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# Frequency of multidrug, extensively drug and pandrug-resistant bacteria isolated from external otitis and dermatitis in dogs

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The increase in multi-drug resistance of bacteria from animals has been registered worldwide. The aim of this study was to report the frequency of multidrug-resistant (MDR), extensively drug-resistant (XDR) and pandrug-resistant (PDR) bacteria isolated from external otitis and dermatitis in dogs. A total of 587 antimicrobial susceptibility records were analyzed between 2014 and 2017 from pets that were examined at an University Veterinary Clinic in the northeast of Lima, Perú. Antimicrobial susceptibility was determined by disk-diffusion method according to the Clinical Laboratories Standards Institutes breakpoints. Grampositive strains were identified in 71.2 % (418/587) and 0.2 % (1/587) as *Staphylococcus* spp. and *Streptococcus* spp., respectively. Enterobacteriaceae were identified in 3.4 % (20/587), 2.9 % (17/587), 1.5 % (9/587) and 0.2 % (1/587) as *Proteus* spp., *Escherichia coli*, *Klebsiella* spp. and *Citrobacter* sp., respectively. The 20.27 % (119/587) were identified as *Pseudomonas* spp., and 0.32 % (2/587) as non-

fermenting gramnegative bacillus. The 22.7 % (95/418) of *Staphylococcus* spp. were MDR and resistant to cephalosporins. Also, the 35.16 % (147/418) of MDR strains were resistant to three or more antibiotics categories. On the other hand, the 2.39 % (10/148) of *Staphylococcus* spp. were resistant to at least one agent of all the antimicrobial categories, considering possible PDR. The 2.13 % (1/47) of *Proteus* sp. from dermatitis was a possible XDR as it shows resistance to at least one agent of the eight categories (folate pathway inhibitors, fluoroquinolones, penicillin and beta-lactamase inhibitors, first and third-generation cephalosporins, carbapenems, aminoglycosides and tetracyclines). The frequency of MDR Enterobacteriaceae strains were 19.15 % (9/47) because they were resistant to five, six and seven antimicrobial categories; therefore, it could be considered as possible XDR. Finally, the 1.65 % (2/121) strains of *Pseudomonas* spp. from otitis were MDR since they were resistant to fluoroquinolones, cephalosporins and aminoglycosides, but susceptible to carbapenems. There was no association between the frequency of MDR bacteria and sex or age ranges. In our study, most *Staphylococcus* strains and an important group of gramnegative isolates were MDR. Bacteria carrying antimicrobial resistance to more than one category limit the antibiotic therapy choices in small animals. Its epidemiological surveillance based on the One-Health approach are important because these bacteria could be transmitted to humans.

**Keywords**: *Staphylococcus*, antimicrobial resistance, Enterobacteriaceae, MDR, PDR, pets.