

# Bacteriology of chronic discharging ears in Port Harcourt, Nigeria

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## Summary

**Objective:** The objective of the study was to isolate and identify aerobic bacteria in chronic discharging ears and determine their antibiotic susceptibilities, which is essential for reasonable empiric treatment.

**Methods:** Ear swabs of discharging ears aseptically collected from 102 patients of various age groups attending Ear, Nose, and Throat out-patient clinic at University of Port Harcourt Teaching Hospital were cultured for bacterial agents using blood agar, chocolate agar and MacConkey agar. Culture plates were incubated aerobically at 37°C for 24 – 48 hours. Isolates were identified using standard microbiological methods. Members of the family enterobacteriaceae were identified using enterotubes. Antibiotic susceptibility test was carried out for 13 drugs using disc diffusion method.

**Results:** Seventy-eight percent of the patients studied were in the age group 0 – 14 years and there were more male infants than females. Gram negative bacteria comprised 75% of the isolates. Predominant isolates were *Pseudomonas aeruginosa* (41%), *Proteus* sp. (22%), *Staphylococcus aureus* (22%), *Escherichia coli* and other coliforms (11%). Drug susceptibility profile of the isolates showed that ceftazidime, ceftriazone and gentamycin were most effective drugs in vitro.

**Conclusion:** The predominant bacterial agents in chronic discharging ears in Port Harcourt, Nigeria were gram negative bacteria and included *Pseudomonas aeruginosa*, *Proteus* sp., *Escherichia coli*. Gram positive bacterial constituted 25 percent of the isolates and included *Staphylococcus aureus*, *Staphylococcus epidermidis* and *Streptococcus* sp. Ceftazidime, ceftriazone and gentamycin were the most effective drugs in vitro.

**Key-words:** Bacteria, Chronic discharging ears, Otitis media.

## Résumé

**Objectif:** L'objet de cette étude est d'isoler et identifier des bactéries aérobiques dans les oreilles avec des écoulements chroniques; et décider leur susceptibilités antibiotiques qui sont essentiel pour un traitement raisonnable et empirique.

**Méthode:** La collecte aseptique des prélèvements des écoulements des oreilles chez 102 patients de la tranche d'âge divers qui vont au service des consultations externes d'oreille, Nez et gorge du centre hospitalier universitaire

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de Port Harcourt ont été cultivés à l'égard des agents bactériens avec l'utilisation du agar du sang, agar chocolat et agar MacConkey, assiettes de la culture ont été incubées aérobiquement en 37°C pendant 24-48 heures. Des isolates ont été notés à travers l'utilisation de la méthode microbiologique de série. Membres de la famille entérobactérien ont été notés avec l'utilisation des entérotubes. Essai de la susceptibilité antibiotique a été effectué pour 13 drogues avec l'utilisation de la méthode de la diffusion du disque.

**Resultats:-** Soixante dix huit pourcent des patients étudiés étaient de la tranche d'âge 0-14 ans et il y avait beaucoup d'enfants du sexe masculin (0 - 1 an) plus que du sexe féminin. Bactérie négative du gram constituée 75% des isolates. Des isolates prédominants étaient *Pseudomonas aeruginosa* 41%, *Proteus* sp 22% *Staphylococcus aureus* 22%, *Escherichia coli* et d'autres colibacilles (11%). Profil de la susceptibilité des drogues des isolates a indiqué que ceftazidime, ceftriazone et gentamycine étaient des drogues les plus efficaces in vitro.

**Conclusion:** Des agents bactériens prédominants dans les oreilles avec des écoulements chroniques à Port Harcourt, Nigeria étaient des bactériennes négative de Gram(75%) y compris *Pseudomonas aeruginosa*, *Proteus* sp. *Escherichia coli* et bactérienne positive de Gram ont constitué 25 pourcent des isolates y compris *Staphylococcus aureus*, *Staphylococcus epidermidis* et *Streptococcus* sp. Ceftazidime, ceftriazone et gentamycine étaient des drogues les plus efficaces in vitro.

## Introduction

Otitis media is an acute and chronic inflammatory state of the middle ear which may be suppurative or non-suppurative. Acute otitis media (AOM) is primarily a disease of infants and children whereas the chronic form and its complications generally arise in late life. It remains one of the most common diseases of childhood worldwide and the most common reason for out-patient antibiotic therapy in children.<sup>1,2</sup> There also is great concern with regards to the social burden and indirect cost due to time lost from school work.<sup>3</sup> Knowledge of which micro organisms are the most common pathogens in acute otitis media (AOM) and/or chronic suppurative otitis media (CSOM) in different parts of the world and their susceptibilities towards antimicrobials is essential for the reasonable empiric treatment.

