chilean Agency for Food Safety and Quality

APEC: Asia Pacific Economic Cooperation

ARAISP: (*Agentes con resistencia a antimicrobianos de importancia en Salud Pública*) - Antimicrobial Resistant Agents of Relevance to Public Health

of Relevance to Fublic Health

AWaRe: (Access, Watch, and Reserve) developed by the WHO for AMR

CDC: Center for Disease Control

CESFAM: (Centros de Salud Familiar) - Family Health Centers

CRS: (*Centros de Referencia Secundaria*) – Secondary Referral Centers

DIGERA: (División de gestión de la red asistencial) - Division for Management of the Healthcare Network

DIPOL: (División de Políticas Públicas saludables y Promoción) - Division for Healthy Public Policies and Promotion

DIPRECE: (División de Prevención y Control de Enfermedades) - Division for Disease Prevention and Control

DIVAP: (*División de atención primaria*) – Division for Primary Healthcare

ELEAM: (Establecimientos de larga estadía de adultos mayores) - Long-Term Stay Facilities for the Elderly

EPV: (Enfermedades prevenibles por vacuna) - Vaccine Preventable Diseases (VPDs)

ETA: (*Enfermedades transmitidas por alimentos*) – Foodborne Illnesses

FAVET: (Facultad de Ciencias Veterinarias y Pecuarias) - School of Veterinary and Livestock Sciences

GES: (*Garantías Explícitas en Salud*) - Explicit Health Guarantees Regime

GIRAM: (*Grupo interministerial para la Resistencia a los Antimicrobianos en la cadena alimentaria Interministerial*) – Interministerial Group on Antimicrobial Resistance in the Food Chain

IAAS: (Infecciones asociadas a la atención de salud) - Healthcare Associated Infections (HAIs)

IFOP: (*Instituto de Fomento Pesquero*) - Fisheries Development Institute

ISP: (Instituto de Salud Pública) - Institute of Public Health

ITS: (Infecciones de transmisión sexual) - Sexually Transmitted Diseases (STDs)

MINSAL: (Ministerio de Salud) - Ministry of Health

OIE: (Organización Internacional de Sanidad Animal) - World Organization for Animal Health

ONUSIDA: (*Programa Conjunto de las Naciones Unidas sobre el VIH/Sida*) - Joint United Nations Program on HIV/AIDS (UNAIDS)

OMS: (Organización Mundial de Salud) - World Health Organization (WHO)

OPS: (Organización Panamericana de Salud) - Pan American Health Organization (PAHO)

PGSA: (Programa para la Gestión Sanitaria de la Acuicultura) - Aquaculture Health Management Program

PrEP: (Profilaxis Pre Exposición Sexual) - Pre-Exposure Prophylaxis

PROA: (Programa de optimización de uso de antimicrobianos) - Antimicrobial Stewardship Program

RAM: (Resistencia a los antimicrobianos) - Antimicrobial Resistance (AMR)

REAS: (Residuos generados en establecimientos de atención de salud) - Healthcare Waste (HCW)

SAG: (Servicio Agrícola y Ganadero) - Agricultural and Livestock Service

SEREMI: (Secretarías Regionales Ministeriales) - Ministerial Regional Secretariats

SERNAPESCA: (Servicio Nacional de Pesca y Acuicultura) - National Fisheries and Aquaculture Service

SUBDERE: (Subsecretaría de Desarrollo Regional y Administrativo) - Undersecretariat of Regional and Administrative Development

SIDA: (Síndrome de inmunodeficiencia adquirida) - Acquired Immunodeficiency Syndrome (AIDS)

VIH: (Virus de Inmunodeficiencia Humana) - Human Immunodeficiency Virus (HIV)



Address by the Minister of Health Enrique Paris

In 2014 the World Health Assembly (WHA67.25) spoke of the grave threat to public health posed by antimicrobial resistance and adopted a Global Action Plan to fight against it and ensure continued prevention and treatment of communicable diseases. As of then, countries drafted National Action Plans according to the guidelines of the international agencies, intersectoral and with the One Health approach, which allows devising strategies not only based on the health sector as such but also other sectors related to the use of antimicrobials and their ecological consequences.

Chile faced the challenge of implementing a National Plan on Antimicrobial Resistance with the One Health approach as of 2017, formulating an intersectoral National Plan that set out interministerial commitments for making headway along the established strategic guidelines. The 2017–2020 Chilean National Plan on AMR considered the same strategic lines as the Global Action Plan, achieving progress in human health as well as animal health thanks to joint work by various government agencies and in collaboration with academia and scientific societies.

This second version of the National Plan on Antimicrobial Resistance for 2021–2025 upholds the commitment to jointly address communicable disease by safeguarding the efficacy of antimicrobials, at a complex time when infection has gained new prominence on account of the COVID–19 pandemic that today affects humanity. The effective use of antibiotics and managing bacterial infection in patients infected by the SARS–CoV–2 virus is an added challenge that we must address as a society, and specifically as the health system, building awareness of the importance of combating the silent pandemic posed by bacterial resistance.



Address by the Minister of Agriculture María Emilia Undurraga

Through this document our Ministry addresses the global challenge of food safety and security that we face permanently with an impact on consumers, producers, and society as a whole, on account of the impact on human health as well as animal and plant health.

The plan marks the start of a new cycle in the activities that Chile will carry out to address antimicrobial resistance, renewing our commitment to collaborate among various actors, so that efforts may be efficient and uphold the "One Health" approach, highlighting the value of cooperation and the role of various groups and disciplines that work on this topic with a systemic approach that considers the interconnectivity of social and environmental dimensions.

Antimicrobials are of key importance for the treatment of disease in humans as well as animals and plants -that represent a relevant part of the farm and forest resources in our country. This is why the Ministry of Agriculture and its services constantly support producers in the prudent, wise, and responsible use of antibiotics, upholding the standards of quality that position us as world leaders.

Our efforts over the years past and future shall be to identify the best policies and practices in this regard as well as creating synergies to devise an integrated Antimicrobial Resistance surveillance program to cover the entire food chain and with the results adopt new measures for prevention. With this we will be each time more prepared and prevent this world issue from increasing its impact, so we may continue developing our sector in a sustainable, innovative, and competitive manner.



Address by the Minister of the Environment Carolina Schmidt

The new challenges we face in terms of biodiversity and climate change deserve a timely response and commitment by all sectors involved. The deterioration of our surroundings has a major impact on the quality of life of people, comprehensively affecting the ecosystem of services that we depend on. In tune with the antecedents provided by science in these matters, we have raised the promotion of new and better instruments to address the issue of conservation and sustainable use of our natural heritage as a priority for the country.

The current scenario we are facing with the pandemic caused by the SARS-CoV-2 virus is not beyond our capacities and poses new environmental challenges that we must address in a coordinated manner. The origin of this health crisis lies in the transmission of disease from animals to human beings. There are various factors behind this issue: deforestation, changes in soil use, climate change, and the illegal trade of wild species. This situation drives closer the relation between wildlife and people, which allows animal microbes to transfer to people and produce infections that spread around the world. Therefore, we ask IPBES –the most important scientific platform in the world with regard to biodiversity– to, supported by the best science at its service, make recommendations on public policy to prevent future pandemics and protect people as well as nature.

The appearance of COVID-19 has entailed the use of substances -antimicrobials and disinfectants- to control its spread. If these are used improperly, they will end up in the environment and have an impact on ecosystems and biodiversity, leading to the appearance of what we know as Antimicrobial Resistance (AMR). Therefore, as the Ministry of the Environment we have produced the handbook of "Good Environmental Practices for Cleaning and Disinfection in places with high traffic of people", that aims to provide guidance for citizens on the use of chemical substances for the control of COVID-19, reducing inasmuch as possible their impact on our surroundings.

