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Microbiology of acute otitis media with perforation (AOMwiP) in Aboriginal children living in remote communities—monitoring the impact of 7-valent pneumococcal conjugate vaccine (7vPCV)

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Abstract. In young Aboriginal children with new episodes of AOMwiP, *Haemophilus influenzae* (57%), *Streptococcus pneumoniae* (34%) and *Streptococcus pyogenes* (6%) are the major pathogens recovered from ear discharge. In children immunised with pneumococcal conjugate vaccine, there were fewer vaccine type pneumococci and more vaccine-related type pneumococci than unimmunized children. Replacement of vaccine types by non-pneumococcal pathogens was not detected.

Keywords: Acute otitis media; Tympanic membrane perforation; Pneumococcal conjugate vaccine; Replacement

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1. Introduction

Chronic Suppurative Otitis Media (CSOM) is a serious problem for Aboriginal children living in remote communities. In a 2001 survey of over 700 Aboriginal children aged 6 to 30 months, 24% had tympanic membrane perforation [1]. The World Health Organization considers a CSOM rate of 4% to be a public health emergency requiring immediate attention [2]. CSOM has its origins in preceding recurrent acute otitis media with perforation (AOMwiP), caused primarily by *Streptococcus pneumoniae* and *Haemophilus influenzae*, although *Moraxella catarrhalis* and *Streptococcus pyogenes* (group A streptococci, GAS) may each cause 10%. In the FinOM study, several natural perforations were cultured and *S. pneumoniae* was relatively more common (35%) and *M. catarrhalis* less common than specimens obtained by tympanocentesis from AOM without perforation [3]. Interestingly, *S. pyogenes* was also more frequently associated with natural perforations. In Israeli children with AOM or AOM with perforation, *H. influenzae* (48%) and *S. pneumoniae* (43%) were the most common pathogens and *M. catarrhalis* (5%) and *S. pyogenes* (4%) were far less common pathogens [4].

Seven-valent pneumococcal conjugate vaccine (7vPCV) 'Prevenar' was made available for Aboriginal and other high risk Australian children in July 2001. In the Finnish and Californian randomized controlled clinical trials of pneumococcal conjugate vaccine, overall efficacy for all-cause OM was low (<10%). Vaccine efficacy for AOM associated with serotypes in the vaccine was estimated at 67% [5,6]. In the Finnish trial, there was an increase in frequency of non-vaccine type pneumococcal OM in the vaccinated group, the first evidence that non-vaccine type disease was more common in vaccinated children [6]. Others have indicated replacement by non-pneumococcal pathogens may also be possible. A study in the Netherlands in which children with recurrent AOM received a single dose of Prevenar, followed by the 23-valent polysaccharide vaccine (23vPPV), no reductions in pneumococcal infection or vaccine type natural perforations were detected, but the vaccinated group experienced significantly more *Staphylococcus aureus* infections [7]. The authors also found a negative correlation between *S. aureus* and vaccine type pneumococci in the nasopharynx, particularly in older children [8]. Comparable data on competitive carriage with pneumococci are not available for *S. pyogenes*, although in a small series of GAS-positive neonates, density of GAS was highest in the absence of pneumococci [9]. The aim of this study was to analyze ear discharge culture results from Prevenar-vaccinated and non-vaccinated Aboriginal children with AOM with perforation.

2. Methods

2.1. Prevenar vaccination in the Northern Territory

Seven-valent pneumococcal conjugate vaccine (7vPCV) 'Prevenar' which contains serotypes 4, 6B, 9V, 14, 18C, 19F, 23F (vaccine types, VT) was made available for Aboriginal and other high risk Australian children in July 2001. A 2, 4, 6 month schedule plus a booster dose of 23vPPV was introduced along with a catch up program.