Haemophilus influenzae type b (Hib)
**Haemophilus influenzae type b (Hib) factsheet**

This factsheet provides detailed information on Hib, a disease that is caused by the *Haemophilus influenzae* type b bacteria. Hib can cause a wide range of illnesses in children sometimes leading to death.

The factsheet also describes the vaccine that protects against Hib and is given to children with their diphtheria, tetanus and pertussis (whooping cough) (DTPwP) vaccine at 2, 3 and 4 months of age. Written in a question and answer format, and with a glossary explaining technical medical terms, this factsheet is designed to provide concise yet comprehensive information on this serious disease.
The disease

What is Hib disease?
*Haemophilus influenzae* infections are caused by a family of bacteria that can cause serious diseases. The strain of these bacteria that used to cause the majority of disease before the vaccine was introduced is type b. This strain is called Hib.

Not everyone that becomes infected with Hib develops the disease. Before Hib vaccine was introduced, about 4 in every 100 children aged 1 to 4 years were Hib carriers.¹

Most children who get Hib infections become very ill and need hospital care. Hib causes a number of serious diseases including meningitis, septicaemia and epiglottitis (see table below and glossary). The complications that arise from these diseases such as deafness, convulsions and intellectual impairment can be devastating. Hib disease can be fatal; for example, about one in twenty children who develop Hib meningitis die.² Symptoms and complications from Hib disease are summarised in the table below.

<table>
<thead>
<tr>
<th>Invasive disease caused by Hib</th>
<th>Symptoms</th>
<th>Serious complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meningitis</td>
<td>Fever, refusing to feed, irritable/high-pitched cry in babies, pale or blotchy skin, being difficult to wake, stiff body with jerky movements or else floppy and listless, tense or bulging soft spot on the head.*</td>
<td>Fifteen to thirty children in every hundred will develop long-term problems, such as: • hearing disorders • learning and language disability or delayed development • seizures (fits) • visual impairment. One child in every twenty who develop Hib meningitis will die</td>
</tr>
<tr>
<td>Epiglottitis (inflammation of the epiglottis)</td>
<td>Swelling of the epiglottis causing noisy and painful breathing</td>
<td>Severe blockage of the airway that can be fatal</td>
</tr>
<tr>
<td>Septic arthritis (serious infection in a joint)</td>
<td>Fever, painful, red, hot and swollen joints</td>
<td>Permanent damage to joints. Septicaemia (blood poisoning)</td>
</tr>
<tr>
<td>Osteomyelitis (inflammation of the bone)</td>
<td>Fever, painful limbs</td>
<td>Long-term bone infection. Septicaemia</td>
</tr>
<tr>
<td>Cellulitis (bacterial skin infection)</td>
<td>Sore, hot, painful area of skin</td>
<td>Septicaemia</td>
</tr>
<tr>
<td>Pneumonia (inflammation of the lung)</td>
<td>Cough, breathing difficulties, chest pain</td>
<td>Septicaemia Can cause death</td>
</tr>
<tr>
<td>Pericarditis (inflammation of the membrane that surrounds the heart)</td>
<td>Chest pain, breathing difficulties</td>
<td>Can cause death</td>
</tr>
</tbody>
</table>

* Further information on the signs and symptoms of meningitis and septicaemia can be found in the Hib leaflet, on the websites www.immunisation.nhs.uk www.meningitis.org (Meningitis Research Foundation, Freephone 24-hour helpline 0800 8800 3344) www.meningitis-trust.org.uk (Meningitis Trust, 24-hour helpline 0845 6000 800) or call NHS Direct on 0845 46 47.
How common is Hib disease?

Before Hib vaccine was introduced, children under 4 years of age were at most risk from Hib disease. Over two-thirds of cases were in children less than 2 years of age and the age group most at risk was infants of 10-11 months. Around 1 in 600 children developed some form of the Hib disease by their fifth birthday. Hib infection was the most common cause of bacterial meningitis in children. Each year Hib led to around 30 deaths and left about 80 children with permanent brain damage in England and Wales.

The introduction of Hib vaccine in October 1992 had a dramatic impact on cases of Hib disease, including meningitis (see fig. 1). When Hib vaccine was introduced in 1992 all children under the age of 4 years were offered the vaccine as part of a catch-up programme. This programme protected children at risk from Hib disease, interrupted its spread and thereby protected anyone who had not been immunised.

![Hib vaccine introduced]

Source: PHLS, HRU/CDSC. *Provisional data for 2002
Figure 1: Laboratory reports of Hib disease in England and Wales (1990-2002).

