# Starch paper technique is easy to detect beta lactamase detection from cases of diarrheagenic *Escherichia coli* in Osogbo

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Received September 16, 2007

**Abstract**

Out of two hundred and twenty isolates recruited for childhood diarrhea cases, were reported in other studies. We selected eighty-two *Escherichia coli* samples that were positive for beta-lactamase through paper techniques, using Odugbemi techniques and non beta-lactamase producing strains as control, relative resistance pattern was observed for both. The resistance pattern of *Escherichia coli* to all the antibacterial tested for among the beta-lactamase, showed highest resistance to penicillin 100%, ampicillin with 98.8% and ceftriaxone showed the highest susceptibility of 65% and resistance of 20.7% respectively. The distribution pattern of *Escherichia coli* was highest in age group 1 – 3 years among the beta-lactamase producing *Escherichia coli* strains with 42.7% and lowest within the age group 5 – 7 with 3.7%. There was no significant difference from the results of beta-lactamase producing strains of *Escherichia coli* to non beta-lactamase producing *Escherichia coli* strains, $P < 0.05$. From the results beta-lactamase proliferation in our clinical samples is becoming a concern to antimicrobials usage. [Life Science Journal. 2007; 4(4): 72 – 74] (ISSN: 1097 – 8135).

**Keywords:** beta lactamase; prevalence pattern; paper technique; southwest Nigeria

## 1 Introduction

Diarrhoeal diseases are part of the main social problems in Osogbo, Nigeria, as in other developing countries in the tropics (Olowe *et al*, 2003). However, the major pathogen most commonly associated with children diarrhoea is *Escherichia coli. Escherichia coli* is one of the main causes of nosocomial infections in humans. *E. coli* is also a common inhabitant of the human and animal gut and is considered an indicator of fecal contamination in food (Laura *et al*, 2002). Despite the fact that antibiotics were initially developed for the treatment of infectious disease in people, multidrug resistance to these antibiotics are becoming of global concern. In Nigeria, few reports have documented the prevalence of beta-lactamase producing microorganism especially the gram-negative bacilli. Hence the existence of the β-lactamases presented a distinct survival advantage to the bacteria (Brook *et al*, 1995). This widespread use of antibiotics could be associated with the selection of antibiotic resistance mechanisms in pathogenic and non-pathogenic strains of *Escherichia coli* (Odukoya *et al*, 1997; Livermore *et al*, 1998). This has given rise to misuse of antimicrobial agents with the emergence of multi-drug resistance pathogens (Pitout *et al*, 1998; Agbolahour *et al*, 1982). This study is a report of our first twelve months experience of the pattern and susceptibility profile of beta-lactamase producing *Esherichia coli* from cases of diarrhea using starch paper method at Ladoke Akintola University Teaching Hospital Osogbo, Southwest Nigeria.

## 2 Materials and Methods

The study was carried out in Lautech college of Health Sciences Teaching Hospital; samples were collected from stool samples . All the samples were aseptically processed in the laboratory, according to standard microbiological procedures. Biochemical tests were carried out on the isolates using conventional microbiological methods according to Cowan and Steel (1985). Antibiotic susceptibility

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by the disc diffusion method was performed on all bacterial isolates, following NCCLs standard using Mcfarland standard. The diameters of the zone of inhibition were measured using meter rule and interpretation chart was used to determine the resistance pattern of the isolates (Odukoya *et al*, 1997) The detection of the beta-lactamase was carried out using the starch paper technique according to Odugbemi starch paper technique (Odukoya *et al*, 1997, 1995).

## 3 Results

In Table 1, a consideration of the age distribution showed *Escherichia coli* was more prevalent in children aged 1 to 3 years (42.7%). The prevalence rate in males and females were 25 and 10 respectively within this age group. Whereas in age over 5 yeares old, the prevalence pattern was found to be lowest with percentage rate of (3.7 %), male accounting for 1 and female 2 respectively. Table 2 showed the results of overall susceptibility profile of beta-lactamase producing *E. coli* from clinical isolates. Out of the 82 beta-lactamases that were positive by starch paper method, (98.8%) were resistant to Ampicillin, while resistance to penicillin G was (100%), Gentamicin (35.4%), Cephalexine with (24.4%) and tetracycline (94%). Results of antibiotic susceptibility with respect to Non-β-lactamase production were shown in Table 3. Highest resistance was seen with Ampicillin, with 10 out of the 18 isolates showing resistance (55.6%), for Cloxacillin 16 out of 18 showed resistance (88.9%), and Penicillin had 14 out of the total 18 that showed resistance (77.8%).