The role played by the environment in the appearance and spread of antimicrobial resistance is vital. It is each time more evident that it is necessary to reconsider our relation with our surroundings, the way we protect and preserve our ecosystems and the goods and services that nature provides, as well as the biodiversity that protects us from these pandemics. It is imperative to learn of the repercussions of these diverse interactions with the environment and biodiversity, the pathogen reservoirs that may cause future pandemics arising from zoonosis, preventing the generation of Antimicrobial Resistance on time and promoting the "One Health" approach.

In this context it is necessary to identify the environmental sources and the AMR transmission pathways, as well as the resistant bacteria and genes classified as of highest priority for national public health. Surveillance of antimicrobial resistance is an essential tool to have an overall view of critical resistance mechanisms and bacteria, and ba-

sed on the outcomes assess strategies to contain the spread of AMR. To achieve all this, it is necessary to have intersectoral perspectives and approaches to drive forward with transformations leading to sustainability, in addition to encouraging understanding of the relation between degradation and restoration of ecosystems, the structure of the landscape, and the risk of new diseases.

In line with this, the Ministry of the Environment is actively working on the Post 2020 Global Biodiversity Framework, that will lay the path to safeguard nature and its contributions to human wellbeing in the coming 10 years.

During this period to review world targets in terms of biodiversity, coronavirus has obliged us to take this new challenge seriously. Therefore, protected areas have been an essential pillar for meeting international commitments within the framework of the Convention on Biological Diversity, and will surely also be a priority for the Post 2020 Framework.

We must continue making headway toward responsible management of our resources in harmony with the environment. This is the only path that will allow us to improve the quality of life of people, ensuring our prosperity as humanity and the wellbeing of our entire home: the planet.



Address by the Minister of Science, Technology, Knowledge, and Innovation Andrés Couve

The pandemic caused by SARS-CoV-2 once again showed how fragile the human being is. However, at the same time, it also showed our tremendous capacity to organize ourselves and react to the unknown, to create networks and structures to generate new knowledge and new capacities to respond to the challenges we face as a species.

We know viruses are not the only threat for which we should be prepared. Rather, we should extend this preparation to microbes in general. The improper use and abuse of antimicrobials such as antibiotics have favored their resistance and are challenging areas we believed already resolved.

The phenomenon of antimicrobial resistance (AMR) is -to a certain extent- comparable to climate change. Also, its origin lies in the scarcely responsible behavior of our species and may entail serious consequences. For example, excessive administration or improper use of antibiotics in companion animals and the possible transfer of disease to the population through close contact, or the contamination of soil and water; mass inclusion in the farming sector, especially pest control using pesticides, and microbial control in the meat industry; or intensive use of pharmacological substances in developing aquaculture species for human consumption. All situations that imply a risk to the sustainability of agrifood systems and a threat to human health, due to the contamination of products and the environment with resistant bacteria or antimicrobial residues.

The scientific community has accumulated experience, knowledge, and tools to address, contain, and combat this issue.

Surveillance studies may provide valuable information for detecting trends in the type of microorganism and the frequency of some pathogens in certain ecosystems -causing infections in humans and antimicrobial resistance mechanisms-, also developing specific interventions adapted to each context. Likewise, comparing data over time allows assessing the efficacy of these interventions and making corrections.

Creating a cross-cutting workplan on this topic with a five-year horizon and an interministerial approach, in addition to collaboration by various actors in the public and private world, seeks to promote research into AMR, furthering relevant scientific projects to create new knowledge about microorganisms, about the antimicrobial resistance mechanisms, and provide alternative solutions to their use.

As the Ministry of Science, we expect all efforts and progress made in this regard -at both individual and collaborative level- will lead to coordination, convergence, and may translate into practical applications showing their usefulness and efficacy in protecting the health of the population. In this way we will strengthen the transfer of quality knowledge that is relevant to issues and demands that affect our society.

Introduction





Antimicrobials are indispensable medicines for treating a series of infectious processes in humans as well as animals. However, their use entails the risk of microorganisms becoming -in their natural adaptation process- resistant to antimicrobials, compromising the chances of treating the disease. The appearance and spread of bacteria or other multiresistant agents, together with the slow development of new therapeutic alternatives, have been recognized as one of the greatest problems affecting public health and animal health to be addressed today.

In 2014 the World Health Assembly highlighted Antimicrobial Resistance (AMR) as a growing threat to world health and urged member countries to develop National Action Plans on the basis of a Global Action Plan to combat AMR, recognizing as main strategies the prudent and responsible use of antimicrobials, AMR surveillance, and the control of infections leading to a reduction in the need to use antimicrobials. All of this supported by effective communication to the population, adequate professional training to avoid the improper use of antimicrobials, and furthering the development of research and innovation in new technology to allow taking care of these medicines.

The use of antimicrobials and generating resistance occurs not only in the sphere of human health. The use of these drugs on animals to produce terrestrial and aquatic food is essential to animal health and wellbeing since it allows combating infectious diseases, which is also related to food safety. In agricultural produce the use of pesticides with antimicrobial effects allows combating pests that affect food production. However, the excessive use of antimicrobials in the food industry has contributed to speeding up the development of AMR, implying a risk to the sustainability of agrifood systems and threatening health through the contamination of products and the environment with resistant bacteria or antimicrobial residues.



Finally, antimicrobials are also used to treat disease in companion animals and equines, and excessive or improper use in these animals also contributes to generating AMR and spreading to human beings through close contact or contamination of the soil or water with resistant bacteria or antimicrobial residues.

Hence AMR is a complex issue to be addressed with a multisectoral approach. This strategy is the so-called "One Health" principle, which means establishing collaborative and integrated programs among various stakeholders and which will allow better outcomes, considering that what we do in one sector will affect the others, and that joint work is required to address these issues.

Chile has responsibly taken on the challenge of implementing a National Plan on Antimicrobial Resistance with the One Health approach. In 2016 the country was a pioneer in Latin America in formulating an intersectoral National Plan, establishing interministerial commitments to move ahead with the devised strategies. The 2017–2020 National Plan on AMR contemplated the same strategic lines as the Global Action Plan, achieving progress in human health as well as animal health, thanks to joint work by various government organizations in collaboration with academia and scientific societies. Chile also has a long history in terms of resistant microorganism surveillance, controlling noso-

comial infections, and implementing hygiene and sanitation measures. Additionally, Chile has ample health service coverage based on primary care, and is committed to continue progressing in its fight against AMR.

The new National Plan on Antimicrobial Resistance was designed for the 2021–2025 period and has added new Ministries to its joint work. In this way, efforts by the Ministry of Health, Ministry of Economy through its National Fisheries and Aquaculture Service, and the Ministry of Agriculture were joined by the Ministry of Education, Ministry of the Environment, and the Ministry of Science, Technology, Knowledge, and Innovation, which will allow extending the scope of the actions contemplated to sectors not addressed under the first plan. Scientific societies, universities, and other public and private institutions were involved in drafting this document for the next five years.





GLOBAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE



The World Health Organization (WHO) has instructed member countries to draft National Plans to address the challenges stemming from antimicrobial resistance (AMR), with a multisectoral approach and defining objectives based on five strategic guidelines aiming to build awareness and educate key actors and the general population with regard to AMR, conduct epidemiological surveillance of microorganisms, prevent the appearance of infections and controlling these when they do appear –particularly in hospital facilities–, promote the regulation and responsible and prudent use of antimicrobials, and build knowledge with regard to antimicrobial resistance 1¹,².

A diagnosis was conducted in Chile in 2016 with regard to the situation of the various strategies related to the control of antimicrobial resistance, and which were carried out in a segmented manner in the country. This exercise allowed identifying gaps and drafting proposals for the design of the first National Plan on AMR, with activities foreseen to be developed from 2017 to 2020³.