Following the introduction of the vaccine, laboratory confirmed cases of Hib disease in children under 5 years of age fell by 98 per cent. Disease rates also declined in unvaccinated older children and adults because of the reduced circulation of Hib bacteria amongst vaccinated children. Similar marked declines of Hib disease have also been seen after the introduction of Hib vaccine in other countries in Europe, Australia, Canada and America.

Immunising children against Hib disease has proved very successful in cutting rates of this disease. Over the last ten years in the UK, this vaccination has prevented about 7300 cases of Hib disease and approximately 270 deaths in children under 4 years of age.

What has happened to the levels of Hib disease in the last few years?

In the UK there are very good systems for monitoring disease and the impact of immunisation. Initially Hib disease fell dramatically with the almost complete disappearance of Hib disease in young children. Since 1999, there has been a small but gradual increase in the number of cases of Hib disease reported, mostly in children under 4 years of age. However, these cases (122 cases in 2002, provisional data) are much lower than the levels of disease seen before the introduction of Hib vaccine (around 800 every year).

What might have caused this rise in the number of cases of Hib?

There are several possible explanations for this increase:

- This is a short-term rise in disease and it may go down again naturally.

** Calculated using estimates of the number of cases and deaths arising from Hib infection prior to the introduction of Hib vaccine
At the start of the campaign in 1992, all children aged up to 4 years were given the vaccine as part of a 'catch-up' campaign. This led to the rapid and effective control of Hib disease. This 'catch-up' effect may now be wearing off. It may be that now that time has passed a Hib booster dose needs to be added to the immunisation schedule.

Some of the new cases are in children who have not been vaccinated. So, herd immunity (when enough people have been vaccinated to stop circulation of a virus or bacterium, then those who have not been vaccinated are protected) may be lower now than was first achieved.

Most of the new cases, however, have been in vaccinated children. But this is not surprising because almost all children have been vaccinated and any new effect would be mostly seen in vaccinated children. The use of a particular combination of DTaP-Hib vaccine in 2000/2001, produced lower Hib antibodies in these children, and this added to the increase already seen.

So, why was DTaP-Hib used instead of DTwP-Hib?
Babies are given diphtheria, tetanus, pertussis (whooping cough) vaccine at 2, 3 and 4 months with their Hib and polio vaccines. The diphtheria, tetanus, pertussis vaccine is called DTwP because it contains pertussis vaccine that has been manufactured from the 'whole cells' of the pertussis bacteria. Older children are given diphtheria, tetanus, acellular pertussis (DTaP) vaccine as their pre-school booster. This pertussis vaccine has no cells. The DTaP vaccine causes fewer side effects in older children and so that product is used for pre-school boosting instead of DTwP.

However, in 2000/01, there was a widespread shortage in supplies of the usual DTwP-Hib vaccine because of manufacturing problems. To ensure that children were not left unprotected against diphtheria, tetanus and whooping cough, the DTaP-Hib vaccine was used as an alternative.

This decision was taken because studies had shown that, although the combined DTaP-Hib vaccine led to lower levels of antibodies produced by the Hib component, other measures of the immune response were thought to be sufficient for protection.\textsuperscript{11,12,13} The situation was carefully monitored. This surveillance now suggests that three doses of Hib, especially when combined with DTaP, may not adequately protect all children against Hib disease.

How will I know whether my child received DTaP-Hib vaccine during their primary immunisations?
It may be recorded in their 'Red Book' and your GP may have the information. But all children are being offered a booster irrespective of the DTwP/DTaP received.

Can anything be done to prevent this increase in Hib disease?
Studies show that children’s antibodies against Hib can be raised to satisfactory levels by giving them an extra dose of Hib vaccine.\textsuperscript{14} By improving the level of antibodies they will each be better protected.

What happens now?
All children who will be aged over 6 months and under 4 years on 1 April 2003 (i.e. born between 2 April 1999 and 1 October 2002) will be invited for an extra dose of Hib vaccine unless specifically contraindicated.

Babies who reach 6 months of age during the course of the immunisation campaign will also be offered the extra dose of vaccine. These children will be offered the Hib booster when they reach 6 months of age.
How do we know this programme will work?
Laboratory studies show that even when children have very low antibody levels, the one extra dose of vaccine is very effective in boosting their immunity to a satisfactory level. The number of Hib cases will continue to be closely monitored to make sure that this programme is effective.

What about the future?
The extra dose of Hib is expected to halt the recent increase in cases, and take the disease back to its previous very low levels. The best way to maintain this protection against Hib in the long term is being reviewed. Once this review is completed, the next steps will be announced. One outcome of the review may be the introduction of a routine Hib booster as part of the childhood immunisation programme but until the review is completed this can not be said for certain.

