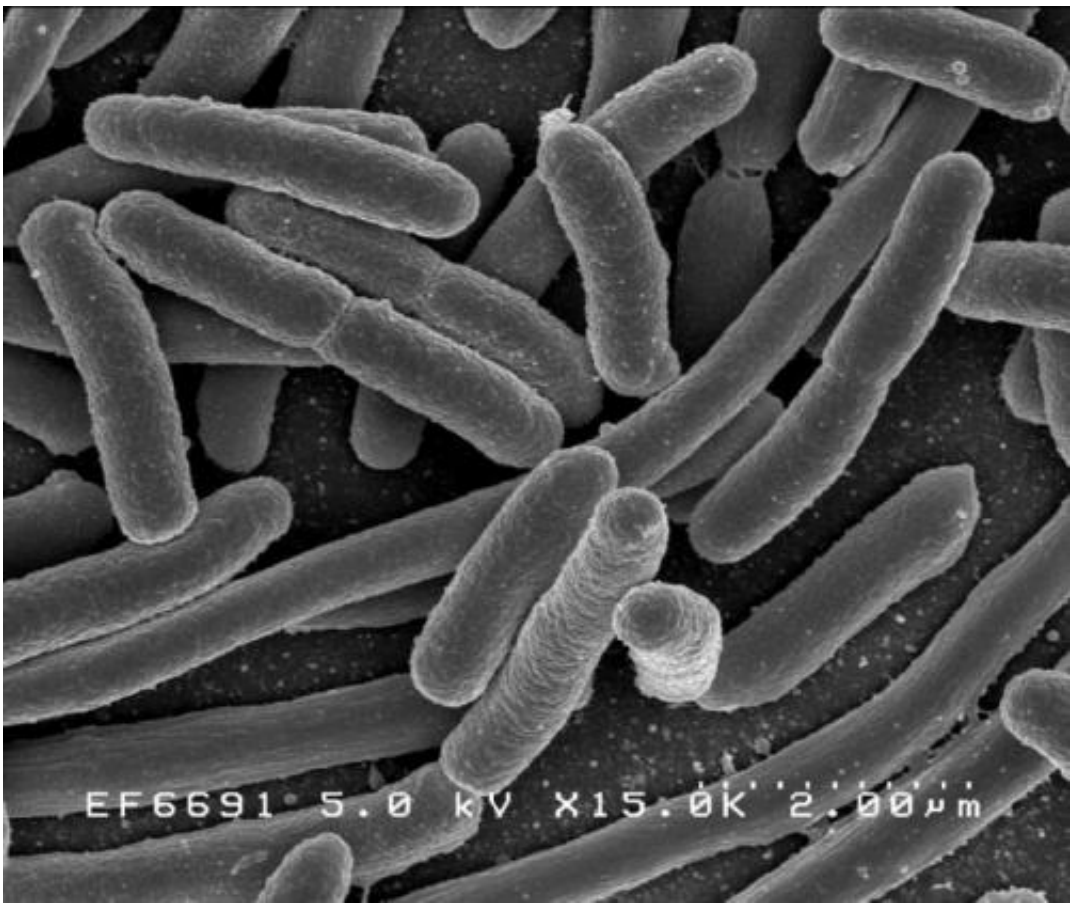
Both antibiotic resistant bacteria and genes transmitted between healthy dogs and cats and their owners

April 6 2022



Escherichia coli. Credit: Rocky Mountain Laboratories, NIAID, NIH

Healthy pet dogs and cats could be passing on antibiotic-resistant

bacteria as well as genes that play a key role in bacterial resistance to their owners, according to new research to be presented at this year's European Congress of Clinical Microbiology & Infectious Diseases (ECCMID) in Lisbon, Portugal (23-26 April). The study is by Dr. Juliana Menezes from the University of Lisbon in Portugal and Dr. Sian Frosini from the Royal Veterinary College, UK, and colleagues.

