MOLECULAR CHARACTERIZATION
OF MULTIDRUG-RESISTANT
Salmonella Isangi IN
HOSPITALIZED PATIENTS
IN SOUTH AFRICA

Tersia Kruger

A dissertation submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in fulfillment of the requirements for the degree
Master of Science in Medicine

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Johannesburg
DECLARATION

I, Tersia Kruger, declare that this dissertation is my own work. It is being submitted for the degree of Master of Science in Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature of candidate

13th day of JUNE, 2007
PUBLICATION


PRESENTATIONS


ABSTRACT

Extended-spectrum beta-lactamase (ESBL)-producing *Salmonella enterica* serotype Isangi has emerged as a common *Salmonella* serotype affecting mainly children in hospitals throughout South Africa. Between 2000 and 2002, 279 *S*. Isangi isolates from single infection episodes were referred from 21 hospitals in 5 provinces to the Enteric Diseases Reference Unit of the National Institute for Communicable Diseases of South Africa. All isolates were subjected to antibiotic susceptibility testing and three disk-diffusion methods confirmed ESBL-production in 273 isolates. PCR and nucleotide sequencing of 101 isolates identified TEM-1 (2%), TEM-63 (91%), a novel TEM-131 (7%), and SHV-5 (2%), but CTX-M was not found. Plasmid profiling produced types with 1 to 6 plasmids, 7.4kb to 166kb in size, which were neither serotype nor ESBL-type specific. Pulsed-field gel electrophoresis revealed four major clusters while subclusters with identical, or near identical banding patterns suggested extensive intra-hospital transmission and clonal spread between hospitals and provinces in South Africa.
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NOMENCLATURE

°C  degrees Celcius
A  adenine
aa  amino acid
Ag  antigen
AIDS  acquired immune deficiency syndrome
APA  amino-penicillanic acid
ATCC  American Type Culture Collection
AUG  clavulanic acid
β  beta
bp  base pair
BSAC  British Society for Antimicrobial Chemotherapy
C  cytosine
CAZ  ceftazidime
CARL  Carletonville Hospital
CHB  Chris Hani Baragwanath Hospital
CIP  ciprofloxacin
CLSI  Clinical Laboratory Standards Institute
CPD  cefpodoxime
CT  cefotaxime Etst
CTL  cefotaxime + clavulanic acid Etst
CTX  cefotaxime
DDD  double disk diffusion
DNA  deoxyribonucleic acid
dNTPs  deoxynucleoside triphosphate
DRC  Democratic Republic of Congo
EC  Eastern Cape Province
EDRU  Enteric diseases reference unit
EDTA  ethylenediaminetetraacetic acid
ESBL(s)  extended-spectrum beta-lactamase(s)
ESC  extended-spectrum cephalosporins
et al.  and others
EtBr  ethidium bromide
FEP  cefepime
FS  Free State Province
g  gram
G  guanine
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<td>TEMB</td>
<td>Tembisa Hospital</td>
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<tr>
<td>TEMED</td>
<td>N,N,N',N'-tetramethyl-ethylenediamine</td>
</tr>
<tr>
<td>TET</td>
<td>tetracycline</td>
</tr>
<tr>
<td>Tris</td>
<td>Tris-(hydroxymethyl)-aminomethane</td>
</tr>
<tr>
<td>TSE</td>
<td>Tsepong Hospital</td>
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<tr>
<td>µg/ml</td>
<td>micrograms per milliliter</td>
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<tr>
<td>µl</td>
<td>microliters</td>
</tr>
<tr>
<td>U</td>
<td>uracil</td>
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<tr>
<td>UPGMA</td>
<td>unweighted pair group method with arithmetic averages</td>
</tr>
<tr>
<td>URE</td>
<td>urea</td>
</tr>
<tr>
<td>USA</td>
<td>United States of America</td>
</tr>
<tr>
<td>UV</td>
<td>ultraviolet</td>
</tr>
<tr>
<td>VNTR</td>
<td>variable number tandem repeat analysis</td>
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<tr>
<td>VP</td>
<td>Voges Proskauer</td>
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<tr>
<td>v/v</td>
<td>volume per volume</td>
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<tr>
<td>WC</td>
<td>Western Cape Province</td>
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<td>WHO</td>
<td>World Health Organization</td>
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<td>w/v</td>
<td>weight per volume</td>
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