City birds found to be carriers of antimicrobial resistant bacteria

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Research led by scientists at the Ineos Oxford Institute for antimicrobial

research at Oxford University has found that wild birds such as ducks and crows living close to humans, for example in cities, are likely to carry bacteria with antimicrobial resistance (AMR). This creates an urgent need for policy makers and health services to consider the different ways antibiotic resistant bacteria can spread outside hospital settings.

The study, "Proximity to humans is associated with antimicrobial resistant enteric pathogens in wild bird microbiomes," is published in *Current Biology*.

AMR occurs when disease-causing microbes such as bacteria become resistant to antibiotics that would otherwise kill them. In the UK, an estimated 58,224 people had a severe antibiotic-resistant infection in 2022, and 2,202 died. Globally, AMR was directly responsible for an estimated 1.27 million deaths in 2019, and the World Health Organization has described it as one of the top global public health and development threats.

In the study, researchers analyzed 700 samples of bacteria taken from the guts of 30 species of wild birds across eight countries: Canada, Finland, Italy, Lithuania, Japan, Sweden, the UK, and the USA. They looked at Campylobactor jejuni, a common diarrhea-causing zoonotic bacteria found in birds' gut microbiomes. Zoonotic diseases are those that can spread between animals and humans.

Using genomic analysis, they studied the diversity of C. jejuni strains, as well as the presence of genes associated with AMR. A novel statistical model was developed to study the relationship between these and various factors including bird behavior and location.

Genetic markers associated with AMR were found across all bird species studied.

It was found that wild birds living close to humans, such as crows and ducks, contained a wider range of bacterial strains, and up to three times more AMR genes than birds living in more isolated environments such as mountains. This included genes associated with resistance against many commonly used human antibiotics, including fluoroquinolones and beta-lactams.

Professor Samuel Sheppard, Digital Microbiology and Bioinformatics Lead, Ineos Oxford Institute for antimicrobial research and Department of Biology, Oxford University, lead author of the study, said, "Antimicrobial resistance (AMR) is a complex problem that affects not only human health but also animals and the environment.

"Wild birds have potential to transfer AMR over long distances to livestock raised for meat consumption and companion animals such as pets. This can have economic implications for agriculture, animal welfare, and food security."

Animals living in urban areas are exposed to various sources of antimicrobial resistant bacteria, such as wastewater-contaminated rivers, and could play a role in spreading these to humans. As human populations continue to grow, urbanization disrupts the existing environment as well as the animals that live there. This leads to increased contact between humans and wild animals, providing new opportunities for the spread of zoonotic pathogens.

Despite this threat to global health, there has been little research into how habitat disruption impacts the bacteria carried by animals living close to humans. This new study provides important quantitative evidence for the transmission of AMR throughout ecosystems, and highlights the interconnected roles of humans, animals, and the environment in contributing to the spread of AMR.

Birds can travel large distances, and many species identified in this study, such as crows and thrushes, are prevalent in urban environments, in close contact with humans. The data provided by this research will be invaluable for future studies to understand the full impact of human expansion on the spread of zoonotic pathogens and AMR.

More information: Evangelos Mourkas et al, Proximity to humans is associated with antimicrobial-resistant enteric pathogens in wild bird microbiomes, *Current Biology* (2024). DOI: 10.1016/j.cub.2024.07.059

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