

**Characterization of Aminoglycoside Resistant Bacterial Strains  
Implicated in Invasive Infections in Kenya.**

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**A thesis submitted in partial fulfillment for the degree of Master of  
Science in Biotechnology in the Jomo Kenyatta University of  
Agriculture and Technology**

**2011**

## ABSTRACT

Aminoglycosides resistance through production of aminoglycoside-modifying enzymes (AMEs) is the most common type of microbial resistance. Possession of AMEs genes in Gram negative bacteria on plasmids, transposons and integrons facilitates the rapid acquisition of drug resistance. The study aimed at characterizing Aminoglycoside resistant strains of *Escherichia*, *Klebsiella*,

*Pseudomonas* and *Acinetobacter* implicated in invasive infections in Nairobi, Kenya.

The experimental design was a two point cross-sectional design comparing 54 clinical isolates obtained from Kenya Medical Research Institute (KEMRI) laboratory collected in 2001-2006 and 54 clinical isolates from Aga Khan University Hospital (AKUH-new) collected in 2007-2008. The isolates were identified using standard methods, tested for antimicrobial susceptibility to seven aminoglycosides; amikacin, gentamicin, kanamycin, neomycin, streptomycin, tobramycin, and High level Resistance (HLR) spectinomycin using disk diffusion by Kirby Bauer method. They were also tested for Extended spectrum betalactamases (ESBL) production by synergy between Ceftazidime and Clavulanate whereby a disk of Augmentin (20 µg of Amoxicillin plus 10 µg of Clavulanic acid) and a disk of Ceftazidime (30 µg) were placed 30 mm apart (center-to-center).

Deoxyribonucleic acid (DNA) was extracted by the boiling method. Detection and characterization of AMEs was done by PCR using selected primers. Conjugation experiments were carried out to detect conjugative plasmids using *E. coli* J53 (Sodium azide resistant) and *E. coli* C600 (Rifampicin resistant) as donors. Results showed an increase in aminoglycosides resistance particularly to naturally derived antibiotics like streptomycin, kanamycin, and Gentamicin either due to their prolonged and continuous use. AKUH- New isolates showed the

highest percentages of resistance with 87%, 81% and 69% resistance to streptomycin, kanamycin and Gentamicin compared to KEMRI stored isolates.

This may be attributed to loss of the AMEs due to the long storage of the isolates.

A large number of *P. aeruginosa* strains (85%) were found to be Multi-drug resistant and showed resistance to Carbapenems. A total of 24 out of 108 (22%) of the clinical isolates tested were found to be ESBLs producers. These were mainly *E.coli* and *Klebsiella* spp. isolates. The genotypic results of the six AMEs amplified by PCR showed the most prevalent AME in the present study was *AAC(6')-Ib-cr* (45.9%), followed by *AAC(3)-II* (30.9%), *AAC(6')-II* (25.9%), *AAC(6')-I* (22.2%), and *AAC(3)-I* (16.3%). Increase in Aminoglycoside resistance by both naturally derived and semi-synthetic antibiotics is alarming. Methods of monitoring their effectiveness should be instituted at various levels of healthcare system in Kenya, to assist in determination of more appropriate chemotherapeutic agents for infection control.