**Table 1.** Age distribution of isolated *E.coli* that are positive to beta-lactamase

| Age | Male | Female | Total | Rate (%) |
|---|---|---|---|---|
| < 1 | 12 | 13 | 25 | 30.4 |
| 1 – 3 | 10 | 25 | 35 | 42.7 |
| 3 – 5 | 6 | 13 | 19 | 23.2 |
| > 5 | 1 | 2 | 3 | 3.7 |
| Total | 29 | 53 | 82 | 100 |

## 4 Discussion

Beta-lactamase producing gram negative bacilli is becoming a problem in the tropics, yet the epidemiology is not well charted, the aetiopathogenesis is not fully understood and treatment is becoming more difficult due to high prevalent with high multidrug resistant strains. This study was designed to highlight the current antimicrobial susceptibility pattern of beta-lactamase producing *Escherichia coli* strains in this area, from cases of diarrhea especially from childhood. Over 93% of *Escherichia coli* respectively were found to be β-lactamase producers. The results of isolates to be positive for beta-lactamase production is in line with the previous reported incident of extended spectrum beta-lactamase prevalence of *Escherichia coli* as reported by Odugbemi *et al* (1995). Beta-lactamase production by *Escherichia coli* is by recognized mechanism of resistance to β-lactam antibiotics, such as penicillin and Ampicillin (Marchese *et al*, 1998) . High rate of resistance was also observed in non-β-lactamase producer. Resistance to penicillin may be due to lack of penicillin receptors or inaccessibility receptors because of permeability barriers of bacterial outer membranes (Odugbemi *et al*, 1995). Another possibility is the failure of activation of autotypic enzymes in the cell wall, which can result

**Table 2.** Susceptibility pattern of isolated *E. coli* to different antibiotics and percentage resistance

| Antibiotics | Isolated (*n*) | Sensivity (%) | Resistance *n* (%) |
|---|---|---|---|
| Ampicillin | 82 | 1 | 81 (98) |
| Penicillin | 82 | 0 | 82 (100) |
| Amoxicillin | 82 | 7 | 75 (91) |
| Cephalexine | 82 | 60 | 20 (24.4) |
| Ceftriaxone | 82 | 65 | 17 (20.7) |
| Gentamicin | 82 | 53 | 29 (35.4) |
| Erytromycin | 82 | 59 | 23 (28.0) |
| Streptomycin | 82 | 40 | 42 (51.0) |
| Tetracycline | 82 | 5 | 77 (94.0) |
| Chloramphenicol | 82 | 54 | 28 (34.0) |

**Table 3.** Susceptibility pattern of non-beta-lactamase producing *E. coli* to different antibiotics and percentage resistance

| Antibiotics | Isolated (*n*) | Sensivity (%) | Resistance *n* (%) |
|---|---|---|---|
| Ampicillin | 18 | 8 | 10 (55.6) |
| Penicillin | 18 | 4 | 14 (77.6) |
| Amoxicillin | 18 | 2 | 16 (88.9) |
| Cephalexine | 18 | 18 | 0 (0) |
| Ceftriaxone | 18 | 16 | 2 (11.1) |
| Gentamicin | 18 | 11 | 7 (38.9) |
| Erytromycin | 18 | 14 | 4 (22.2) |
| Streptomycin | 18 | 8 | 10 (55.6) |
| Tetracycline | 18 | 3 | 15 (83.3) |
| Chloramphenicol | 18 | 14 | 4 (22.2) |

in inhibition without killing bacteria, may also contribute to high resistance rate as reported by Brook *et al* (1995). The resistance pattern exhibited by the bacterial isolates of commonly used antimicrobial agent in our environment is a reflection of misuse as a result of poor antibiotic prescription policy and off - the- counter availability of these agents. The third generation cephalosporins, and floroquinolones, which are rather expensive, are not yet prone to such abuse. These can provide viable alternative treatment of resistant infection (Machese *et al*, 1998). From these findings, β-lactamase producing *Escherichia coli* was found to have highest resistance pattern to most antimicrobial drugs available in this area. But the resistance pattern of non-beta-lactamase was seen to exhibit some degree of resistance but not as predominant as beta-lactamase ($P < 0.05$). This result is first of its kind from cases of childhood diarrhea testing for beta-lactamase production using starch paper techniques.

## 5 Conclusion

Results shows that there was high indication of presence of the beta-lactamase found in the isolates used for the test and of the percentage of resistance to commonly used antibiotics. The method also is a probability that isolates may actually harbore plasmids, which may actually cause the ability for resistance among the isolates. In light of these findings, we suggest prompt antibiotics susceptibility test in addition to test for β-lactamase production. This will aid in mentoring multi-drug results pattern of the beta-lactamase in our environment.

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