



Letter to the Editor

Epidemiological implications of drug-resistant bacteria in wildlife rehabilitation centers

Dear Editor,

The constant increase of antimicrobial resistance in human and animal pathogens is a current public health concern [1,2]. In this regard, even though this issue seems to be more related to humans, food-producing and companion animals, it also has implications for wildlife [2].

To date, discussions about transmission routes of drug-resistant bacteria in wildlife are in evidence [3]. Their identification in migratory wild animals inhabiting remote environmental niches with limited human footprints has been documented, such as in isolated oceanic islands and Antarctic region [3–5].

Direct contact with agricultural and livestock facilities or other anthropogenic impacted environments has been considered the main transmission pathway of drug-resistant pathogens to wild populations [3]. On the other hand, some studies have point out that wildlife-human interactions and contact with other diseased animals could also favor these transmissions [6,7].

Wildlife rehabilitation centers provide shelter, care and rehabilitation with the central purpose of releasing native wildlife back into their natural habitat. These institutions are remarkably important for wildlife conservation, playing a paramount role to reduce the negative impacts of human-associated activities in wildlife ecosystems. However, it is plausible that reintroduction programs could unintentionally contribute for the transmission of human-associated pathogens to wild animals and natural environments [6,7].

Ingestion of contaminated food and direct contact with other hospitalized animals or rehabilitation staff may be potential transmission pathways of drug-resistant bacteria to animals undergoing rehabilitation [6–8]. A remarkable example was observed in sanctuary apes from Zambia and Uganda, where the transmission of drug-resistant, human-associated lineages of *Staphylococcus aureus* between humans and chimpanzees was suggested [8].

Similar situations were documented in wildlife rehabilitation centers in U.S. Jijón et al. [7] have identified a ceftiofur-resistant *Salmonella* Kentucky in an Eastern gray squirrel (*Sciurus carolinensis*) in Ohio. Likewise, Steele et al. [6] have recovered 13 multidrug-resistant bacteria from seabirds in California and Washington. Unfortunately, it remains unclear if the animals entered the rehabilitation facilities carrying these strains or if they became colonized after admission [6,7].

More worrisomely, some global priority pathogens [e.g., extended-spectrum β -lactamases (ESBL)-producing Enterobacteriaceae, carbapenem-resistant *P. aeruginosa*, multidrug-resistant *Salmonella* spp., and methicillin-resistant *Staphylococcus* spp.] may present versatile behavior and be able to colonize and persist in gut or skin microbiota of human and wildlife hosts [2,3,5–10]. As a

result, asymptomatic animals colonized by these bacteria may lead to severe ecological implications when released into the environment [6–8].

In summary, the appearance of drug-resistant pathogens in wild animals of rehabilitation centers constitutes a serious risk to balance of wildlife ecosystems. The reintroduction of asymptomatic carriers could offers substantial implications to conservation of endangered or threatened species. As a matter of urgency, scientific community and wildlife authorities must debate this issue as a new ecological concern. Perhaps, transmission of drug-resistant bacteria could be reduced by implementation of simple prophylactic measures [6]. Additional actions could involve housing infected animals individually to avoid cross-contamination to other hospitalized animals [6]. Finally, continuous surveillance of antimicrobial resistance may significantly contribute to determine possible transmission routes of drug-resistant pathogens between humans, wildlife and their shared environments.

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Competing interest

None declared.

Ethical approval

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