

TITLE: OCCURRENCE OF THE COLISTIN RESISTANCE GENE *mcr-3* FROM AGRICULTURAL AND FOREST SOILS IN NOVA FRIBURGO, RIO DE JANEIRO, BRAZIL

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ABSTRACT:

The emergence of multiresistant bacteria has been limiting the commonly used therapeutic options. The colistin, polymyxin E, is a last-resort antimicrobial to treat infections caused by multiresistant gram-negative bacteria. Since the discovery of the first plasmid-mediated colistin resistance gene *mcr-1* in 2015, other mechanisms of resistance to this antimicrobial have been identified. Recently in 2017, the *mcr-3* gene was added to the list of the phosphoethanolamine transferase enzyme family that confers resistance to colistin. Resistance is caused by the modification of the lipid A molecule in the outer membrane of the bacteria by the addition of phosphoethanolamine or 4-amino-4-deoxy-L-arabinose residue that reduces the affinity of the antimicrobial and decreases bacterial susceptibility. The discovery of plasmid-mediated resistance to colistin has prompted concern to international health organizations because of the loss of effectiveness of this antimicrobial to treat infections in humans. The soils represent a reservoir and source of antimicrobial resistance and the application of manure from animal production can enhance the abundance and diversity of antibiotic resistance determinants. From this perspective, this study aimed to detect the colistin resistance gene *mcr-3* in agricultural soil areas that received non-composted poultry litter as organic fertilizer and forest soils in Nova Friburgo, Rio de Janeiro, Brazil. Twenty soil samples were collected at 0-20 cm depth, including 10 from agricultural areas and 10 from forest areas. Total DNA was extracted and the detection of the *mcr-3* gene was performed by Polymerase Chain Reaction (PCR). The *mcr-3* resistance gene was detected in all samples analyzed. In the previous work of our group, the *mcr-1* gene also was detected in these same soil samples. Once there are reports of co-occurrence of the colistin resistance genes *mcr-1* and *mcr-3* on the same plasmid and both genes were found in all soils evaluated, further studies are necessary to elucidate the spread potential of these genes in the environment, since the colistin appears at the World Health Organization's List of Critically Important Antimicrobials for Human Medicine.

Keywords: antimicrobial resistance, One Health, Polymerase Chain Reaction (PCR), polymyxin E, poultry manure

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