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Short communication

Beta lactamase Production by *Staphylococcus aureus* from Children with Sporadic Diarrhoea in Ibadan and Ago-Iwoye, Nigeria

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ABSTRACT

Isolates of *Staphylococcus aureus* from children aged 5 years and below with sporadic diarrhoea were tested for their ability to produce beta-lactamase enzyme. Of the 95 isolates tested 79 (83.2%) were beta-lactamase-producing strains. The study confirms that majority of clinical isolates of *S. aureus* from diarrhoeic children acquire resistance to the beta-lactam antibiotics as a result of beta-lactamase activity. (*Afr. J. Biomed. Res. 10: 95 – 97, January 2007*)

Keywords: Attitudes, Preferences, Physiotherapists, Back pain management.

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INTRODUCTION

Staphylococcus aureus is a very significant cause of infections in hospitals, causing superficial skin infections and systemic infections in newborn babies, surgical patients, old and malnourished persons and patients with diabetes and other chronic diseases (Emmerson, 1994; Tuo *et al.*, 1995). In addition *S. aureus* is associated with three toxicoses, staphylococcal food poisoning, toxic shock syndrome and exfoliative dermatitis (Schlievert 1984; Rifan *et al.*, 1989; Jones *et al.*, 2002).

The majority of clinical isolates have shown resistance to the penicillins and cephalosporins of the first and second generations due to the preponderance of β -lactamase-producing strains worldwide. The development of methicillin which was to overcome the problem of infection by penicillin-resistant strains have failed as a result of emergence of methicillin-resistant strains. Many of these *S. aureus* strains carry the gene for enterotoxin production which is responsible for staphylococcal food poisoning (Arbuthott 1994; Jones *et al.*, 2002). Staphylococcal food poisoning is the major type of food intoxication in the United States, accounting for 185,000 food borne illnesses per year (Mead *et al.*, 1999). In Nigeria, many cases of food poisoning go unreported. In studies carried out in Ibadan (Efuntoye and Adetosoye, 2003) and Ago-Iwoye (unpublished data) enterotoxigenic strains of *S. aureus* were isolated from children aged 5 years and below suffering from sporadic diarrhoea. Their antibiotic susceptibility pattern revealed increasing level of resistance to antibiotics including the penicillins and cephalosporins. In an attempt to examine the phenomenon of penicillin resistance due to β -lactamase the isolates from children with diarrhoea were examined for β -lactamase production.

MATERIALS AND METHODS

Strains tested

The strains of *S. aureus* used in this investigation were preserved on Tryptone Soya

Ager slants at 4⁰C and sub-cultured periodically.

Test for Beta-lactamase Production

Strains were tested for beta-lactamase production using a commercially available method-Oxoid identification rods (Unipath Limited, Hampshire, England). The tips of each rod was impregnated with a solution of nitrocephin, a chromogenic cephalosporin that produces a rapid colour change from yellow to red when the beta lactam ring is hydrolysed by a beta lactamase. Each rod was used to touch a well separated colony on the agar plate. A positive reaction was shown by the development of a pink/red colour visible within 5 minutes. A negative reaction was indicated by no colour change within 15 minutes and the absence of beta lactamase.

The cell-suspension iodometric method (Sykes 1978) was also employed. *S. aureus* NCTC 1156 strain was used as a positive control while unused sticks and ordinary penicillin phosphate buffered solution served as controls for each method respectively.

RESULTS

Ninety-five diarrhoeic isolates of *S. aureus* were examined, of which 79 (83.2%) were beta-lactamase-producing strains and 16 were non-beta-lactamase producing. Of the 16 strains that failed to produce β -lactamase 10 were penicillin sensitive while the remaining 6 were resistant to penicillin. Both the chromogenic cephalosporin and cell-suspension iodometric methods gave complete agreement in their detection of beta-lactamase producing strains of the *S. aureus* tested.

DISCUSSION

Resistance of *S. aureus* to antibiotics, particularly the penicillins and cephalosporins has been attributed largely to enzymic degradation by β -lactamase. The high percentage of beta-lactamase producing *S. aureus* recorded in this study is an evidence to show that indeed

the enzyme plays a dominant role in the resistance of *S. aureus* to beta lactam antibiotics. The majority of the β -lactamase producing *S. aureus* were sensitive to methicillin. Only 5 strains were resistant to methicillin. This resistance to methicillin has been attributed to an intrinsic characteristic of the bacterial cell wall and the presence of a novel penicillin binding protein, PBP2a, although degradation by β -lactamase may also be involved (Lacey *et al.*, 1986). Also 6 non- β -tactamase producers were resistant to the penicillins investigated. This shows that enzymic degradation by β -lactamase may not be the only mechanism for all *S. aureus* resistant to penicillin. The increase in the proportion of diarrhoea caused by *S. aureus* and β -lactamase-producing strains among children makes it mandatory that susceptibility testing should always be carried out before selection of antibiotics for use in treating infections. Several authors have confirmed that the rise in resistance by most clinical isolates of *S. aureus* to antibiotics represented a serious threat to health (Oyelese & Oyewo 1995; Olukoya *et al.*, 1995; Adeleke and Odelola, 2000).

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