Global Antimicrobial Resistance Surveillance System (GLASS)

The detection and reporting of colistin resistance

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Acronyms and abbreviations

AMR	antimicrobial resistance
CLSI	Clinical and Laboratory Standards Institute
EUCAST	European Committee on Antimicrobial Susceptibility Testing
GLASS	Global Antimicrobial Resistance Surveillance System
PCR	polymerase chain reaction

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Summary

The scope of this technical note is to review current methods for the detection of colistin resistance and to provide a framework for its investigation. The document highlights the critical distinction between phenotypic detection of colistin resistance and genotypic detection of specific colistin resistance mechanisms, such as *mcr* and chromosomal mutations. Colistin resistance in Enterobacteriaceae and *Acinetobacter baumannii* is included in the WHO Global Antimicrobial Resistance Surveillance System (GLASS). Currently, however, reliable tests for phenotypic detection of colistin resistance for clinical and surveillance purposes are not widely available.

The technical note describes existing phenotypic methods for detecting colistin resistance, genotypic methods for detecting specific colistin resistance mechanisms and surveillance strategies for monitoring colistin resistance.

This is a rapidly evolving field with new resistance genes being identified regularly and new methods for phenotypic resistance testing being described, hence this document will be updated, as needed, to reflect these developments.

1. Introduction

Colistin belongs to a group of antimicrobial agents known as polymyxins, which were originally isolated from the spore-forming soil organism *Paenibacillus polymyxa.* Molecules in this group are polymyxins A, B, C, D and E, of which only polymyxin E (colistin) and polymyxin B are used clinically in humans.

Colistin is a mixture of polymyxin E1 and E2, two bactericidal pentacationic lipopeptides. The mode of action of colistin is not fully elucidated but involves binding to lipopolysaccharides and phospholipids in the outer membrane of Gram-negative organisms, which results in membrane disruption and cell death. Colistin is active against a wide variety of Gram-negative bacteria and is not active against Gram-positive bacteria, which lack an outer membrane.

Colistin is used in both human and veterinary medicine. In humans, colistin is generally used to treat infections with multidrug-resistant, extensively drug-resistant and pan drug-resistant bacteria *(1)*. It is usually administered by injection or inhalation (the latter, for example, for patients with cystic fibrosis) as the sodium salt of colistin methanesulfonate, which is an inactive prodrug. It is considered less toxic than colistin sulfate, which is used orally (with very limited absorption) or topically *(2)*.

In veterinary medicine, colistin has been widely used in various food-producing animals (broiling and laying hens, pigs, calves, beef cattle, dairy cattle, meat- and milk-producing