The predominance of gram negative bacteria isolates

over gram positive bacteria in chronic discharging ears has been reported by various workers.<sup>4,5,6,7,8</sup> The predominant aerobic gram negative bacteria include *Pseudomonas aeruginosa*, *Proteus* sp. and *Escherichia coli* while the gram positive bacteria include *Staphylococcus aureus* and streptococci. Strick anaerobes namely *Peptococcus* sp., and bacteroides have been isolated by Brook and Finegold<sup>9</sup> from purulent middle ear effusions aspirated by tympanocentesis. Tympanocentesis is a technique that is not readily available to most workers and was not used in this study.

The purpose of this paper is to present the aerobic bacteriological finding and antibiotic susceptibilities in cultures from ear swabs in Port Harcourt, Nigeria and to compare our findings with observation of other workers elsewhere. We are not aware of any previous study on this subject in Port Harcourt.

**Materials and methods**

Ear swabs were carefully collected from 102 patients of various ages ranging from 3 weeks to 32 years using sterile swab sticks. The patients were those attending the Ear, Nose and Throat (E.N.T.) out-patient clinic at the University of Port Harcourt Teaching Hospital (U.P.T.H.), Port Harcourt. Samples of the ear discharges were promptly plated for bacterial and fungal agents using blood agar, chocolate agar, MacConkey agar and sabouraud dextrose agar. The plates were incubated aerobically at 37°C for 24 – 48 hours. Isolates were purified and identified using standard microbiological methods. Members of the family Enterobacteriaceae were identified by using enterotubes (Roche Diagnostics). Antibiotic susceptibility test was carried out for 13 drugs using the disc diffusion method with Oxoid discs and sensitivity agar. Control organisms (*Escherichia coli* NCTC 10418 and *Staphylococcus aureus* NCTC 6571) were tested side by side to ascertain that the potency of the drugs contained in the antibiotic disc was still valid.

**Result**

During the ten month-period-of study, 102 out-patients

were diagnosed by the E.N.T. consultants at the UPTH as having chronic suppurative otitis media. Table 1 shows the age and sex distribution of the patients. The age group 0 – 4 years formed 57 percent of the patients and there were more male infants than females especially amongst the under-1 year olds. Age group 0 – 14 years formed 78.5 percent of the patients with 48 males and 32 females. Age group 5 – 29 years had about the same number of male and female patients, while patients 30 years old and over were all females.

**Table 1 Age and sex distribution of patients**

Age (Years)	Number of patients	Percent	Male/female ratio
Below 1	26	25.5	20 : 6
1 – 4	32	31.5	20:12
5 – 14	22	21.5	8:14
15 – 29	16	15.7	10 : 6
30 and above	6	5.9	0 : 6
<b>Total</b>	<b>102</b>	<b>100</b>	<b>58:44</b>

Table 2 represents the various types of organisms isolated from patients with single and mixed infections of chronic suppurative otitis media. Thirty three percent of the isolates or 76 out of 230 isolates occurred as pure cultures. Gram negative bacteria constituted 75 per cent of the isolates compared to 25 per cent of gram positive organisms. The latter included two fungal isolates identified as *Candida albicans* and *Aspergillus niger*. *Pseudomonas aeruginosa* accounted for 41 per cent of the isolates followed by *Staphylococcus aureus* and *Proteus* sp., each with an incidence of 22 percent and *Escherichia coli* and other coliforms 11 per cent. *Staphylococcus epidermidis* and beta haemolytic streptococcus sp. were each isolated only once.

Table 3 represents the number and percentage drug sensitivity of the primary ear isolates. The isolates were resistant to most of the 13 drugs tested. *Pseudomonas aeruginosa* was most sensitive to ceftazidime (77%) and gentamycin (78%). *Staphylococcus aureus* was most sen-

**Table 2 Incidence of organisms associated with chronic suppurative Otitis Media**

Organism	Single infection	Mixed infection	No. of isolates	Incidence (%)
<i>Pseudomonas aeruginosa</i>	44	50	94	40.9
<i>Proteus</i> sp.	12	38	50	21.7
<i>Staphylococcus aureus</i>	12	38	50	21.7
<i>Escherichia coli</i>	-	10	10	4.3
<i>Klebsiella pneumoniae</i>	-	6	6	2.6
<i>Klebsiella oxytoca</i>	-	4	4	1.7
<i>Citrobacter freundii</i>	2	-	2	0.9
<i>Serratia liquefaciens</i>	-	2	2	0.9
<i>Serratia marcescens</i>	-	2	2	0.9
<i>Staphylococcus epidermidis</i>	2	2	4	1.7
<i>Streptococcus</i> sp.	-	2	2	0.9
<i>Candida albicans</i>	2	-	2	0.9
<i>Aspergillus niger</i>	2	-	2	0.9
Gram negative isolates	58	112	170	74.8
Gram positive isolates	18	42	60	25.2
<b>Total number of isolates</b>	<b>76</b>	<b>154</b>	<b>230</b>	<b>100</b>