The first step was to enhance antimicrobial resistance as a relevant public health issue requiring political support by multiple sectors. In this way, in April 2017 a cooperation agreement was signed among the Ministry of Health, Ministry of Agriculture, and Ministry of Economy through its National Fisheries and Aquaculture Service, to address AMR. This agreement, fully operational as of that same year, was materialized in coordinated and collaborative work by various agencies in the purview of these three ministries and under the technical secretariat of the Undersecretariat of Public Health, Ministry of Health.

The National Action Plan on AMR was approved in July 2017 under Exempt Resolution No.892 of the Ministry of Health, and addressed the five strategic objectives of the WHO¹ Global Action Plan⁴. The current situation and the progress achieved are described below:

1. Improve public awareness and professional training





From 2017 to 2020 the different agencies related to the National Plan to address AMR promoted, developed, and collaborated in various activities aiming to promote the topic of AMR. Various communication campaigns by the Agricultural and Livestock Service (SAG), National Fisheries and Aquaculture Service (SERNAPESCA), Chilean Agency for Food Safety and Quality (ACHIPIA), and the Ministry of Health (MINSAL) were deployed each year through various communications media, aiming to inform the population at large, producers, and prescribers, of the relevance of responsible and prudent use of antibiotics. These dissemination activities have been especially relevant during the World Antimicrobial Awareness Week, held every year in the month of November.

In addition to these activities promoted by government agencies there has been strong support by academia, universities, and scientific societies, including associations for research into human and animal health through organizing and participating in conferences, seminars, and workshops on AMR, among other activities. Additionally, in 2019 our country was responsible for organizing the Global Conference on Aquatic Animal Health by the World Organization for Animal Health (OIE), activity that supplements the efforts made to position the topic in all areas of the country⁵.

With regard to professional training, educational content on systematic AMR and with an interdisciplinary approach is still scarce. However, varied initiatives have come up related to face-to-face and on-line training on the use of antimicrobials in human and veterinary medicine. Examples of these are the Diploma course on the proper use of antimicrobials in aquaculture, which came about through collaboration by SERNAPESCA and the University of Chile School of Veterinary Science, as well as training courses on AMR in human health offered by the Ministry of Health, scientific societies, universities, and international agencies.

2. Integrated surveillance of antimicrobial resistance





Institutionality in Chile is currently more robust and in a constant process of integration to address AMR under the "One Health" principle, promoting an interdisciplinary and integrated approach to issues affecting public health. Among the most relevant progress made in terms of AMR is approval of the new Regulation on Statutory Notification of Infectious Diseases and their Surveillance, which extends the number of causative organisms subject to surveillance and susceptible to antimicrobials that have been isolated from clinical samples, community based as well as associated to

healthcare. The decree also includes surveillance of environmental matrices such as water and food, and the surveillance of disease of any communicable etiology, including outbreaks produced by foodborne illnesses and healthcare associated infections (HAI)7.

Also relevant in this period is Decree No.16 passed in March 2019, and which amends Technical Norm No.175 on National Surveillance of Antimicrobial Resistance in agents that may produce infections associated to healthcare, and which updates surveillance of antimicrobial resistance in this type of infection by extending the list of agents subject to study and confirmation by the Institute of Public Health (ISP)8.

Within the context of integrated surveillance, during this period a pilot surveillance study was carried out for Salmonella spp resistance in poultry flesh, stemming from samples obtained by the National Surveillance Program of pathogens in food, coordinated by the Ministry of Health, a joint study between ACHIPIA and the ISP. This pilot is currently being extended to include samples obtained from slaughter plants or farms, which in turn will give rise to the implementation in coming years of integrated surveillance of different food chains.

At academic and scientific society level it is worth noting the existence of the Collaborative Group on bacterial resistance of the Chilean Society of Infectious Diseases, which is a consolidated group that has been working for years and systematically gathers information from more than 20 facilities throughout the country. Through their work they have devised strategies to address the issue of antibacterial resistance and have publications showing their work, recommendations, and national surveillance data for different agents.

3. Prevent and control infections associated to healthcare

Since 1982 in Chile there is a Surveillance Program of Healthcare Associated Infections (HAI). This program, in addition to maintaining a specific surveillance program on AMR of healthcare–associated agents for more than two decades, in recent years has drafted and updated various regulatory documents aiming to improve surveillance and contain the spread of AMR, the most relevant being:

- » Communication and implementation in hospitals since 2017 of the norms updating standard definitions and operational criteria for the notification of HAIs for epidemiological surveillance and the drafting of the appropriate handbook⁹.
- » Approval in 2018 of an update to the Technical Norm on Preventing Infection in Surgical Wounds. Among other things, this norm regulates the prophylactic use of antibiotics and which had not undergone relevant amendments since 1989¹⁰.
- » Approval in 2018 of the Technical Norm on Preventing and Spreading of Antimicrobial Resistant Agents of Relevance to Public Health (ARAISP) which aims at preventing the endemic or epidemic spread of ARAISP and its impact on inpatient facilities¹¹.
- » Inclusion in 2019 of Candida auris as ARAISP due to its high resistance to antimicrobials, which re-

- presents a risk to public health due to the limited number of available therapeutic options, morbimortality, associated costs of treatment, and possible association to grave epidemic outbreaks¹².
- » Update of the norm regulating the reprocessing of medical devices for clinical use (high-level sterilization and disinfection), a component of the standard precautions associated to infection outbreaks by relevant antimicrobial resistant agents, especially carbapenemase-producing enterobacter¹³.

Likewise, in late 2020 participation began in the joint project among CDCs, PAHO, and Argentina, an AMR Networking of Networks Initiative that seeks to strengthen the capacity to detect AMR events of relevance to Public Health and facilitate a quick response to contain certain agents with antimicrobial resistance of interest.

4. Optimum use of antimicrobials in human and animal health





Following the 2017-2020 National Plan guidelines, the work carried out by the Agricultural and Livestock Service (SAG) was highlighted in view of the OIE recommendation to member countries with regard to gathering quantitative data on the sale of antimicrobials in order to establish patterns of use. In this way, during 2017 a norm was adopted establishing requirements for the sale of antimicrobials for veterinary use in Chile. This norm establishes that national pharmaceutical producing laboratories as well as importers should annually report the absolute amounts, in kilograms, of active antimicrobials traded during the year14. A second norm along the same lines was passed establishing requirements for the registration, trading, and use of antimicrobials for veterinary use, highlighting the need to be explicit on the purpose for which it is used, prescription-only sale, determining situations when the prescription should be retained, and the explicitly forbidden use of antimicrobials to promote growth 15.

For its part, SERNAPESCA currently has a certification program for "free of antimicrobials" in the salmon farming industry¹⁶, with an "online" prescription system for veterinarians and a good practices program since 2015 which promotes the responsible use of antimicrobials¹⁷. From 2016 to 2019 SERNAPESCA implemented the Aquaculture Health Management Program (PGSA), an initiative financed by the Ministry of Economy and salmon farmers and associations, its main goal being to generate public information to improve the efficiency and efficacy of the disease control programs and improve public-private health management in aquaculture. Implementation also began in 2020 of the PROA/ Salmon Program, a voluntary official certification program for farms designed on the basis of recommendations by the Aquaculture Health Management Program (PGSA) and experience in the industry as such¹⁸. Today, the use of antimicrobials in the salmon farming industry has dropped by 45% since 2015, an achievement that is directly related to the activities promoted by SERNAPESCA as described above19.



