

Addressing AMR in poultry production: **Challenges and sustainable solutions for LMICs**

AMR affects low and middle-income countries by posing a threat to public health through the transmission of resistant bacteria. A team from ICARS looks into this issue



Antimicrobial resistance (AMR) poses a significant threat to development and public health as it facilitates the spread of resistant microorganisms among humans, animals, and the environment. To mitigate this issue, the International Centre for Antimicrobial Resistance Solutions (ICARS) works with low- and middle-income countries (LMICs) to address the complexities surrounding AMR.

The growing demand for meat, particularly poultry, is expected to rise due to increasing global incomes and population growth. Regions such as Asia, the Middle East, and sub-Saharan Africa will experience the highest

surge in chicken meat demand, leading to an exponential increase in global poultry production and trade. In many countries, escalating demand has resulted in intensified poultry farming practices and the excessive antimicrobials use in cases where proper animal husbandry practices and disease prevention measures are lacking. The widespread use of antimicrobials in animals, plants, and humans is a significant driver of AMR.

To reduce AMR, responsible antimicrobial use, especially antibiotics, is critical. Sick animals should only be treated when necessary, and antibiotics should

not be used to prevent disease or promote growth, as is commonly observed in many countries. Another essential factor in addressing AMR is reducing the transmission of resistant bacteria between animals, farms, and across the One Health spectrum, which recognises the interconnections between human, animal, and environmental health. Improving farm biosecurity is one approach to achieving this in poultry production. Continuous guidance and support, including structural and systematic interventions, are necessary for poultry farmers and stakeholders involved in the poultry value chain to shift towards practices that reduce the reliance on antimicrobials and mitigate the risk of AMR.

ICARS collaborates with LMICs to develop and fund projects aligned with each country's National Action Plans (NAPs) to mitigate AMR. The organisation works closely with ministries, researchers, and practitioners in LMICs to implement tailored solutions that encompass human health, animal health, agriculture, and the environment. Currently, projects aimed at reducing antimicrobial use in poultry are being implemented in five Asian and African countries, namely Georgia, Benin, Tanzania, Zambia, and Zimbabwe.

In many instances, poultry producers and stakeholders in the poultry supply chain engage in imprudent antimicrobial use and improper disposal of unused and expired drugs. This can be attributed to various factors, including inadequate farm management practices related to hygiene, biosecurity, vaccine usage, deworming, water and feed quality, and animal density. Limited awareness about AMR and a lack of access to professional animal health advice further contribute to the problem. Farmers often resort to obtaining antimicrobials over the counter due to poor access to diagnostic services, while the national recording of antimicrobial use and AMR in poultry and other food animals remains insufficient. Very often, farmers use antimicrobials to protect their flocks and livelihoods without being fully aware of the associated risks. Years of misconceptions and mismanagement within the poultry production sector and the poultry value chain have aggravated this challenge.

Regulatory issues play a crucial role in addressing AMR. In Zimbabwe, for example, the One Health NAP incorporates AMR surveillance into existing disease notification systems for animals, including poultry. The NAP focuses on strengthening biosecurity measures in hatcheries, farms, slaughterhouses, and food processing establishments, setting up AMR surveillance, developing guidelines for animal health management, increasing awareness among animal keepers and farmers, improving movement controls, and promoting responsible antimicrobial use in the poultry sector through education campaigns and regulatory measures.

While the majority of LMICs have developed NAPs to tackle emerging AMR in various sectors, including human and animal health, food production, food safety, and the environment, the implementation of these plans is often more advanced in the human sector compared to other sectors. Many LMIC governments demonstrate a strong commitment to addressing AMR through improved awareness, knowledge, evidence-based practices, infection prevention and control, research and development, governance, and antimicrobial use. However, limited resources and capacity pose challenges,

resulting in uncertainties regarding the implementation of interventions, the prioritisation of actions, and a lack of practical examples.

To address these issues, ICARS offers technical expertise and financial support to develop and test tailored, evidence-based, and cost-effective solutions in collaboration with key stakeholders, enabling countries to efficiently tackle AMR challenges.