"Our findings verify not only the sharing of antibiotic resistant bacteria but also of resistance genes between companion animals and their owners in the community, underscoring the need for continuous local surveillance programs to identify the potential risk to human health", says Dr. Menezes from the University of Lisbon.

The role of companion animals as potential reservoirs of antimicrobial-resistant bacteria is a growing concern worldwide. *Escherichia coli* (*E. coli*) bacteria are common in the intestines of healthy people and animals. There are a number of different types and, while the majority are harmless, some can cause serious food poisoning and life-threatening infections, including blood poisoning, with over 40,000 cases each year in England alone.

Particularly important are infections caused by highly resistant strains with ESBL and AmpC-producing *Enterobacteriaceae* (AmpC-E) and Carbapenemase-producing *Enterobacterales* (CPE), which are resistant to multiple antibiotics including penicillin and cephalosporins.

In this study, researchers wanted to find out how these resistant bacteria are spread and whether there is a cross-over between healthy companion animals (ie, cats and dogs) and their owners.

The health of companion animals was evaluated by their vet when attending the Small Animal Veterinary Teaching Hospital at the University of Lisbon and the Royal Veterinary College Small Animal

Veterinary Referral Service at the Royal Veterinary College in the UK. Only animals and their owners who had not experienced bacterial infections or taken antibiotics in the 3 months prior to the start of the study were recruited.

Stool samples were collected from 58 healthy people and the 18 cats and 40 dogs that lived with them from 41 households in Portugal, and from 56 healthy people and 45 dogs from 42 households in the UK.

Samples were collected at monthly intervals for four months, and genetic sequencing was used to identify both the species of bacteria in each sample, and the presence of drug resistance genes.

The researchers used Rep-PCR, a fast and simple to use molecular fingerprinting technique that helps to identify related strains of bacteria. Because it is not as sensitive as whole genome sequencing, they also sequenced the strains to confirm the possible sharing of resistant bacteria.

Between 2018 and 2020, 15 out of 103 (15%; 1 cat and 14 dogs) pets and 15 out of 114 (13%) household members from both countries were found to be carrying ESBL/AmpC-producing bacteria. Of these, almost half the cats and dogs (6 in Portugal and 1 in the UK), and a third of the household members (4 in Portugal and 1 in the UK), were colonized with at least one multidrug-resistant strain (see table 1 in notes to editors).

No carbapenem-resistant Enterobacterales or *Acinetobacter* spp were detected in any of the samples.

In four Portuguese households, the ESBL/pAMPc resistance genes found in pets matched those found in their owner's stool samples. In three of these households, matched resistance genes were only recovered at one timepoint (see figure 2 in notes to editors), but in one household,

sharing strains were noted at two consecutive timepoints suggesting a persistent colonization of shared bacteria.

In addition, in two of the households, the microbes in pets matched *E. coli* strains found in their owner's stool sample, but in the other two, there was no evidence of bacteria sharing (see figure 3 in notes to editors).

"Sometimes the bacteria may not be shared, but their resistance genes can be", explains Dr. Menezes. "These genes are found in mobile bits of DNA, meaning that they can be transferred between different bacterial populations in animal and humans."

She continues, "Even before the COVID-19 pandemic, antibiotic resistance was one of the biggest threats to public health because it can make conditions like pneumonia, sepsis, urinary tract and wound infections untreatable. Although the level of sharing from the households we have studied is low, healthy carriers can shed bacteria into their environment for months, and they can be a source of infection for other more vulnerable people and animals such as the elderly and pregnant women. Our findings reinforce the need for people to practice good hygiene around their pets and to reduce the use of unnecessary antibiotics in companion animals and people."

This is an observational study and cannot prove that close contact with pets causes colonization with antibiotic resistant bacteria, but only suggest the possibility of such an effect. The authors point to several limitations, including that it involved a small number of families and the longitudinal follow up was limited.

Provided by European Society of Clinical Microbiology and Infectious Diseases