As to the use of antimicrobials in humans, during this period the Ministry of Health drafted Technical General Norm No.210, passed on 29 December 2020, and which updates Technical General Norm No.43 on the rationalized use of antimicrobials in clinical care, which strengthens the creation of an Antimicrobial Stewardship Program (PROA) in medium and high complexity hospitals, and which will also allow monitoring the use of these drugs at these health facilities throughout the country²⁰. Additionally, the National Tuberculosis Program, besides the universal surveillance of antimicrobial resistance established several years back, included new treatments for drug-resistant tuberculosis in order to improve the outcomes of anti-tuberculosis treatment²¹.

The first intersectoral panel to address bacterial resistance in small animals was set up in 2019. The panel comprises various members of the University of Chile School of Veterinary and Livestock Sciences (FAVET) as well as faculty members and professionals from Universidad Mayor, Universidad de Concepción, Chilean Society of Infectious Diseases Antimicrobial Committee, Institute of Public Health, Agricultural and Livestock Service, and the College of Veterinarians, also supported by the Una Salud-Chile group. This group created the first Handbook of Good Practices for the use of antimicrobials in small animals, a document that

was made official by the SAG and MINSAL.

Finally, it should be noted that the "Protected Pet" Program for Responsible Keeping of Companion Animals which provides funding to public and private entities to perform veterinary services (sterilizations, vaccination, identification, consultations). For example, only in 2020, 185 Municipalities, 38 governorships, and 59 organizations took part. For veterinary services the Program has a "Handbook of Medical Protocols" as a guideline for all these services, implemented by the same entities or third parties and which considers all current related technical standards, demonstrating there is territorial institutionality for the proper use of antimicrobials in these animals.

5. Research related to antimicrobial resistance

The 2017-2020 National Plan was a strong incentive creating interest in the topic of antimicrobial resistance, expressed not only in active participation by government institutions, scientific associations, and professional training centers in conferences, seminars, and related workshops, together with awareness building communication campaigns, but also in terms of a sustained growth in the number of national and international scientific publications in the country on this topic. To date there are 97 research papers published in Chile on this topic in the PubMed database from 2017 to 2020. Of these, 35 publications are studies on humans, 20 papers on terrestrial animals and salmon farming, and 12 publications on antimicrobial resistance in the environmental sphere (essentially surface water studies).

In terms of aquatic animal production, the Fisheries Development Institute carried out a scientific research program called "Surveillance of pathogen agent resistance to commonly used antimicrobials in national salmon farming" deployed in stages (currently at Stage VI). The program focused on two major topics: on the one hand validation and standardization for assessing bacterial susceptibility to antimicrobials commonly used in salmon farming in Chile for various pathogen agents, and on the other defining criteria for proper interpretation of the results²².

In 2019 the ISP published a study on antimicrobial resistance and the antibiotics most sold in Chile²³, and actively took part in organizing an international workshop titled "Building Competence in Antimicrobial Resistance Surveillance among APEC Economies" in 2018 organized by ACHIPA and the University of Chile School

of Veterinary and Livestock Sciences²⁴. These activities show a positive trend in research and knowledge creation in relation to AMR.



Strategic lines of the 2017-2020 National Plan on Antimicrobial Resistance.

Methodology for drafting the 2021-2025 Plan

The drafting of this document followed a methodology based fundamentally on WHO strategic guidelines with regard to AMR (2015) and their adaptation to national reality, working from an intersectoral perspective and taking into account the limitations and restrictions due to the COVID-19 pandemic. This latter situation implied that all work was performed online.

A first activity was an assessment of progress and gaps with regard to the 2017-2020 National Plan on Antimicrobial Resistance, by means of drafting and disseminating a document that was later discussed in the AMR Intersectoral Panel²⁵. At a second meeting of the intersectoral panel the methodological aspects were made known for drafting of the current version, and general ideas were gathered as to the content. Subsequently a first draft of this document was circulated, and observations, comments, and topics were received and systematized in a second draft. Once the missing or supplementary information had been gathered, a preliminary final draft was prepared. This first stage was conducted from December 2020 to January 2021, and for this purpose an external consultant was hired by the Pan American Health Organization within the context of the "Working together to fight Antimicrobial Resistance" project²⁶.

A second stage consisted in disseminating the preliminary version and collecting observations by AMR technical panels. The first panel was the Committee on Antimicrobial Resistance of the Ministry of Health, coordinated by the Technical Secretariat for the plan. The second panel was the interministerial Group for Implementation of the National Action Plan, coordina-

ted by ACHIPIA. At the same time, the document was distributed among other departments and offices of the Ministry of Health and whose policies and actions were related to Antimicrobial Resistance, in order to gather their contributions and opinions. A second version of the plan was drafted with the feedback from both of these technical panels and the other departments consulted.

Finally, this last version was disseminated among the various Health SEREMIS and participating research centers, scientific societies, and related members of academia and other public institutions to gather their contributions and observations.

At the end of this third round the drafting of the document was considered finished and sent to the authorities for approval.

Table 1 shows the different institutions and agencies that took part in the design of the plan.

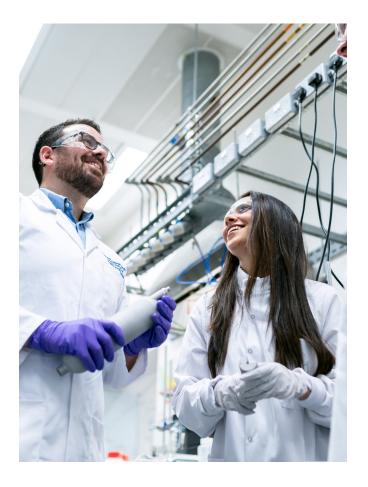
Table 1. Participating agencies in the various drafting stages of the 2021–2025 National Plan on Antimicrobial Resistance.

Stage	Participating agencies and institutions
FIRST STAGE Intersectoral Panel	 National AMR Plan Technical Secretariat. Department of Communicable Diseases (DIPRECE-MINSAL) Chilean Agency for Food Safety and Quality (ACHIPIA). Ministry of Agriculture Agricultural and Livestock Service (SAG). Division for Agricultural and Forestry Protection. Ministry of Agriculturera. National Fisheries and Aquaculture Service (SERNAPESCA). Ministry of Economy Ministry of the Environment Ministry of Science, Technology, Knowledge, and Innovation Institute of Public Health (ISP). Ministry of Health National Program on the Control of Healthcare Associated Infections (HAIs). Undersecretariat of Healthcare Networks. Ministry of Health
SECOND STAGE Committee on Antimicrobial Resistance of the Ministry of Health	 National AMR Plan Technical Secretariat. Department of Communicable Diseases (DIPRECE-MINSAL) Institute of Public Health (ISP). Ministry of Health National Program on the Control of Healthcare Associated Infections (HAIs). Undersecretariat of Healthcare Networks (DIGERA-MINSAL) Department of Environmental Health (DIPOL- MINSAL). Department of Nutrition and Food (DIPOL- MINSAL) Department of Pharmaceutical Policies and Regulations, Health Providers, and Supplementary Medicines (DIPOL- MINSAL) Office of Zoonosis and Vector Control (DIPOL- MINSAL) Department of Epidemiology (MINSAL) Department of Care Management (DIVAP- MINSAL) Department of Clinical Processes and Hospital Management (DIGERA- MINSAL)

Participating agencies and institutions Stage Chilean Agency for Food Safety and Quality (ACHIPIA). Ministry of Agriculture Agricultural and Livestock Service (SAG). Division for Agricultural **SECOND STAGE** and Forestry Protection, and the Division for Livestock Protection. Ministry of Agriculture **Interministerial Group on Antimicrobial** Resistance in the food chain (GIRAM National Fisheries and Aquaculture Service (SERNAPESCA). Ministry of Economy Ministry of the Environment Department of Nutrition and Food. Division for Healthy Public Policies and Promotion. Ministry of Health Institute of Public Health. Ministry of Health National Tuberculosis Program. Department of Communicable Diseases (DIPRECE-MINSAL) **SECOND STAGE** National Program for the prevention and control of HIV/AIDS and STDs (DIPRECE-MINSAL) Other programs not included in technical panels Department of Immunizations (DIPRECE-MINSAL) Office of Integral Health for Older Persons. Department of the Life Cycle (DIPRECE-MINSAL) Chilean Society of Infectious Diseases Undersecretariat of Regional and Administrative Development **THIRD STAGE** (SUBDERE) Intersector and regional levels Ministerial Regional Health Secretariats







The National Plan on Antimicrobial Resistance is an intersectoral initiative that functions based on the "One Health" principle whereby various institutional actors in the public and private sectors converge in carrying out actions aiming to combat the resistance of bacteria and other microorganisms to antimicrobials. The activities carried out for this purpose are framed within the strategies of this plan and are activities proper to each sector as well as activities that are jointly designed and implemented.