Data on the links between regulation and AMR in poultry is limited, and policies governing antimicrobial use vary widely between countries. Brazil, the world's largest poultry meat exporter, still lacks an adequate legal framework for the use of antimicrobials. On the other hand, China, the largest producer of eggs and the second-largest producer of chicken meat globally, has recently implemented regulations to reduce antimicrobial use. According to the World Organisation for Animal Health (WOAH)'s 7th edition of the *Annual Report on Antimicrobial Agents Intended for Use in Animals*, 68 per cent of countries have already discontinued the use of antimicrobial agents for growth promotion in animals, either with or without legislation or regulations. The ICARS-supported poultry projects involve reviewing existing regulations and generating evidence to support the development and revision of regulations. For instance, in Georgia, the ICARS-supported project focuses on testing solutions such as vaccination and enhanced biosecurity to eliminate the use of growth promoters and reduce the use of critically important antibiotics in poultry without compromising productivity.

■ **Georgia's efforts to reduce AMU.** The country is addressing these challenges by developing a NAP that includes initiatives such as implementing a licencing system for veterinarians, revising registration rules for veterinary medicines, prohibiting antibiotic growth promoters (AGP), expanding laboratory capacity for testing residues and antimicrobial susceptibility, and conducting information campaigns for farmers and veterinarians. Georgia's Deep and Comprehensive Free Trade Agreement (DCFTA) with the European Union also involves implementing sanitary and phytosanitary regulations and establishing regulations for the use of animal feed additives and antibiotics.

The government of Georgia actively disseminates information to the target sector ahead of upcoming regulations. Recognising the challenges faced by businesses in implementing new equipment or changes, the collaboration ensures a long transition period and utilises various projects to disseminate knowledge effectively. The collaboration with ICARS serves as a positive example, demonstrating to farmers through 'champion farms' that it is feasible to reduce antimicrobial use in poultry production without significant economic costs, and without compromising productivity.

■ **Enhancing regulation in Zimbabwe's poultry sector.** ICARS is actively engaged in testing solutions to guide enhanced regulation and enforcement related to antibiotic use in poultry farming, aiming to limit the emergence of AMR. These efforts align with Strategic Objective 4 of the NAP, which focuses on the rational use of antimicrobials. The government and technical working groups have developed an operational plan outlining specific activities to achieve the objectives. One key aspect is

formalising the registration of veterinary paraprofessionals under the Veterinary Professions Legislation to improve access to safe and effective antimicrobials. Additionally, rules are being made more flexible for veterinarians to provide services in communal settings, and more access points for quality-assured over-the-counter antimicrobials for animal keepers are being created.

In 2018, a national legal consultation exercise on AMU and AMR legislation was conducted. The resulting report provided an analysis of the national legal framework and offered advice to relevant ministries and partners, such as ICARS.

Although there is no specific legislation dedicated exclusively to addressing AMU and AMR in poultry, the existing animal health legislation encompasses all animals used in food production. To bridge any gaps within the legal framework, efforts are underway to amend animal feed legislation, establish guidelines for crop production, waste management, and water quality, and enhance the supervision of veterinary medicine sales by registered veterinarians. These measures are aimed at fostering responsible practices in poultry farming and supporting sustainable agriculture in Zimbabwe.

■ **Addressing AMU in Benin.** In 2022, a comprehensive study conducted in Benin by the research unit in Applied Microbiology and Pharmacology of Natural Substances at the Polytechnic School of Abomey-Calavi, University of Abomey-Calavi, with the support of ICARS, aimed to document antimicrobial use practices by poultry farmers. The findings revealed extensive use of antibiotics on poultry farms across the country.

Alarming, instances of self-medication by farmers were observed, as antibiotics were easily available over the counter without expert guidance, leading to unregulated and haphazard use. Farmers frequently based their decisions on individual experiences, highlighting the need for improved regulation and responsible antibiotic use practices in the poultry sector in Benin.

