



Letter to the Editor

Zoonothroponotic transmission of high-risk multidrug-resistant pathogens: A neglected public health issue



Dear Editor,

The One Health approach has gained global recognition as an important way to address critical public health issues, including the problem of antimicrobial resistance at the interface of human and veterinary medicine. In this regard, even though numerous studies have provided substantial evidence of spread of clinically significant antibiotic-resistant bacteria from animals to humans, genomic epidemiology studies have confirmed that humans can also transmit antibiotic-resistant pathogens to animals in a reverse zoonotic event, called zoonothroponosis [1–3]. Therefore, although the term “zoonosis” has been adopted to define any transmission of pathogens (including drug-resistant) between human and animals [2,3], the term “zoonothroponosis” should be applied to define specifically the transmission from humans to animals.

A major issue in this field is the transmission of international high-risk clones of extended-spectrum beta-lactamase (ESBL)-producing bacteria, from humans to companion animals, including *Escherichia coli* (sequence types ST10, ST131, ST405 and ST648), *Enterobacter cloacae* (ST114) and *Klebsiella pneumoniae* (ST11) [4–7]. Worryingly, genetic lineages of methicillin-resistant *Staphylococcus aureus* (MRSA) ST8, ST22, ST239 and ST254, have been isolated from human, as well as from animals; and more recently, KPC-2-producing *E. coli* ST648 has begun to be identified in pet infections [4,8].

Another important point refers to the transmission of nosocomial lineages of bacterial pathogens, from hospital-discharged patients to companion animals, in household settings. In this regard, the transmission of carbapenem-resistant NDM-5-producing *E. coli* ST167, from humans with previous history of hospitalization, to dogs presenting infections, has been suggested [9]; whereas zoonothroponotic transmission of the high-risk hospital lineage of VIM-2-producing *Pseudomonas aeruginosa* ST233 has been confirmed after pet owner discharge from the hospital to home [1]. Currently, colonization by OXA-23 and NDM-1-producing *Acinetobacter baumannii* in pets hospitalized in veterinary care centers has also been documented [10].

In summary, zoonothroponotic transmission of high-risk multidrug-resistant pathogens (including carbapenem-resistant *Enterobacteriales* or vancomycin-resistant enterococci) tends to increase in response to closer relationships between humans and companion animals. Contrary to human medicine, where carbapenem and vancomycin remain as drugs of last resort for the treatment of ESBL and MRSA infections, respectively, use of these

drugs have been not approved in veterinary medicine. Therefore, the occurrence of high-risk multidrug-resistant pathogens in veterinary medicine is leading to an antibiotic resistance crisis, similarly to what occurs in human medicine. Finally, adopting the One Health approach, interdisciplinary investigations should be encouraged as collaborative efforts between human and veterinary professionals.

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Competing interests

None declared.

Ethical approval

Not required.

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