To carry out this plan it has been necessary to create instances for governance and coordination allowing fluid communication as well as political and technical backing. This is how the National Plan is based on the coordination of six Ministries that have made their collaboration official though the appointment of technical references as focal points, in response to a request by the Undersecretariat of Public Health of the Ministry of Health, and have actively contributed to the design of the 2021–2025 AMR Plan. This commitment to collaborate has enabled the formation of an Interministerial Panel that will function in the period of implementation of the plan under the coordination of the Ministry of Health.

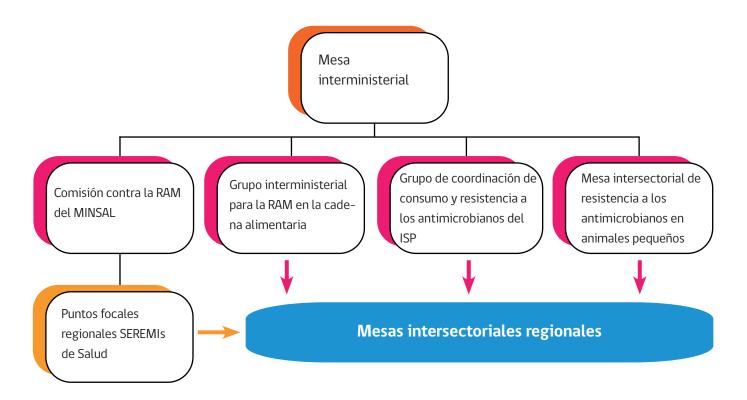
More specific collaboration instances have also been created for proceeding with the initiatives related to differentiated areas, some of these already formed and other functional panels in the process of being formalized. These are:

» Committee on Antimicrobial Resistance of the Ministry of Health: comprised by different departments of the Ministry of Health and the Institute of Public Health, its function is to contribute to the activities stipulated under the National Plan on AMR from the viewpoint of human health. Exempt Resolution No.1048 of 21 September 2016 of the Ministry of Health.

- Interministerial Group on Antimicrobial Resistance in the food chain (GIRAM), which is led by ACHIPIA and brings together the public and private references related to productive chains.
- » Coordination group on the consumption and use of antimicrobials. Exempt Resolution No.02917 of 10 December 2020.
- » Intersectoral panel on antimicrobial resistance in small animals, initiative that brings together the Office of Zoonosis and Vector Control of the Ministry of Health, College of Veterinarians, Schools

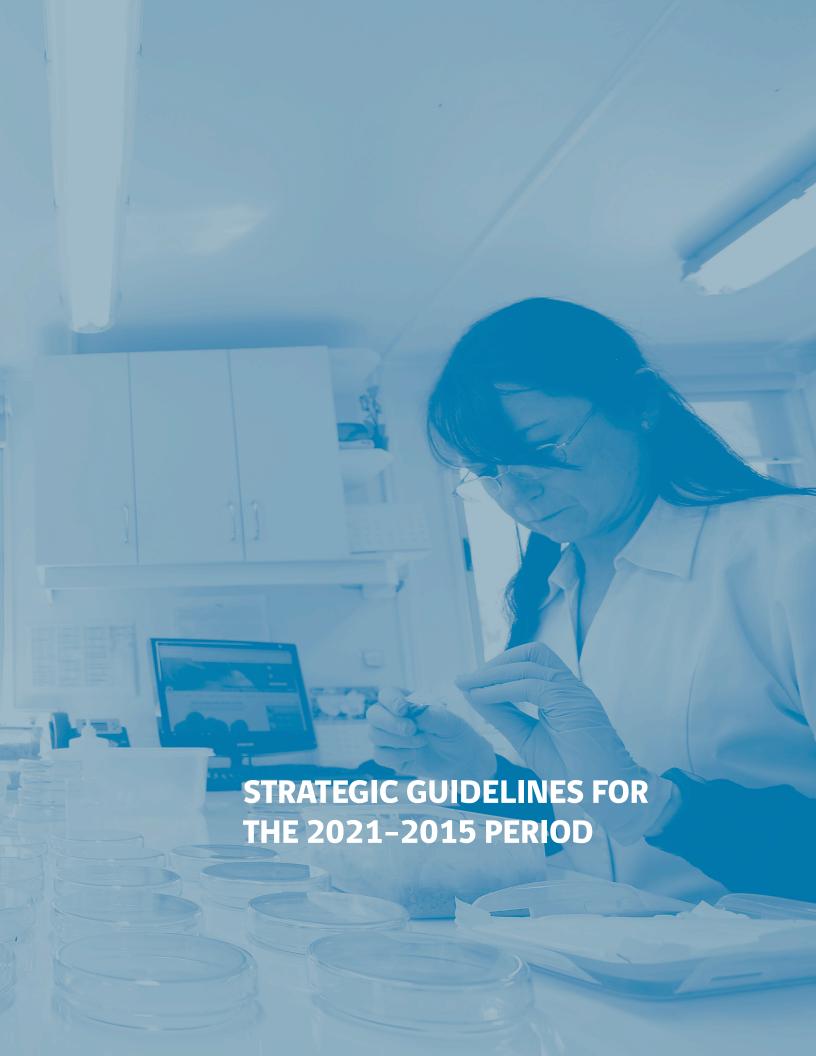
of veterinary science at different universities, the Program for Responsible Keeping of Companion Animals of the Undersecretariat of Regional and Administrative Development, participants of the SAG, ISP, and other scientific societies.

For this new period, it is expected to begin with the decentralization of activities via the formation of Regional Intersectoral Panels led by the Ministerial Regional Secretariats for Health, thereby enabling the analysis and solution of issues proper to each territory.



Governance and coordination of the National Plan on Antimicrobial Resistance.





The 2021-2025 National Plan on Antimicrobial Resistance maintains the same strategic lines as the previous plan, related to the Global Action Plan, and adapted to the national context considering the uncertain future scenarios visualized on account of the COVID-19 pandemic, and which at world level has affected various health programs, including those related to the treatment of other infections and the surveillance and monitoring systems. Therefore, the Plan presented below contemplates the strategies that were defined as of priority for development in the period, but allowing space for implementing annual or biannual operational plans that allow continuous planning and assessment of the activities proposed so as to enable making adjustments in case of unforeseen events.

The strategic lines of the 2021–2025 National Plan on AMR are:

- Strengthen awareness and training with regard to AMR in the community at large and in specific groups.
- 2. Strengthen the national surveillance system of antimicrobial resistance.
- 3. Prevent and control infections associated to human health and animal and plant health.
- 4. Regulate and monitor the use of antimicrobials.
- 5. Improve access to information and foster AMR related research.



Strategic lines of the 2021-2025 National Plan on AMR.

