

## Rethinking the role of animals in antimicrobial resistance



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Antimicrobial resistance (AMR) is a major global threat, recognised by WHO, the Food and Agriculture Organization, the World Organization for Animal Health, and the UN Environment Program as a cross-cutting health, economic, and environmental challenge.<sup>1</sup> In this framework, the use of antimicrobials in animals is frequently identified as a key factor that contributes to the development of AMR in human pathogens.<sup>2</sup> The 2023 scientific opinion from the French Agency for Food, Environmental and Occupational Health and Safety (ANSES) presents a comprehensive sectoral analysis, questioning the extent to which animal reservoirs contribute to AMR in humans under current conditions.<sup>3</sup>

Since 2011, France has implemented three national Ecoantibio plans to reduce antibiotic use in veterinary medicine. These initiatives actively involved farmers, veterinarians, regulators, and researchers. From 2011 to 2021, the overall antibiotic exposure in livestock decreased by 47%, with substantial reductions, exceeding 90% in some key antimicrobials, such as fluoroquinolones in poultry and colistin in pigs and calves. Of note, colistin, a drug that was once commonly used in livestock, saw a 66% reduction in exposure between 2014 and 2022, surpassing the initial targets.<sup>3</sup>

These policy efforts have produced a measurable biological impact, with data from French national surveillance showing a steady decline in resistance levels over the past decade. The 2023 ANSES scientific report identified 11 priority bacteria–antibiotic combinations to monitor in animals, due to their implications for human health. For most of these, including meticillin-resistant *Staphylococcus aureus*, fluoroquinolone-resistant *Escherichia coli*, and colistin-resistant Enterobacterales, no strong molecular or epidemiological evidence links animal strains to multidrug-resistant infections in humans. The most crucial, Enterobacterales resistant to carbapenems, remains virtually absent in French livestock and has only been detected sporadically in companion animals.<sup>3</sup>

The One Health framework remains essential,<sup>4</sup> but its implementation requires greater contextual sensitivity. In France and other high-income countries, the assumption of symmetrical risk between sectors is inaccurate, as human AMR trends have not mirrored the progress achieved in the animal sector, showing that veterinary interventions alone have insufficient impact. Although

interspecies transmission does occur through some foodborne pathogens and livestock-associated meticillin-resistant *Staphylococcus aureus*, such cases are exceptions. The primary drivers of AMR in humans remain within the health-care system, including inappropriate antibiotic prescribing, weak infection prevention and control, and human-to-human transmission.<sup>5</sup>

International trade, travel, and medical tourism serve as well documented pathways for the spread of resistant strains, including carbapenemase-producing Enterobacterales.<sup>6</sup> This pattern is observed across both high-income and emerging economies. In particular, hospitalisations abroad, especially in countries with low infection prevention and control infrastructure, are frequently linked to the importation of multidrug-resistant pathogens.<sup>7</sup>

In low-income and middle-income countries, AMR is exacerbated by weak health systems, poor regulation, substandard drug quality, and insufficient diagnostics.<sup>8</sup> Environmental factors such as wastewater, industrial effluents, and contaminated manure also facilitate the spread of resistance genes.<sup>9</sup> Since AMR is an evolutionary process driven by gene transmission through bacteria and mobile genetic elements across hosts, species, and ecosystems,<sup>10</sup> the environmental dimension needs to be recognised as a central component of national and global strategies.

France's experience shows the effectiveness of structured, science-based, and inclusive stewardship policies in the veterinary sector, but success in one domain alone cannot shift national AMR trends. Achieving lasting impact requires similar ambition and investment in human and environmental health, with policies that are proportionate to each sector's actual contribution and tailored to specific contexts. Policies should be evidenced, drawing on genomic surveillance, risk assessment, and measurable outcomes, while also being socially and politically acceptable to stakeholders.

Based on the outcomes noted in France, we recommend expanding integrated AMR surveillance systems by incorporating real-time genomic capabilities to track resistance gene flow across domains. National strategies should be tailored to local epidemiological patterns, infrastructure, and capacities, rather than relying on standardised global templates. Priorities also include promoting transparency, sharing data and experiences,

and strengthening collaboration across countries and sectors. Finally, moving away from blame-based narratives and fostering a balanced international discourse that recognises both progress and remaining gaps is essential.

The fact that animals can harbour and transmit resistant bacteria is acknowledged, but current evidence indicates that the contribution of animals to the impact of AMR on public health is low in France.<sup>3</sup> The next step is ensuring that the same level of ambition applies across other countries. As AMR threatens to erode decades of medical progress, we should avoid diverting efforts based on misplaced assumptions. A targeted, coordinated, and evidence-based One Health strategy, rooted in local realities and global solidarity, is the path forward.

We declare no competing interests.

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*\*Elissa Khamisse, Xavier Bertrand, Damien Bouchard, Lucie Collineau, Olivier Fortineau, Marisa Haenni, Jean-Yves Madec, Claude Saegerman, Etienne Giraud†, Eric Oswald†*

[elissa.khamisse@anses.fr](mailto:elissa.khamisse@anses.fr)

†Joint senior authors

Direction de l'évaluation des risques, French Agency for Food, Environmental and Occupational Health and Safety (ANSES), Maisons-Alfort, France (EK); Université Marie et Louis Pasteur, Centre Hospitalier Universitaire de Besançon, Besançon, France (XB); ANSES, French Agency for Food, Environmental and Occupational Health and Safety, Antibiotics, Biocides, Residues and Resistance Unit, Laboratory of Fougères, ANMV, National Agency for Veterinary Medicinal Products, Fougères, France (DB); Epidemiology and Surveillance Support Unit, University of Lyon - French Agency for Food, Environmental and Occupational Health and Safety

(ANSES), Lyon, France (LC); ANSES - Université de Lyon, Unité Antibiorésistance et Virulence Bactériennes, Lyon, France (MH, J-YM), Société Nationale des Groupements Techniques Vétérinaires (SNGTV), Paris, France (OF); Research Unit in Epidemiology and Risk Analysis applied to Veterinary Sciences (UREAR), Fundamental and Applied Research for Animals & Health (FARAH) Center, Faculty of Veterinary Medicine, University of Liège, Liège, Belgium (CS); INTHERES, Université de Toulouse, INRAE, ENVT, Toulouse, France (EG); IRSD, Université de Toulouse, INSERM, INRAE, ENVT, Toulouse, France (EO); University Hospital of Toulouse, Hôpital Purpan, Service de Bactériologie-Hygiène, Toulouse, France (EO)

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