



## IS THE LACK OF ANTIMICROBIAL RESISTANCE (AMR) SURVEILLANCE IN WILDLIFE A PUBLIC HEALTH GAP?

### RELEVANCE TO CFEZI

The Centre for Food-borne, Environmental and Zoonotic Infectious Diseases assesses the risk and reduces the impact of infectious diseases in Canada and internationally that can be spread to humans through contaminated food or water, including zoonotic pathogens and antibiotic resistant enteric bacteria. Wildlife are often overlooked as sources and sinks of antimicrobial resistance genes. A growing number of surveys and studies point to wildlife as important environmental reservoirs of AMR, as means to transport antimicrobial resistance (AMR) genes over long distances, and as sources of surface water and country food contamination. The magnitude of risk this environmental source presents to public health is unquantified. As few wildlife are treated with antimicrobials, AMR testing is not routinely done for wildlife presented to diagnostic labs. Cost and reporting limitations prevent information on AMR on clinically ill wildlife being entered into a national surveillance system. The case load of the Canadian Wildlife Health Cooperative (CWHC) could allow for a geographically dispersed source of wildlife samples that could provide consistent AMR surveillance.

**Is there a problem:** Wildlife contribute to environmental contamination with bacterial pathogens and their transfer to the human food chain and potable water supplies (1,2). The magnitude of the contribution of wildlife to antimicrobial resistant enteric bacteria by foodborne or waterborne routes is unquantified. Environmental reservoirs of resistance determinants are poorly understood. There are, however, a growing numbers of case studies and surveys indicating that wildlife function as important host reservoirs and potential vectors for the spread of resistant bacteria and genetic determinants of AMR (3). Migratory wild birds are viewed by some as important contributors to the dissemination of AMR genes (4). Water can be of importance in the exchange of AMR organisms or resistance genes between wildlife and people (2). While the depth of literature is shallow compared to investigations in livestock, there is a growing array of studies showing the importance of wildlife as reservoirs and potential vectors for the spread of resistant bacteria and genetic determinants of AMR in Canada in urban, agricultural and wild settings. (ex 5,6,7).



## AMR TRAFFIC BETWEEN PEOPLE AND WILDLIFE

Wild birds could create a potential public health threat by transmitting multi-drug resistant bacteria to water streams and other environmental sources through their feces, and to remote regions by migration (8). The relative importance of various wildlife sources and sinks of AMR bacteria is speculative because most reports of AMR in wildlife are survey based and/or small scale. There is opinion and evidence that wildlife acquire antimicrobial resistant bacteria through contact with people, domesticated animals and the environment rather than from clinical use of antimicrobial agents. Antibiotic resistance in wildlife associated bacteria is correlated with the proximity of the animals to human populations (4). Strong links exist between human activities on natural habitats and the carriage of antimicrobial-resistant bacteria by wildlife (2). North American and European studies have found high prevalence of antibiotic-resistant *Salmonellae* and *E. coli* in both pond water and sympatric water birds (ex. 9,10). There may be increased risk with climate change that heavy rain or snowmelt may flush wildlife feces into surface water supplies (11). Urban wildlife are involved in the AMR cycle. For example, multidrug resistant *E.coli* and methicillin resistant *Staphylococci* and *Clostridium difficile* have all been detected in rats in Vancouver (12,13).

## OPPORTUNITIES AND OBSTACLES TO AMR SURVEILLANCE IN WILDLIFE

Free-ranging wildlife are rarely provided antibiotic because of concerns with food residues, the challenges of maintaining therapeutic levels long enough, and cost limitations. Wildlife held for clinical care can be provided antimicrobial agents, but financial constraints limit AMR testing and clinical facilities are generally not part of national or regional surveillance systems. Therefore, most of what we know in Canada comes from sporadic surveys or time limited studies restricted to a small sub-set of species. The Canadian Wildlife Health Cooperative handles thousands of dead or dying animals along with other wild animals contacted through field research. Because clinical treatment is not a consideration for these animals and the people funding wildlife disease surveillance generally are not concerned with AMR in wildlife, rarely are cases presented to the CWHC tested for the presence of antimicrobial resistant pathogens or genes. However, the pan-Canadian network of samples and access to advanced diagnostic facilities enables the CWHC to be a source of samples for agencies or individuals interested in determining if/how wildlife contribute to the AMR emergency in Canada. Just as was done in response to West Nile virus incursion and the threat of pandemic avian influenza, the CWHC could provide a foundation for environmental surveillance for AMR of public health concern.

*“Monitoring the resistance prevalence of indicator bacteria such as Escherichia coli and enterococci in wild animals makes it possible to show that wildlife has the potential to serve as an environmental reservoir and melting pot of bacterial resistance (14). We need to take more steps to decrease the spread of resistance genes in environmental bacteria into human pathogens and to decrease the spread of resistant bacteria to people and animals via foodstuffs, wastes and water (15).*

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