

Residual antimicrobials in food can select for antimicrobial resistance

Authors' reply

We thank Sheeba Santhini Manoharan-Basil and colleagues for their Correspondence¹ and for extending the discussion initiated by our Comment published in *The Lancet Microbe*.² Our paper primarily focused on the French context and Europe more broadly in light of the measurable progress achieved through national programmes, such as the EcoAntibio plans in France.

We fully acknowledge that residual antimicrobials in food can, under some conditions, exert selective pressure on bacteria. We also acknowledge in-vitro studies suggesting that the lowest observed effect concentrations of some antibiotics (particularly fluoroquinolones) are lower than the EU-established maximum residue limits of antibiotics in foodstuffs. However, as we indicated, this potential selective effect cannot be equated with that of antibiotics used in clinical settings. In France, the occurrence of antimicrobial residues exceeding the maximum residue limits in food of animal origin is now rare, reflecting both strict regulatory frameworks and the success of national actions to reduce and rationalise antimicrobial use in veterinary medicine. For example, fluoroquinolones, one of the most scrutinised antimicrobial classes, are now rarely, if ever, used in food-producing animals. Withdrawal periods are rigorously respected, and official monitoring consistently reveals the absence of antibiotic residues in meat intended for human consumption. In summary, while we share the concern regarding residual antimicrobials as potential contributors to antimicrobial resistance, the available evidence in Europe, based on the latest European Food Safety Authority reports, indicates that the contribution of domestic animal production is now minimal.³

One of the ongoing challenges in evaluating the potential role of antimicrobial residues in food in driving antibiotic resistance is that the quantities, origins, and profiles of antimicrobial residues in imported foodstuffs are insufficiently characterised. Strengthening traceability and harmonising monitoring at the European and global levels would usefully complement national initiatives aimed at reducing the potential impact of these residues on the development of antimicrobial resistance. In addition, the impact of commonly used non-antibiotic medications on the development and selection of antimicrobial resistance might be considerably greater than that of the trace antibiotic residues occasionally detected in food products. Several studies have shown that non-antibiotic pharmaceuticals can increase mutation frequencies and facilitate the emergence of high-level antimicrobial resistance in bacteria.^{4,5} This broad pharmacological contribution to resistance evolution deserves increased attention in the global debate on the drivers of antimicrobial resistance.

We declare no competing interests.

Copyright © 2025 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

*Elissa Khamisse, Xavier Bertrand, Damien Bouchard, Lucie Collineau, Olivier Fortineau, Marisa Haenni, Jean-Yves Madec, Claude Saegerman, Etienne Giraud, *Eric Oswald*
eric.oswald@utoulouse.fr

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, 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 - 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, 31300 Toulouse, France (EO); University Hospital of Toulouse, Hôpital Purpan, Service de Bactériologie-Hygiène, Toulouse, France (EO)

- 1 Manoharan-Basil SS, Ingelbeen B, Kenyon C. Residual antimicrobials in food can select for antimicrobial resistance. *Lancet Microbe* 2026; 7: 101281.
- 2 Khamisse E, Bertrand X, Bouchard D, et al. Rethinking the role of animals in antimicrobial resistance. *Lancet Microbe* 2026; 7: 101248.
- 3 European Food Safety Authority, Salvatore S, Vericat Ferrer M. Report for 2023 on the results from the monitoring of residues of veterinary medicinal products and certain substances in live animals and animal products. *EFSA Support Publ* 2025; 22: EN-9297.
- 4 Maier L, Pruteanu M, Kuhn M, et al. Extensive impact of non-antibiotic drugs on human gut bacteria. *Nature* 2018; 555: 623-28.
- 5 Chen H, Sapula SA, Turnidge J, Venter H. The effect of commonly used non-antibiotic medications on antimicrobial resistance development in *Escherichia coli*. *NPJ Antimicrob Resist* 2025; 3: 73.



Lancet Microbe 2026; 7: 101302

Published Online December 9, 2025
<https://doi.org/10.1016/j.lanmic.2025.101302>

See [Correspondence](https://doi.org/10.1016/j.lanmic.2025.101281) <https://doi.org/10.1016/j.lanmic.2025.101281>