I. Strengthen awareness and training with regard to AMR in the community at large as well as in specific groups



Through this strategic line the goal is to disseminate information and knowledge about AMR and encourage changes in attitude with regard to the use of antimicrobials both in the community at large as well as specific groups such as prescribers, future prescribers, and health workers in general, in addition to food producers, aiming to create favorable conditions for the success of the activities and interventions to be implemented in this plan. Achievement of this strategic line is based on the following specific objectives:

I.1. Devise and implement educational communication strategies to address the community

This objective seeks to disseminate information and build awareness in the population at large about the prevention of infections and about the correct use of antimicrobials, both for human use as well as in animals and plants, with an ecological approach. These activities refer to regular informative campaigns through communications media and social networks, integrally carried out by the public agencies responsible for the National Plan on AMR, especially during the World Antimicrobial Awareness Week, and specific communicational campaigns held at health facilities through their Promotion and Prevention programs, awareness for the prudent and responsible use of antimicrobials in farm production and aquaculture, as well as other initiatives of this type furthered by different actors.

I.2. Promote the inclusion of topics on resistance and prudent and responsible use of antimicrobials among educators and in educational spheres

The Ministry of Education has adopted an active role in the National Plan on AMR. The General Education Act establishes that students have the right to receive an education that offers opportunities for their integral training and development, and regulates rights and duties in the educational sphere27. The Curricular Bases are the main document of the national curriculum and are compulsory for all schools, a reference for the pre-



paration of coursework. The Curricular Bases -valid since 2012- determine the common learning to be achieved by all children and adolescents in the entire country from preschool to secondary education; that is, the knowledge, skills, and attitudes that enable -aside from the integral development of students- the competences required to take part in the decisions and actions that affect their wellbeing and that of society²⁸.

Considering the Curricular Bases are present in the Learning Outcomes that directly or indirectly address the topics on AMR, the aim of the Ministry of Education in the National Plan on AMR is to promote educators should highlight the topic, identifying the opportunities presented in the national curriculum for the achievement of student learning to gain knowledge about antimicrobial resistance.

I.3. Create instances for the creation, updating, and improvement of knowledge and competences on AMR among prescribers and other professionals

This objective seeks to develop knowledge on AMR and capacities related to the prudent and responsible use of antimicrobials, both among practicing prescribers as well as new prescribers. For this it is necessary, on the one hand, to include AMR as a relevant topic in the study programs of professional studies and health techniques, especially for human health, veterinary science, dentistry, obstetrics, chemistry and pharmacy, building awareness among future prescribers and dispensing pharmacists about AMR and actions to control their emergencies

Additionally, induction programs and continued training will be continued and strengthened to update competences among the prescribers of antimicrobials and other professional users and implementors of antimicrobials in human, animal, and plant health. This im-

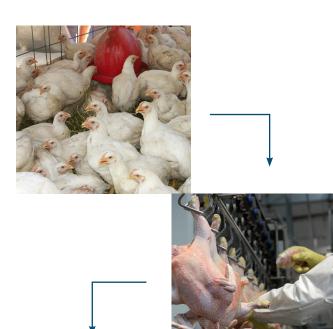


plies the development of educational instances such as courses, workshops, and seminars given by the very public institutions related to the AMR Plan as well as in collaboration with other training initiatives by scientific societies, academia, and other relevant actors.

I.4. Create local instances for the training of health professionals in relation to the control of infection, the use of antimicrobials, and AMR

This objective seeks to include all health professionals in acquiring knowledge on the control of infection, prudent and responsible use of antimicrobials, and AMR. The purpose is to create formal training at the various levels of healthcare via actions carried out by local teams of the infection control programs associated to healthcare and Antimicrobial Stewardship Programs (PROA).

II. Strengthen the national surveillance system of antimicrobial resistance





This strategic line seeks to pool current efforts and AMR surveillance activities comprising the national surveillance system, from the viewpoint of the "One Health" principle, strengthening activities under the current AMR surveillance system in human health. In this way, the intention is to improve the capacity to detect AMR and give an early and integrated response to situations of risk, as well as carry out actions and interventions to control AMR. Development of this strategic line is based on the following specific objectives:

II.1. Develop an integrated AMR surveillance system for selected microorganisms

Selected microorganisms are covered under this objective within an integrated AMR surveillance system that unifies the information coming from the sphere of human health, animal health, plant health, and the environment, according to the "One Health" principle, and that enables the effective provision of data. The system will begin with the surveillance of a prioritized productive food chain, integrated with isolated patient samples, gradually extending to other relevant microorganisms and other productive chains.

II.2. Strengthen the monitoring system of Antimicrobial Resistant Agents of Relevance to Public Health

This objective seeks to strengthen surveillance of antimicrobial resistance in the infections associated to healthcare by collecting and monitoring Antimicrobial Resistant Agents of Relevance to Public Health (ARAISP), correlating the information obtained with the sanitary outcome, through the assessment of epidemiological indicators with regard to the main clinical syndromes caused by these agents in health facilities and their trends over time, so as to establish plans for improvement and corrective measures.



II.3. Strengthen laboratory surveillance in relation to AMR

This objective seeks to implement Ministry of Health 2020 Supreme Decree No.7 on Statutory Notification of Infectious Diseases and their Surveillance, updating technical circulars on AMR laboratory surveillance and extending laboratory surveillance to studies on resistance methods in the country.

The strengthening of laboratories also includes those working in the fields of animal health, plant health, and food safety, where it is necessary to standardize guidelines for susceptibility tests and form an integrated network for optimum and continued data management and their transfer to the integrated surveillance system.

II.4. Strengthen surveillance of drug resistant tuberculosis

The National Tuberculosis Program performs universal surveillance of all bacteriologically confirmed cases of tuberculosis in relation to Mycobacterium tuberculosis resistance to TB drugs. Therefore, currently all patients have the results on susceptibility to rifampicin, isoniazid, and second line drugs 29. In coming years, the capacity of the tuberculosis laboratory network is to be extended to include universal surveillance of drug resistant tuberculosis as of the first sample, by broadening coverage of molecular tests for initial diagnosis of tuberculosis in addition to strengthening the study of resistance mechanisms by using genetic sequencing techniques. This will improve the timeliness of susceptibility results and provide relevant information for decision making²⁹.



II.5. Strengthen surveillance of resistance in microorganisms causing sexually transmitted infections

The study of resistance in strains of Neisseria gonorrhoeae coming from health facilities where cases of gonorrhea were diagnosed is permanently done in Chile. Less than 50% of the strains studied in recent years are sensitive to ciprofloxacin, but there is 100% susceptibility to ceftriaxone. This specific objective seeks to surpass current limitations in the surveillance of resistance by this gonococcus in relation to the design applied for sample collection, moving toward a design that allows statistical inference.

II.6. Strengthen surveillance of antimicrobial resistance in pathogen microorganisms of animals for food production

This objective seeks to extend surveillance of pathogen microorganisms causing disease in animals for food production toward surveillance of their antimicrobial resistance, contributing to optimize the use of antimicrobials in animal production and also allow detecting the emergence of new mechanisms of resistance and their determinants which may enter the food chain.

III. Prevent and control infections associated to human health and plant and animal health



The prevention and control of infections allows reducing the use of antimicrobials and the pressure of selection on microorganisms. All areas of human, animal, and plant health should work together to avoid the appearance of infectious diseases as a way of acting against antimicrobial resistance. The prevention of infection should be both within health facilities as well as the community, which includes hygiene and environmental health measures to avoid exposure to pathogen microorganisms.

III.1. Prevent Healthcare Associated Infections (HAIs) and the dissemination of antimicrobial resistance with epidemic potential in health facilities

This objective aims to prevent and control HAIs by strengthening work by the National Surveillance Program of Healthcare Associated Infections in hospitals throughout the country in its various spheres and components, to improve results in terms of the prevention of specific HAIs (particularly those associated to greater frequency of an-

timicrobial resistance of relevance to Public Health) as well as containing the dissemination of agents with resistance mechanisms and with epidemic potential, following guidelines included in current regulations (ARAISP norm of 2018) based on strengthening compliance of standard precautions associated to the early identification and adoption of additional precautions on a timely basis.