To counter this, the country is formulating a comprehensive set of recommendations to bolster the regulation and enforcement of antibiotic usage in poultry farming. The primary objective is to counter the rise of antimicrobial resistance. These recommendations cover a wide array of aspects, including targeted training sessions on antibiotic resistance for farmers, strengthening diagnostic capabilities in laboratories to accurately identify and monitor resistant pathogens, increasing awareness among farmers about the risks associated with self-medication, emphasising good biosecurity and hygiene practices, improving prophylactic plans in specific breeding zones, and implementing other pertinent measures. Preliminary results from collaborative efforts have substantiated the fact that imported day-old chicks can potentially serve as a source for the dissemination of antibiotic-resistant bacteria in poultry production.

In LMICs, small- and medium-sized poultry farming systems often entail frequent and close interactions between poultry and humans, with limited biosecurity measures in place. This facilitates the spread of infections, resistant bacteria and resistance genes, within flocks, between farms, and from birds to other animals and humans.

Biosecurity encompasses measures to prevent the introduction and spread of infectious agents, such as



Poultry production in Benin
Photo: ICARS

restricted movements, animal quarantine and isolation, fencing, transport, and cleaning and disinfection protocols. Implementing farm biosecurity can reduce disease incidence, potentially mitigating the need for antimicrobial treatments and the development of antimicrobial resistance. Implementing biosecurity measures and overcoming enforcement challenges can be tricky. In many LMICs, there is a shortage of human resources, limited access to professional laboratory and animal health services, and insufficient financial resources to consistently enforce existing regulations. Enforcement requires substantial resources, and it may not always receive prioritisation in the face of competing needs.

Countries that phased out the use of antibiotics as growth promoters or for prophylaxis several decades ago have demonstrated the advantages of farm biosecurity for poultry health and welfare. To maintain animal health, the use of antibiotics must gradually decline with care and appropriate measures. Despite the benefits of farm biosecurity, farmers and animal health professionals in resource-limited regions often have doubts about its effectiveness and cost-effectiveness as a substitute for or replacement for non-judicious antimicrobial use.

To address this, ICARS is collaborating with countries to generate evidence on the cost-benefit and effect on antimicrobial use of implementing biosecurity measures in different settings. For example, in Zambia, a project is engaging with veterinarians and poultry farmers through participatory training via field schools, guideline development on using antimicrobials at poultry farms, and training of veterinary professionals. The project will also support certification for good farm management

practises. By quantifying financial changes resulting from the implementation of good management practices on farms through the analysis of production parameters, the economic outputs can be used to communicate the effects of interventions to policymakers, thereby supporting the adoption of effective measures and encouraging behaviour change among stakeholders on the ground.

ICARS is actively exploring the use of vaccines as a strategy to reduce current antimicrobial use in several countries. In Tanzania for example, the use of vaccines against bacterial diseases is currently limited in small- and medium scale layer farms. This presents a significant opportunity to employ vaccines for improved disease management and reduced reliance on antimicrobials. ICARS is collaborating with Sokoine University of Agriculture, the Ministry of Livestock and Fisheries, and stakeholders in Zanzibar to understand vaccination practices and optimise vaccination regimes specifically for bacterial diseases within the local context.

This approach considers the realities and limitations that farmers often face. Each ICARS project, including this one, examines the specific implementation context and assesses the business case to tailor interventions to local realities and address challenges faced by farmers. Considering factors such as access, cost, mode of delivery, and country-specific differences is crucial to the success of strategies like vaccination.

ICARS also acknowledges the importance of considering the broader context to effectively address antimicrobial resistance. It is necessary to map the key stakeholders involved in poultry management, with a specific focus on gender dynamics. Women often drive backyard and small-scale poultry production, yet they may not have decision-making authority within their households. The successful implementation of new interventions, such as vaccination, relies on understanding the individuals involved in decision-making at the farm level and throughout the supply chain. To address this, ICARS and Canada's International Development Research Centre (IDRC) are co-funding an initiative that aims to provide resources for incorporating a gender lens into AMR innovation and implementation research, providing support to the research community in this regard.

