ANTIMICROBIAL SUSCEPTIBILITY OF PNEUMOCOCCI COLONISING THE NASOPHARYNX OF CHILDREN WITH SICKLE CELL DISEASE.

B. BAFFOE-BONNIE, *Y. ADU-SARKODIE*¹, PAULINA TWUMASI²
AND YAW OSEI AKOTO³

Departments of Child Health and ¹Clinical Microbiology, School of Medical Sciences, KNUST, Kumasi. ²Department of Child Health, Komfo Anoye Teaching Hospital, Kumasi.

SUMMARY
Penicillin is widely used as prophylaxis in children with sickle cell disease against invasive pneumococcal disease. In recent times, there have been reports worldwide of increasing pneumococcal resistance to penicillin.

Pneumococcal colonisation of the nasopharynx of children with sickle cell disease attending a sickle cell clinic in Kumasi, and antimicrobial susceptibility of recovered pneumococci was studied. Nasopharyngeal swabs were taken from 220 children, 16.4% (36) of whom were found to be carriers of Streptococcus pneumoniae. Carriage was significantly associated with age less than 2 years. Forty four percent (16) of the recovered pneumococcal isolates were resistant to penicillin.

No cross resistance between penicillin and the cephalosporins was found.

In this population, universal susceptibility of the pneumococcus to penicillin can no longer be assumed. The search for an anti pneumococcal agent for use in prophylaxis is paramount.

Keywords: Sickle cell disease, pneumococci, antimicrobial susceptibility.

INTRODUCTION
Children with sickle cell disease are known to be susceptible to a range of microbial diseases. One of these is infection with Streptococcus pneumoniae¹. Invasive pneumococcal disease in these children poses a threat to their health. It has been suggested that the strains of pneumococci that infect them are often carried in their nasopharynx². As a measure against invasive disease, penicillin prophylaxis is routinely given to the children to eradicate nasopharyngeal carriage.

In recent times, there have been reports worldwide of increasing resistance of the pneumococcus to penicillin and other antibiotics³⁴. These resistance patterns have varied widely between different geographic regions and could erode gains made from penicillin prophylaxis. There has been no published data from Ghana in the last two decades on pneumococcal carriage in children with sickle cell disease and their antimicrobial susceptibility patterns. This study was undertaken to determine the prevalence of nasopharyngeal carriage of pneumococci in children attending the sickle cell clinic of the Komfo Anoye Teaching Hospital, and assess the antimicrobial susceptibility of any recovered pneumococci.

METHODS
All children attending the sickle cell clinic during March - May 1997 were eligible for inclusion in the study. Those who had taken any antibiotics in the last 2 weeks (other than for prophylaxis in sickle cell disease) were excluded.

After informed consent from their mothers, posterior nasopharyngeal swabs were taken with a wire minitip collection and transport system (Culturette, Becton-Dickinson, US). The swabs were inoculated on chocolate agar and incubated at 37°C in 5% carbon dioxide overnight. Isolates of Streptococcus pneumoniae were identified by standard methodology⁵.

* Author for correspondence
Screening for penicillin susceptibility was done with a lug oxacillin disc (BBL, Becton Dickson) (resistant strains, zone of inhibition > 20mm). Penicillin MIC determinants was done for all oxacillin resistant strains using the E-test (AB BioDisk, Solna, Denmark). Susceptibility testing of the following antibiotics was done by the Stokes’s comparative method; Chloramphenicol, erythromycin, cotrimoxazole, ceftriaxone and cefotaxime.

RESULTS
Two hundred and twenty (220) children with sickle cell disease aged 1-60 months had nasopharyngeal swabs taken. Forty nine percent (111) were male and 50.2% (109) were female. While 30 (13.6%) were first time attendees to the clinic, 190 (86.4%) had attended 2 or more times. With the exception of the first time attendees, all the other children were on penicillin prophylaxis. Pneumococci were recovered from 36 children, giving a carriage rate of 16.4%. Pneumococcal colonisation was significantly higher in children less than 2 years than those above 2 years (83% and 7% respectively, P < 0.05).

Sixteen (44.4%) of the pneumococcal isolates were resistant to penicillin while 55.6% (20) were sensitive to it. Fourteen (87.5%) of the sixteen penicillin resistant isolates were of intermediate resistance (MIC 0.1 - 1μ g/ml) and 2(12.5%) were highly resistant (MIC >2μg/ml). Thirteen (81.25%) of the 16 resistant isolates were recovered from patients on penicillin prophylaxis. Ten percent (3) of first time attendees had resistant isolates all of which were of intermediate resistance. Penicillin resistance was significantly associated with penicillin prophylaxis (81% vrs. 10%, p < 0.05).

Susceptibility of the pneumococcus to other antibiotics tested was as follows; Chloramphenicol 94.4% (34/36), Erythromycin 94.4% (34/36), Cotrimoxazole 94.4% (34/36), Ceftriaxone 100% (36/36), Cefotaxime 100% (36/36). Two (2) of the isolates were resistant to both penicillin and cotrimoxazole and one was resistant to both penicillin and erythromycin. There was no cross resistance between penicillin and any of the cephalosporins.

DISCUSSION
We found a pneumococcal carriage rate of 16% in children with sickle cell disease in Kumasi. This figure is lower than the 50% carriage observed for 311 well children in the same community (unpublished). Routine penicillin prophylaxis in children attending the sickle cell clinic may account for this difference. Rates of between 6 and 12% has been reported among children with sickle cell disease from the United States of America.6,7,8.

In consonance with other studies, this study from Ghana adds to the knowledge that young age is a risk factor for nasopharyngeal colonisation of pneumococci. While we report a high nasopharyngeal colonisation rate of 83% in children 2 years and below, Steel et al 6 and Overturf et al 9 reported 33% and 32% respectively in the same age group. Unfortunately, it is children in this age group who do not benefit much from the present polysaccharide pneumococcal vaccine. They may benefit from penicillin prophylaxis if the infecting pneumococcal strain is penicillin susceptible however, this cannot be taken for granted with the level of resistance found in this study (44.4%). It is hoped that conjugate vaccines soon to come on the market will address this problem.

Almost one half of all recovered isolates were resistant to penicillin and even though some studies have reported marked cross resistant between penicillin and other antibiotics, we did not find this. More importantly, no single cross resistance was found between penicillin and the tested cephalosporins. That the majority of the penicillin resistant strains were of intermediate resistance indicates that in cases of invasive diseases from such isolates, high doses of penicillin would be useful for management. Friedland has shown that standard beta-lactam therapy is effective in pneumococcal sepsis where the infecting strain is of intermediate penicillin resistance.10 The cephalosporins also remain useful in the treatment of invasive disease in this geographic location.

Children aged 2 months and above attending the sickle cell clinic are put on penicillin prophylaxis. There had been concerns that this practice might lead to the development of pneumococcal resistance.11,12 This study and other have shown that pneumococcal resistance was associated with routine penicillin prophylaxis. In the absence presently, of a suitable alternative to penicillin as prophylaxis in such situations and with the problem of invasive pneumococcal disease leading to great morbidity and mortality in these children, the need to research into this is paramount. We are studying the use of clarithromycin as an alternative in such situations. An anti-pneumococcal vaccine efficacious in all children, including those below 2 years is urgently awaited.
ACKNOWLEDGEMENT
We are grateful to Mr. Larkey, senior microbiology technician for coordinating all the microbiology work. The invaluable support of nurses and staff of the sickle cell clinic, Komfo Anokye Teaching Hospital, Kumasi, is also acknowledged.

REFERENCES