**Table 3** Number and percent in vitro drug susceptibility of ear isolates

Drug (mg)	Percent drug susceptibility of organisms			
	<i>Pseudomonas aeruginosa</i> (94)	<i>Staphylococcus aureus</i> (50)	<i>Proteus</i> (50)	<i>Escherichia coli</i> & Coliforms (26)
Ampicillin (10)	6 (6%)	10 (20%)	10 (20%)	0 (0%)
Carbenicillin (100)	17 (18%)	43 (86%)	44 (88%)	12 (45%)
Ceftazidime (30)	72 (77%)	32 (63%)	47 (93%)	11 (42%)
Ceftriaxone (30)	63 (67%)	50(100%)	50(100%)	26(100%)
Cefuroxime (30)	40 (42%)	42 (83%)	29 (57%)	15 (56%)
Chloramphenicol (30)	2 (2%)	24 (48%)	24 (48%)	16 (62%)
Claforan (30)	30 (32%)	42 (84%)	33 (65%)	16 (62%)
Cloxacillin (5)	0 (0%)	50(100%)	2 (4%)	0 (0%)
Cotrimoxazole (25)	6 (6%)	15 (29%)	24 (48%)	6 (23%)
Erythromycin (10)	2 (2%)	48 (96%)	2 (4%)	0 (0%)
Gentamycin (10)	73 (78%)	43 (86%)	36 (65%)	26(100%)
Streptomycin (10)	6 (6%)	28 (56%)	28 (56%)	4 (15%)
Tetracycline (10)	0 (0%)	10 (20%)	0 (0%)	4 (15%)

sitive to ceftriaxone (100%) and cloxacillin (100%), erythromycin (96%), carbenicillin and gentamycin (86%). *Proteus* sp. isolated was sensitive to ceftriaxone (100%), ceftazidime (93%) and carbenicillin (88%). *Escherichia coli* and other coliforms were sensitive to ceftriaxone and gentamycin (100%). In general, ceftazidime, ceftriaxone and gentamycin were the most effective drugs in vitro.

### Discussion

The observation in this study that gram negative bacteria were the predominant isolates from chronic discharging ears in Port Harcourt, Nigeria and that *Pseudomonas aeruginosa* had the highest incidence compare well with the observations of previous studies.<sup>4,7,9</sup> Fliss et al.<sup>4</sup> reported a very high incidence of *Pseudomonas aeruginosa* (98%) compared to the 41 percent observed in this study. Their observation on the incidence of Staphylococci (25%) compares well with our finding of 24 percent for the staphylococci. While Fliss et al.<sup>4</sup> reported an incidence of 12 percent *Haemophilus influenzae*, we did not isolate this organism in this study.

The low incidence of Streptococcus sp. and the absence of *Haemophilus influenzae* and *Moraxella catarrhalis* in this study support the findings that these pathogens are not as important in chronic suppurative otitis media (CSOM) as in acute suppurative otitis media.<sup>10-13</sup> The observations on the age and sex distribution of patients with respect to incidence of CSOM is also in agreement with previous studies<sup>4,14</sup> that most of the patients are children aged 6 months to 15 years with males being predominant.

This study recorded a high incidence of mixed infections (67%). Mixed infection could be associated with the use of non-sterile medications, ear drops, cotton wool, water and soap. Organisms could also be introduced into the ear from the skin flora of patients or parents of the child.

The observation in this study on the in vitro efficacy of ceftazidime on the isolates compares well with the observation of Fliss et al.<sup>4</sup> in vivo management of chronic suppurative otitis media in which the discharge stopped completely in all 21 children who received ceftazidime intravenously. Overall, the isolates in this study appear to be most sensitive in vitro to ceftriaxone followed by gentamycin. In the Port Harcourt environment, with the high rate of mixed infection, gentamycin is recommended for the treatment of CSOM because it is readily available and comparatively less expensive than other drugs with comparable efficacy. In this study, it is the drug of choice (in vitro) for *Pseudomonas* sp. and coliforms. For single infections by *Proteus* sp., carbenicillin appears effective. *Staphylococcus aureus* appears very susceptible to cloxacillin and erythromycin. A combined therapy, which include local debris removal by suctioning and antibiotic therapy is recommended as has been found useful in treating chronic suppurative otitis media elsewhere.<sup>4</sup>

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