■ **Farmers field schools and sustainable practices in Zimbabwe.** Here ICARS collaborates with the Department of Veterinary Services (DVS) and the Food and Agriculture Organization of the United Nations (FAO) to evaluate the effectiveness of Farmer Field Schools in improving antimicrobial use practises in the districts of Goromonzi, Seke, and Zvimba. This collaboration is expected to yield significant successes, including the development of comprehensive manuals and training schedules as well as the adoption of recommended practices by participating farmers. As a result, poultry health and productivity may significantly improve while the reliance on antimicrobials is expected to decrease, thereby minimising the risk of AMR.

■ **Establishing a microbiological certification system in Benin.** The ICARS project aims to gather data and establish a framework for designing and supporting the implementation of a Microbiological

Certification System (MicS) for local and imported eggs and day-old chicks. The project has four main objectives, which involve conducting a comprehensive assessment of the poultry value chain, determining the types and levels of antimicrobial resistance in priority indicator bacteria found in formally and informally imported day-old chicks and eggs, and exploring the national and international exporters and importers of poultry to better understand the conditions and criteria necessary for establishing a MicS.

The poultry industry in LMICs faces considerable challenges in addressing antimicrobial resistance in food-producing animals. Collaborative efforts among national, regional, and global stakeholders are vital for effective resource allocation and the development of physical and human capacities.

Given the complexity of this challenge, stakeholders must work together, adopting a One Health perspective that considers the interconnectedness between animal health, human health, and the environment. A multidisciplinary approach is essential, involving experts from various fields such as economics, behaviour change, policy, and social sciences, among others. 

Sources

- *Food and Agriculture Organization of the United Nations (2018):* The future of food and agriculture: Alternative pathways to 2050 (224 pp.);
- *OECD/FAO (2021):* OECD-FAO Agricultural Outlook 2021-2030, *OECD Publishing*;
- *Mulchandani R, Wang Y, Gilbert M, & Van Boeckel TP (2023):* Global trends in antimicrobial use in food-producing animals: 2020 to 2030, *PLOS Glob Public Health*, 3(2), e0001305;
- *Osbjor K, & Magnusson U (2021):* Promoting medically rational and responsible use of antimicrobials for healthy and productive livestock, *Policy Brief, ILRI*;
- *Khurana MP, & others (2023):* Mitigating antimicrobial resistance (AMR) using implementation research: A development funder's approach, *JAC-Antimicrobial Resistance*, 5(2), dlad031;
- *World Organisation for Animal Health (2023):* Annual Report on Antimicrobial Agents Intended for Use in Animals (7th ed.). OIE Annual Report on Antimicrobial Agents Intended for Use in Animals, *woah.org*;
- *Allel K et al (2023):* Global antimicrobial-resistance drivers: An ecological country-level study at the human–animal interface, *The Lancet Planetary Health*, 7(4), e291-e303;
- *Agerso Y, Jensen JD, Hasman H, & Pedersen K (2014):* Spread of extended spectrum cephalosporinase-producing *Escherichia coli* clones and plasmids from parent animals to broilers and to broiler meat in a production without use of cephalosporins, *Foodborne Pathog. Dis.*, 11(9), 740–746;
- *Global Burden of Animal Diseases (nd):* GBADS – Global Burden of Animal Diseases, *animalhealthmetrics.org*

Authors

Several ICARS staff and partners developed this piece including Boris Lègba and Victorien Dougnon from the Research Unit in Applied Microbiology and Pharmacology of natural substances, Polytechnic School of Abomey-Calavi, University of Abomey-Calavi, Benin. Maia Berushvili at the European University, Georgia. Canaan Tinashe Hodobo of the Central Veterinary Laboratory and Emily Onesai Waniwa from the Directorate of Veterinary Services, Zimbabwe. As well as ICARS Advisors: Kristina Osbjor, Erica Westwood, Rodolphe Mader and Annick Lenglet