

## Main Articles

# Bacterial colonization of pacifiers of infants with acute otitis media

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### Abstract

The presence of aerobic and facultative anaerobic bacteria on the surface of pacifiers used by children with acute otitis media was investigated. The surface of 40 recently used pacifiers was swabbed after they were allowed to dry for five to six minutes. The swabs were processed quantitatively for the presence of aerobic bacteria. The antibacterial activity of the pacifier material was tested *in vitro*. Microorganisms were isolated from 21 (52.5 per cent) pacifiers. The number of colonies per pacifier varied between one and 35 (average six). The isolates included eight  $\alpha$ -haemolytic streptococci, six *Staphylococcus epidermis*, five *Candida albicans*, five  $\alpha$ -haemolytic streptococci, three *Neisseria* spp. and two *Staphylococcus aureus*. The pacifier material was shown to be inhibitory against *S. aureus*. This study illustrated that pacifiers do not contain high numbers of organisms and therefore are not likely to serve as a source of persistence of transfer of organisms.

**Key words:** Otitis media; Infant care; Microbiology

### Introduction

The use of pacifiers was recently linked with an increased risk of developing ear infections in children who did (Niemala *et al.*, 1995) or did not attend day care centres (Niemala *et al.*, 1994). One possible explanation of this phenomenon was that pacifiers could serve as a medium by which pathogenic micro-organisms are spread between children (Niemala *et al.*, 1994). Another possible explanation is that pathogenic organisms may persist on the surface of the pacifier, thus recolonizing the infant again following clearance of the potential pathogen. Transmission of organisms through fomites was documented in hospitals (Conzantitis *et al.*, 1978) and day care centres (Weniger *et al.*, 1983; Malinberg *et al.*, 1994).

This study was performed to assess whether pacifier surfaces are colonized with microorganisms.

### Patients and methods

Bacterial cultures were obtained from the surfaces of 40 rubber pacifiers that were used by infants seen in the acute paediatric clinic for acute purulent otitis media. Acute purulent otitis media was diagnosed using pneumatic otoscopy and tympanometry, and was defined as the presence of symptoms such as fever, irritability, coryza, and pulling of the ear,

along with bulging, thickened, immobile ear drum, and flat tympanogram. Infant ages varied between six months to three years (mean 17 months), and 22 were males. None had received any antimicrobials prior to their examination. The pacifier was allowed to dry in room temperature for five to six minutes, and thereafter the entire surface of the pacifier was swabbed with a sterile cotton swab that had previously been dipped in sterile saline.

Each swab was then placed in a sterile plastic tube that contained 2 ml of sterile saline; the tip of the swab was broken and the contents were shaken vigorously by vortex machine for 30 seconds. The contents of the tubes were plated quantitatively on media supportive of the growth of aerobic and facultative anaerobic bacteria. The media included blood chocolate and McConkey's agar plates that were incubated at five per cent CO<sub>2</sub> for 48 hours at 37°C.

Quality control studies illustrated the ability of the method used in this study to isolate Gram positive and Gram negative bacteria from environmental sources (i.e. tables).

The number of colonies was counted, and the organisms were identified as previously described (Murray *et al.*, 1995). The inhibitory activity of the pacifier material was tested by placing 3 x 3 mm pieces of the rubber material on six blood agar plates swabbed with *S.aureus* (ATCC# 9144, 3R7089 strain Oxford).

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TABLE I  
NUMBER OF ORGANISMS ISOLATED FROM SURFACE OF 21/40  
PACIFIERS

Bacteria	Number of isolates
<i>Staphylococcus aureus</i>	2
<i>Staphylococcus epidermidis</i>	6
$\alpha$ -haemolytic streptococci	8
$\gamma$ -haemolytic streptococci	5
Diphtheroid species	2
<i>Neisseria</i> species	3
<i>Candida albicans</i>	5
Total	31

## Results

Microorganisms were isolated from the surface of only 21 (52.5 per cent) of the 40 pacifiers (Table I). The number of colonies per pacifier varied between one to 35 (average six per culture-positive pacifier). Most of the organisms isolated were Gram positive cocci: eight  $\alpha$ -haemolytic streptococci, six *Staphylococcus epidermidis*, five  $\alpha$ -haemolytic streptococci, and five *Candida albicans*. No Gram negative bacilli were isolated.

Inhibitory activity was observed by the pacifier material on *S. aureus*.

## Discussion

The above study indicates that although about half of the pacifiers harbour bacteria, their number is relatively small. Most of the organisms recovered were Gram positive cocci, and three of them ( $\alpha$ - and  $\gamma$ -haemolytic streptococci and *S. epidermidis*) are of low virulence. These organisms are not known to cause respiratory infections and do not present a high health risk to non-compromised children. Even though the patients suffered from acute otitis media, we were not able to recover *Haemophilus influenzae*, *Moraxella catarrhalis* or *Streptococcus pneumoniae*, the known major causes of otitis media, from their air-dried pacifiers. These organisms were found to colonize the oropharynx of children with acute otitis media (Niemala *et al.*, 1995). The survival of oral flora organisms on wet pacifiers could be higher, and deserves further studies.

The recovery of such a small number of bacteria was surprising, as the oral cavity contains more than  $10^3$  organisms/ml of secretions (Gibbons, 1974). The anti-bacterial activity of the pacifier material may account for this phenomenon. It is possible that the rubber surface of the pacifiers does not enable oral organisms to attach to it. The lack of contamination

of rubber surfaces by microorganisms has been previously observed (Brook and Brook, 1994). However, since the pacifiers were not analysed for the presence of strict anaerobic bacteria or viruses, the presence of these organisms was not excluded.

The study illustrates that after drying in room air for five to six minutes, pacifiers contain a small number of relatively non-virulent bacteria. The increased prevalence of otitis media in infants who use pacifiers cannot be explained by the spread or persistence of organisms through the use of pacifiers.

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