New research highlights implications of antibiotic use in human and veterinary medicine

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Dr. Dhrati Patangia, University College Cork Ph.D. graduate and Teagasc Researcher. Credit: Teagasc

A series of five research publications on Antimicrobial Resistance

(AMR) by APC Microbiome Ireland yields new data regarding the implications of antibiotic use in early life and the effects of antibiotics in standard dry cow therapy.

Lead author of these publications, Dr. Dhrati Patangia, was recruited under the APC AMR Ph.D. Fellowship program in 2018. The most recent paper, published in *Microbiome* provides evidence that early life exposure of infants to specific antibiotics could lead to multi-drug resistance.

A second publication, in the journal *Antibiotics*, suggests that antibiotic use does not benefit standard dry cow therapy. And a third article, published in *Gut Microbes*, discusses the influence of age, socioeconomic status, and location on the infant gut resistome.

Dr. Patangia is also lead author on two reviews. The first, in *Trends in Microbiology* and titled "Vertical transfer of antibiotics and antibiotic resistant strains across the mother/baby axis," reviews the mechanisms of mother to infant transmission of antibiotics and antibiotic resistant strains.

The second review, published in the journal *Microbiology Open*, titled "Impact of antibiotics on the human microbiome and consequences for host health," discusses the adverse effects of antibiotics on the gut microbiota and thus host health and suggests alternative approaches to antibiotic use.

Dr. Patangia is a recent Ph.D. graduate from the APC and School of Microbiology, University College Cork. While undertaking her Ph.D., she was based in Teagasc in Moorepark, Co Cork, building on the close collaborative relationship between UCC and Teagasc. Dr. Patangia was supervised by Professor Catherine Stanton, APC co-Principal Investigator, and Professor Paul Ross, Director of APC, and has won

several awards including best poster prize at the 2022 Dublin University Microbiological Society focused meeting.

Dr. Patangia says, "My interest in the microbiome started in India when I chose the topic for a research module as part of my Masters program. I was delighted to discover the APC Antimicrobial Resistance Ph.D. Fellowship program which enabled me to target my Ph.D. on my interest areas: the human microbiome, antibiotic resistance, and early life. While antibiotics provide lifesaving benefits, they come at the cost of the potential development of antimicrobial resistance which could result in a lack of effective medication in certain situations."

APC Director Professor Paul Ross says "The goal of the APC Antimicrobial Resistance Ph.D. Fellowship program was to train a group of Ph.D. students with specific research skills to create an expert cohort of AMR researchers. AMR is a huge global crises with an anticipated twofold surge in resistance to last-resort antibiotics by 2035, compared to 2005 levels according to the Organization for Economic Cooperation (source WHO)."

Professor Philip Nolan, Director General, Science Foundation Ireland, said, "SFI is committed to supporting research excellence to address the future challenges. Antimicrobial resistance is a growing global public health challenge, we congratulate APC and Dr. Patangia in their recent scientific discoveries towards a better understanding of and solutions addressing antimicrobial resistance."

Vice President for Research and Innovation at UCC Professor John F. Cryan says, "UCC has a research focus on the challenges and opportunities that are shaping the future of our nation and the wider world. UCC scientists at APC are pioneering critical research to combat the global AMR crises through microbiome research."

Teagasc Senior Principal Research Officer and APC PI Catherine Stanton says, "There is no doubt that antibiotics are vital for the treatment of certain infections in infants. However, this study has shown that antibiotic exposure in early life has an immediate and persistent effect on the gut microbiome, highlighting the need for new alternatives/strategies to be developed and used where needed to restore the microbial ecosystem and maintain a healthy microenvironment, and reduce the use of prophylactic antibiotics during the crucial infancy stage."

More information: Dhrati V. Patangia et al, Early life exposure of infants to benzylpenicillin and gentamicin is associated with a persistent amplification of the gut resistome, *Microbiome* (2024). DOI: 10.1186/s40168-023-01732-6

Dhrati V. Patangia et al, Microbiota and Resistome Analysis of Colostrum and Milk from Dairy Cows Treated with and without Dry Cow Therapies, *Antibiotics* (2023). DOI: 10.3390/antibiotics12081315

Dhrati V. Patangia et al, Influence of age, socioeconomic status, and location on the infant gut resistome across populations, *Gut Microbes* (2024). DOI: 10.1080/19490976.2023.2297837

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Dhrati V. Patangia et al, Impact of antibiotics on the human microbiome and consequences for host health, *MicrobiologyOpen* (2022). DOI: 10.1002/mbo3.1260

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