The role of gulls as reservoirs of antibiotic resistance in aquatic environments: a scoping review

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The role of wildlife with long-range dispersal such as gulls in the global dissemination of antimicrobial resistance (AMR) across natural and anthropogenic aquatic environments remains poorly understood. Antimicrobial-resistant bacteria have been detected in resident and migratory gulls worldwide for more than a decade, suggesting gulls as either sentinel of AMR pollution from anthropogenic sources and/or independent reservoirs that could maintain and disperse AMR across aquatic environments. However, confirming either of these roles remains challenging and incomplete. In this work, we summarized the global dissemination of AMR in gulls, the genetic mechanisms behind this dissemination, and the available evidence suggesting gulls as reservoirs of antibiotic-resistant bacteria and/or antibiotic-resistance genes. We identified 90 studies focusing on AMR in gulls from all continents but mostly in high-income countries. Studies included 23 out of 100 gull species, 49 bacteria species (mainly Escherichia coli and Salmonella spp.), and 13 bacteria classified as critical priority for human health. Despite many studies focusing on AMR in gulls, most studies did not identify the source of AMR, few studies compared bacteria isolated in gulls with another wild or domestic species, and only two studies performed longitudinal sampling to assess the maintenance and dispersion of AMR by gulls within and across regions. We suggest future research required to confirm the role of gulls in the global dispersion of AMR including the standardization of sampling protocols, longitudinal sampling using advanced satellite tracking, and whole-genome sequencing typing.

1. What is your pathogen? Multiple options possible (e.g. if working on coinfections)
   Bacteria : Antimicrobial-resistant bacteria

2. On a scale of 1-5 is your work mostly eco/epidemiological or evolutionary? 1 (100% eco/epidemiological)

3. On a scale of 1-5 is your work mostly theoretical or experimental/empirical?
   1 (100% theoretical)