Furthermore, this line of work seeks to move ahead with the implementation of measures for the prevention and control of infections at outpatient health facilities, including CESFAM, dialysis centers, CRS, among others, contributing to the prevention of AMR in users that do not require admission to hospital but do undergo outpatient invasive procedures.



III.2. Prevent infection in the community

This objective aims to reduce the risk of the population acquiring infections in community settings through hygiene and environmental sanitation. Although the country has ample coverage of drinking water and sewage works, it is still necessary to improve access to drinking water and basic regulatory sanitation conditions with surveillance of the drinking water quality and rural systems for the removal of sewage waters, so that these basic sanitation conditions do not imply a risk to the health of people and the environment.

Also, although the removal of urban household waste is the responsibility of municipalities, there are still municipalities that dispose of waste at landfills or dumps which lead to the proliferation of vectors of health interest and which are vehicles of infection, and therefore this objective considers improving the garbage removal systems that do not meet sanitary landfill standard requirements and furthering the eradication of micro garbage dumps that imply a risk to the health of the population.

III.3. Prevent infections produced by specific microorganisms

This objective seeks to devise strategies to reduce the risk of infection or disease produced by specific microorganisms, either through health promotion activities, vaccination, or the use of preventive medicines in vulnerable populations.

Vaccine preventable diseases

In the current scenario of the COVID-19 pandemic and in view of the need to keep the population protected from vaccine preventable diseases (VPDs) to avoid causing outbreaks, the Department of Immunizations of the Ministry of Health strengthened the guidelines for health teams, aiming to keep vaccine preventable diseases under control, favor opportunities for vaccination, and respond to the spontaneous demand by the population for vaccine



programs and campaigns, updating disrupted vaccination campaigns. Also contemplated within this context is including new vaccines in the vaccination schedule and implementing innovative strategies to address target groups for these interventions, as well as updating the "Recommendations for vaccination of patients with special needs for pathologies or situations with risks", including populations not found in the vaccine campaign schedules.

National Plan for the Prevention and Control of HIV/AIDS and STDs

The Ministry of Health is currently carrying out the National Program for the prevention and control of HIV/AIDS and STDs based on the Combination Prevention Strategy proposed by WHO and UNAIDS. This plan considers the promotion of safe sex and prevention of HIV/AIDS and STDs, strengthening the healthcare network, information and management systems, and stewardship and regulation as strategic lines. The Combination Prevention Strategy is joint implementation of behavioral, biomedical, and cultural interventions with an approach based on human rights and social determinants of health, and the purpose is to prevent and control these epidemics.

Demonstration that the positive impact of antiretroviral therapies is not only individual but collective in preventing the

transmission of the virus has allowed early detection and treatment to be conceived as preventive strategies. So, since the treatment is currently guaranteed in Chile through the Explicit Health Guarantees Regime (GES), a joint and collaborative approach is required at all levels of the healthcare network and other public and private institutions, including social organizations, since in this context follow-up and coaching of people undergoing treatment acquires great relevance, as does psychosocial support for their adherence and actions taken to restart the therapy if it was abandoned.

It is important to point out that abandoning as well as changes in therapeutical schemes may favor the appearance of resistance to antiretrovirals, and in this sense the study of antiretroviral resistance is guaranteed under GES through the genotyping test that is performed in case of failed therapies to detect virological failures and adapt the antiretroviral schemes.

Other strategic lines of the Program that seek to prevent new infections are: social communication campaigns for the prevention of HIV and STDs, which are conducted annually; implementing screening with the visually read rapid test available today at primary levels in all districts in the country; the strategy giving access to condoms, implementation of pre-exposure prophylaxis (PrEP) for more vulnerable populations and at risk, among others.



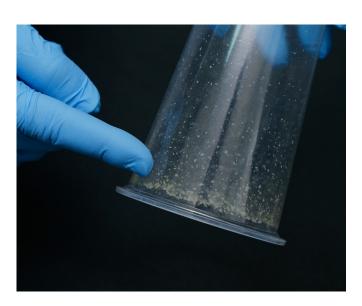
In the sphere of Sexually Transmitted Diseases (non-HIV) it is necessary to point out that these are not diseases regulated under the Health Code and various regulations establishing the role of the State in terms of prevention and the manner of control of ill persons, and contemplates free-of-charge and confidential care for all persons requiring this under the Public Health System, regardless of their health insurance. The care provided considers detection, screening, treatment, diagnostic confirmation, follow-up, study and treatment of contacts. At secondary level there is sexual health control for persons practicing sexual work and which involves prevention, tests to detect STDs, counselling for risk management, and the provision of condoms.

Tuberculosis program

As to tuberculosis, a series of strategies are carried out in the country for early detection and timely treatment of contagious cases at community level through population screening focused on vulnerable groups for the disease, strengthening the laboratory network through technological progress toward molecular biology techniques, and universal and free-of-charge access to the directly observed treatment. New interventions are now also being adopted focusing on preventing the active disease through the treatment of latent tuberculosis in specific population groups, aside from child contacts. This policy seeks to reduce the number of active cases of tuberculosis at community level, and therefore the incidence of the disease.

III.4. Control infection at long-stay facilities for the elderly

This objective seeks to devise specific strategies to control infection at residences for the elderly, such as long-term stay facilities for the elderly (LSIE). At present these institutions are subject to regulation of the health and basic environmental conditions for their functioning, that among their objectives seek to implement the National Plan of Integral Health for Older Persons which will allow strengthening guidelines in terms of healthcare for this population and strengthen the programmatic structure at all levels of care.



III.5. Adopt regulatory measures in relation to the final disposal of waste containing antimicrobials

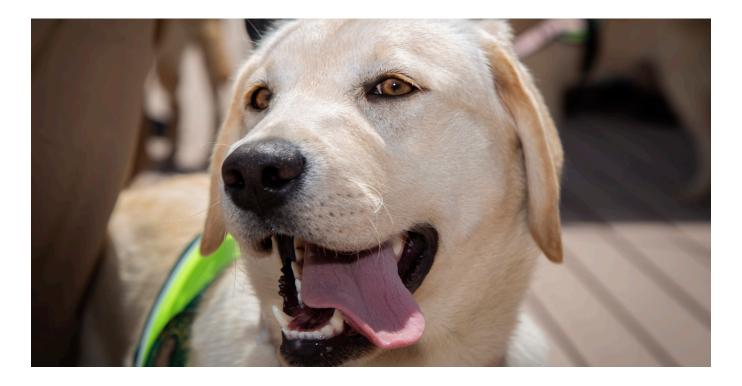
This objective seeks to avoid contaminating the environment with waste that contains antimicrobials coming from healthcare facilities (HCW healthcare waste), and strengthen the regulation of sludge to improve standards for the management, testing, and application of sludge to the soil within the context of the food chain.

Also, although currently there is regulation specifying medicines, drugs, and pharmaceutical products should be managed as hazardous products, it is necessary to strengthen the health regulation to ensure antimicrobial waste is managed appropriately at healthcare facilities, including veterinary facilities.

Additionally, it is necessary to include medicines as priority products so they are applicable to the extended responsibility of the producer, as set forth under Law No.20.920 providing the framework for waste management, extended responsibility of the producer, and promoting recycling. In this way it is possible to recover and appropriately remove these products from the environment when the population needs to discard them, thereby avoiding their disposal through the sewage system or municipal household waste collection, relevant ways of introducing antibacterial agents to the environment.