How will our children be called for their extra dose of Hib?
Appointments for the extra dose will be sent to parents by the Child Health Computer System or by your GP. The vaccination will be given at your surgery, health centre or clinic.

What is happening in other countries? Are they seeing an increase in Hib disease?
We have detected this increase because of our excellent disease surveillance systems. Some countries, such as the Netherlands did not have a catch-up campaign to immunise older children when the vaccine was introduced to their routine childhood schedule. For this reason it has taken longer to control the disease to the very low levels that were in the UK and the rise that we are now seeing may be delayed in other countries. Other countries have an immunisation schedule that includes a booster dose between 11 and 18 months and this may help to prevent any rise in Hib cases.

Can MMR and Hib be given safely together?
Yes. If a child has been called to receive his or her first MMR jab or pre-school dose, Hib vaccine may be given at the same time in a different limb. When Hib was first introduced in 1992, it was routinely given at the same time as MMR. There is evidence that there is no interference between Hib and MMR.

Can Hib vaccine be given at the same time as the pre-school boosters?
Yes, children who are due for their normal pre-school boosters during the campaign will receive a single Hib vaccine along with the others.

My child had a bad reaction after a previous dose of DTwP-Hib; what should they receive instead?
Your child should still have the Hib booster because it is very unlikely that the Hib in the DTwP-Hib vaccine caused the reaction.

What if my child is called for an extra dose of Hib vaccine but they have not completed their primary Hib immunisations yet (i.e. they are having them late)?
If your child is 13 months of age or over and has not previously been immunised against Hib or didn’t complete their primary course of 3 doses, they should receive one dose of Hib vaccine. This is because children 13 months of age or over have a very good response to Hib vaccine and one dose is enough. However, it is important that your child still completes their 3-dose course of DTwP. DTwP can continue to be given up to the age that the pre-school booster is given but DTaP should be used then or thereafter because older children tend to have more reactions to DTwP.

If your child is less than 13 months of age, they should first complete their primary immunisation with 3 doses of DTwP-Hib at the usual intervals and then receive a booster dose of single Hib at least a month later.
The Hib vaccine

What is Hib vaccine?
The Hib vaccine is made from a part of the sugar coat of the bacteria that has been purified. The sugar is then joined to a protein to form what is called a conjugate vaccine. This vaccine can give immunity and hence protection in very young children who are at most risk from Hib disease. Different types of Hib conjugate vaccines are available and are usually combined with DTwP and given as part of the routine primary immunisation course. The extra dose being given in this campaign is a single vaccine of Hib only. Hib is not a live vaccine and can not give anyone Hib disease, or meningitis.

What does Hib vaccine protect against?
Hib vaccine protects against Hib disease and its consequences, including meningitis. However, meningitis can be caused by many other infections, such as meningococcal bacteria or mumps virus. Hib vaccine does not protect against these or other forms of meningitis.

There are other strains of Haemophilus influenzae that are not type b. These can cause severe infections but more commonly cause conditions like otitis media (ear infection) and chest infections. Hib vaccine does not protect against disease caused by these strains.

When are children routinely given the Hib vaccine?
Hib vaccine is given at the same time as, and often combined with, DTwP at 2, 3 and 4 months of age. Children need to be protected before 6 months of age when the risk of Hib disease increases.

Why isn’t the vaccine used in anyone older than 4 years of age?
The vaccine is not routinely recommended for those aged 4 years and over because invasive disease is very rare beyond this age. The vaccine is recommended in some older individuals who are at special risk, such as those who have had their spleen removed.

How effective has Hib vaccine been?
The Hib immunisation programme has had a striking impact on cases of Hib infection in children and Hib disease is now extremely rare. Cases fell by over 98 per cent after the vaccine was introduced.

How long does the protection from Hib vaccine last?
Effective primary immunisation at 2, 3 and 4 months offers good protection at least until the age of 4 years – the period during which children are most vulnerable to infection with Hib. Studies demonstrate that giving a single dose of Hib vaccine to children over 6 months of age provides a high level of antibodies against Hib⁷, but it is difficult to calculate how long this protection might last because Hib infection is now very rare in older age groups.

Is there anyone who shouldn’t receive Hib vaccine?
There are very few children who cannot receive Hib vaccine.⁸ If a child has a high fever the immunisation should be postponed until the child is not feverish.

How safe is the vaccine?
Hib vaccine has proven to be one of the safest vaccines available. By 1992 over 20 million doses had been used worldwide and no serious adverse reactions due to the vaccine had been reported. Since then more than 24 million doses have been safely used in the UK alone.