

# Impact of *Haemophilus influenzae* type b (Hib) vaccination on Hib meningitis in children in Far North Queensland, 1989 to 2003

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## Abstract

Over the four years 1989 to 1992 there were 28 cases of *Haemophilus influenzae* type b (Hib) meningitis in children aged under five years in Far North Queensland.<sup>4</sup> Thirteen (46%) of the cases were in Indigenous children, indicating that the rate of the disease was about 3.5 times greater in these children than in non-Indigenous children. However, no cases of Hib meningitis have occurred in Indigenous children in Far North Queensland in the 10 years following the addition of Hib vaccines to the Australian Standard Vaccination Schedule in 1993. There was only one case of Hib meningitis, in a (vaccinated) non-Indigenous child, between 1994 and 2003. About 70 cases of Hib meningitis in children were prevented by Hib immunisation in Far North Queensland between 1994 and 2003; possibly as many as five deaths and 12 cases with neurological sequelae were also prevented. *Commun Dis Intell* 2004;28:255–257.

Keywords: *Haemophilus influenzae*, meningitis, vaccination

## Introduction

Prior to the introduction of *Haemophilus influenzae* type b (Hib) vaccines into the Australian Standard Vaccination Schedule in 1993, infections due to Hib were an important cause of morbidity and mortality, especially in young children. The most important risk factors for Hib disease in these children were attendance at child day-care, and the presence of young siblings in the home.<sup>1</sup>

The most common manifestation of invasive Hib disease was meningitis, which accounted for approximately 60 per cent of all invasive Hib disease. The overall Hib meningitis fatality was about 5 per cent, and up to 15 per cent of the survivors had neurological sequelae such as deafness and intellectual impairment.<sup>1</sup> Most cases of Hib meningitis occurred in children under 18 months of age. However, there were marked differences between the epidemiology of Hib meningitis in Indigenous and non-Indigenous children in northern and central Australia (and perhaps elsewhere). Not only was the incidence considerably higher, but also the mortality and neurological sequelae were considerably greater in Indigenous children.<sup>2</sup> Furthermore, of particular importance, the onset of Hib meningitis occurred at a much earlier age in Indigenous than the onset in non-Indigenous children.<sup>3</sup>

This report describes the Hib meningitis cases that occurred in children under five years of age in Far North Queensland (FNQ) over 15 years, 1989 to 2003 including the first 10 years following the introduction of Hib vaccines in 1993.

## Methods

Surveillance for Hib meningitis in Far North Queensland dates back to 1989;<sup>4</sup> invasive Hib disease became a notifiable disease in Queensland several years later. Each invasive *Haemophilus influenzae* isolate is referred to the Queensland Health Scientific Services reference laboratory in Brisbane for serotyping. Detailed information is collected on each case of invasive Hib disease, including the patient's age and ethnicity, and if a child, from 1993 Hib vaccination status was collected.

The total population of children less than five years of age in Far North Queensland ascertained from the 2001 national census was approximately 16,500 children, 22 per cent of whom were Indigenous children.<sup>5</sup>

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## Results

Over the four years 1989 to 1992 there were 28 cases of Hib meningitis in children under five years of age in FNQ.<sup>4</sup> Thirteen (46%) of the cases were in Indigenous children, indicating that the rate of the disease was about 3.5 times greater in these children than in non-Indigenous children. The average age of onset of Hib meningitis was 9.5 and 15.5 months in the affected Indigenous and non-Indigenous children respectively. Nearly 25 per cent of the Indigenous cases occurred before six months of age compared with 11 per cent in the non-Indigenous cases.

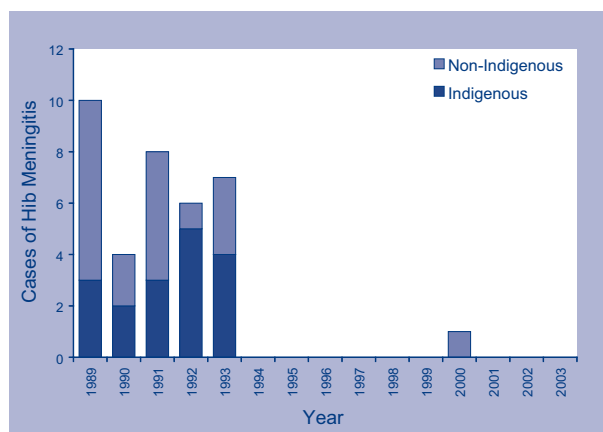
There were no cases of Hib meningitis in 1993 until April, when three cases occurred in unrelated Aboriginal children, all from remote communities, over a four-day interval. A Hib vaccine (PedvaxHIB; PRP-OMP), recently licensed for use in Australia, was immediately made freely available to all Indigenous children under two years of age in remote communities in FNQ. This local initiative commenced in May 1993; the last case (up to the present time) of Hib meningitis in an Indigenous child in FNQ occurred in June 1993 (Figure). This child was 10 months of age and was unimmunised at the time of illness.