III.6. Prevent and control infection in animal production

This objective seeks to promote animal wellbeing and good farming practices in animal production, tending to keep animals at an optimum level of health and wellbeing throughout the productive cycle and avoid favorable settings for the development of disease. Also contemplated is the strengthening of diagnostic capacities and tools to strengthen the early detection of disease and therapeutical use antimicrobials.



III.7. Prevent and control infection in companion animals

In the sphere of companion animals, Law No.21.020 on Responsible Keeping of Companion Animals³² rules drafting regulation establishing conditions of hygiene and safety in places where pets are kept, and which is currently being registered at the Office of the Comptroller General of the Republic.

On the other hand, Decree No.1007 of 2018³³ of the Ministry of the Interior and Public Security sets forth the manner and conditions for applying the norms on Responsible Keeping of Companion Animals, establishing that facilities for temporary keeping of pets should have a Report by the appropriate SEREMI of Health certifying the facility meets the necessary health conditions to function. This report is a prior requirement for enrollment in the appropriate National Register, a legal requirement stipulated under Article 23 of Law 21.020 mentioned above.

The regulation as well as the report provide the grounds for regulation to control infection in places where pets are kept, defined as such under Law No.21.020 as places where, in any capacity, animals are kept non-permanently, either for treatment, lodging, training, trading, exhibition, or custody, such as companion animal breeding farms, animal hotels, hospitals, clinics, and veterinary practices, facilities for animal research and teaching, training centers, exhibition centers, places for the sale of animals, hostels, and rescue facilities.

III.8. Prevent and control infection in plants

This objective seeks to promote practices favoring plant health and the early detection and prevention of pests in plant production and the strengthening of integral pest management.

IV. Regulate and monitor the use of antimicrobials

This strategic line seeks to strengthen the regulatory framework and monitoring and control of the prudent and responsible use of antimicrobials, both in human health as well as animals and agriculture.

The following specific objectives were set for this purpose:



IV.1. Regulate the use of antimicrobials in people

Although in Chile the procurement of antimicrobials is regulated through authorization to trade in health registers, and the retained medical prescription condition for sale as well as control and inspection of pharmacies, it is still necessary to progress in the prudent and responsible use of antimicrobials by prescribers.

The awareness building and training set forth in the first strategic line is seconded by regulatory instruments such as the development of Antimicrobial Stewardship Programs (PROA) in hospitals²⁰, a norm already published and which allows controlling the use of broad-spectrum antimicrobials. In the next period it is necessary to move ahead with regulation of prescription in Primary Healthcare and developing strategies to control the sale of antimicrobials at unauthorized locations (markets, social media over the Internet).

Also, Chile will officially adopt the AWaRe classification in its national list of essential medicines.

IV.2. Strengthen regulatory instruments to reduce the use of antimicrobials in production animals

This objective aims to strengthen regulatory instruments and tools for good practices aiming to encourage the prudent and responsible use of antimicrobials, including their reduced use.

In the sphere of terrestrial and aquatic animal production, the prudent and responsible use of antimicrobials is pursued, avoiding the unjustified use of antimicrobials considered of critical relevance to human health, by regulating their use in the productive chains of greatest relevance in the country.

In the sphere of salmon farming, handbooks on sustainability and good practices in salmon farming and livestock production will continue to be developed and updated. Extending the PROA-Salmon program to the fresh water stage has also been proposed, in this way addressing the entire production chain.



IV.3. Regulate the use of antimicrobials in companion animals

This objective seeks to regulate the use of antimicrobials in companion animals through drafting and disseminating national norms on how to treat infection in small animals and further regulation of veterinary pharmacies and first-aid kits with regard to the storage and disposal of drugs.

IV.4. Regulate the use of antimicrobials in agriculture

With regard to plants, regulating the use of fertilizers of animal origin and antimicrobial action pesticides is contemplated, including these in a list to assess their impact on the emergence of antimicrobial resistance and by including antimicrobial pesticides in the control and inspection program currently implemented by the Agricultural and Livestock Service.

Also, the farming sector will continue to encourage small-scale organic production and agroecology.

IV.5. Monitor the consumption of antimicrobials

This objective considers implementing a monitoring system of antimicrobial consumption to allow better management and control of their use, monitoring the prescription and use of antimicrobials in the terrestrial and aquatic animal production industry as well as companion animals.

Also, with regard to the use of antimicrobials in people, drafting antimicrobial consumption reports is being considered, as well as monitoring the use of selected antimicrobials in clinical spheres by implementing PROA in medium to high-complexity hospitals and other levels of care.

V. Improve access to information and encourage research related to AMR

This strategic line proposes relaying the creation of knowledge about AMR through applied scientific research directed toward operational action and developing therapeutical options, via activities and interventions based on evidence and access to information obtained through different surveillance and monitoring programs.

V.1. Improve access to information about AMR

This objective seeks to facilitate community access to information about AMR and about the strategies devised for prevention and control in different spheres of government. On the one hand the intent is to integrate AMR surveillance findings in different spheres though the creation of a regular report, which in turn ensures the due protection of sensitive information, both for

human health as well as for the animal and plant-based food production industry. A scientific-technical committee for the study, discussion, and dissemination of the AMR surveillance program outcomes will be created to meet this objective.

This objective also contemplates the creation of a repository of public access documents to pool in one place all relevant information with regard to progress made with the National Plan on AMR.

V.2. Promote AMR scientific and technological research

The Ministry of Science, Technology, Knowledge, and Innovation, in its Science, Technology, Knowledge, and Innovation National Plan³⁴ indicates that before the challenges faced by Chile and humanity in general -such as climate change, 21st Century pandemics, aging of the population, and rapid technological change, among others- these should be addressed with the tools given by scientific knowledge. Along this line, the creation and application of knowledge about AMR may become an area to be enhanced in the sphere of challenges faced as a nation.





As such, this objective seeks to establish research on AMR as a line of research of priority to the country, focusing on research projects that are relevant to the creation of new knowledge about microorganisms, antimicrobial resistance, and alternative solutions to their use.

Encouraging collaboration among research centers, groups of researches, universities, enterprises and public institutions will also be promoted so that the knowledge created on AMR may be translated into practical applications useful to the health of the population at large.

V.3. Research on resistance by specific microorganisms

In the area of HIV/AIDS, antiretroviral resistance is a world issue –although considered still emergent. This means a reduced susceptibility to drugs of a patient´s viral strain, and which therefore may lead to the virological failure of the treatment without achieving the therapeutical benefit.

In the country there are some studies on primary resistance done in the past decade, and this is why it is necessary to size the magnitude and current trend of this issue that may lead to an individual problem for the person living with HIV due to the lack of a positive response to treatment; but also collective, since there may be transmission of the resistant virus. So, a specific study on antiretroviral resistance in Chile will be done during the next period.

Also, the massive adoption of new diagnostic methods in the Tuberculosis Program will allow doing specific studies on resistance to the various anti TB drugs, also including research on resistance genes and their presence in the country.



V.4. Research on environmental microorganisms in relation to AMR

This objective seeks to research the presence of environmental resistant pathogens that may potentially infect humans or be reservoirs of resistance mechanisms that may be transmitted to human pathogens. The aim is to have a diagnosis based on the background data gained to date in the country with regard to pathogens and resistance, in addition to research on the environmental impact of antimicrobials in different ecosystems in the country and their respective risk assessment for AMR transmission in the environment, considering as a starting point these bacteria coming from the food production chain that may carry AMR mechanisms that might affect environmental matrices.

This background data would allow designing AMR surveillance programs in the environment based on impacts and risks according to pathogens identified with AMR potential, the study of environmental niches as potential sources of resistant microorganisms, identification of pathogens that may imply a risk to AMR in different ecosystems, the design of promotion activities and appropriate awareness building measures in environmental terms, in addition to strengthening the national regulatory framework in these matters.

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