The Commonwealth funded National Hib Immunisation Program began in mid-1993 for all children born in or after February 1993, and in September 1993 for older children. This program provided free Hib vaccination, for all Australian children under five years of age as part of the routine childhood immunisation program. Because of the epidemiological differences between the two populations of children, Indigenous children were given PRP-OMP vaccine, whereas non-Indigenous children were given a different vaccine (HibTITER; HbOC). However, from 2000, all children were given PRP-OMP.

Three cases of Hib meningitis occurred in non-Indigenous children in FNQ in 1993. No further cases occurred for the next seven years. However, a case occurred in a non-Indigenous child in September 2000; that (otherwise healthy) child was 11 months of age, and she had received the recommended three doses of HbOC vaccine at 2, 4 and 6 months. This case was the only case of Hib meningitis in a child under five years of age in FNQ in the 10 years, 1994 to 2003, following the implementation of the National Hib Immunisation Program.

Altogether, there were 35 cases of Hib meningitis in children aged under five years in FNQ between 1989 and 1993; an annual average of seven cases. Seventeen (49%) of these cases were in Indigenous children.

**Figure.** Cases of *Haemophilus influenzae* type b meningitis in children under five years of age in Far North Queensland, 1989 to 2003



## Discussion

Hib vaccination has had a profound impact on the incidence of Hib meningitis, and very likely on the other less common forms of invasive Hib disease, in children in FNQ since 1993. The rapidity and extent of the impact was far more profound than expected from vaccine uptake in children in the region at the time. Surveys in the early 1990s showed that many children in child-care in Cairns,<sup>6</sup> and Indigenous children throughout FNQ,<sup>7</sup> were incompletely immunised by their second birthday. The rapidity in the decline of Hib meningitis was probably assisted by the reduction in nasopharyngeal carriage of the Hib bacterium in vaccinated children. This indirect effect reduces the transmission of the organism via respiratory droplets resulting in less exposure to the organism in unvaccinated children.<sup>8</sup>

Based on the epidemiology of Hib meningitis in FNQ in the years 1989 to 1993, it can be predicted that about 70 cases of Hib meningitis in children were prevented in FNQ over the 10 years 1994 to 2003. Using published information on the outcome of Hib meningitis in other parts of Australia, possibly as many as five deaths and 12 cases with neurological sequelae were also prevented. There is no reason to suggest that this success was not the same elsewhere in other parts of north Queensland, including the Townsville, Mackay and Mt Isa districts as well as FNQ. Taking into consideration the demography of the childhood population throughout north Queensland, with a total of approximately 43,480 children aged less than five years,<sup>5</sup> it can be estimated that about 150 cases of Hib meningitis in children were prevented by Hib vaccination throughout north Queensland over the 10 years 1994 to 2003.

With the exception of the one vaccine failure in 2000, this impact has been sustained over the decade. The vaccine failure reminds us that there is no such thing as a 100 per cent effective vaccine;<sup>9</sup> fortunately the child made a full recovery. It also reminds us that the Hib bacterium still exists in north Queensland, and indeed elsewhere in Australia, so there can be no suggestion of stopping Hib vaccination in the foreseeable future. To do so would invite an inevitable, and probably rapid, resurgence in Hib disease in young children.

During the 1990s allegations were made that Hib vaccination, when given early in life, increased the risk of developing type 1 diabetes. However, several very large epidemiological studies in Europe and the United States of America have failed to show any association between Hib vaccines and type 1 diabetes.<sup>10</sup> In essence, there are no recognised substantive safety concerns about Hib vaccines.

In conclusion, Hib vaccination is safe and extremely effective. Over the 10 years that Hib vaccines have been in widespread use, perhaps as many as 150 cases of Hib meningitis have been prevented in north Queensland. Indigenous children in the region are no longer at an increased risk of acquiring this disease; indeed, the risk to any child in north Queensland is now extremely low, and will remain so provided that the current high levels of vaccine uptake are sustained.

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