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Meningitis
Research Foundation



Vital signs Vital issues

Recognition and
prevention of
meningitis and
septicaemia

**Help for community
practitioners**

Second Edition



Contents

Introduction	1
Early recognition of meningitis and septicaemia	
■ Observations	2
■ Findings	3
■ Action	4
■ Public Health	5
Prevention: the only way to defeat meningitis and septicaemia	
■ Impact of MenC vaccine on Group C meningococcal disease (graph)	6
■ Meningitis vaccines in the routine infant immunisation schedule and the diseases they prevent	6
- Meningococcal disease and MenC vaccine	6
- Hib (Haemophilus influenzae b) meningitis and Hib vaccine	7
■ Meningitis vaccines currently outside the routine schedule, and the diseases they prevent	9
- Pneumococcal disease	9
- Vaccines against pneumococcal disease	10
- At-risk recommendations for pneumococcal vaccines (table)	11
- Hyposplenic or asplenic individuals	11
■ Travel & Pilgrimage: Protection against other serogroups of meningococcal disease	12
■ Safety	13
Reassuring parents about vaccine safety	
■ Do multiple vaccines, either combinations or separate vaccines given at the same time, weaken or overload a baby's immune system?	14
■ There seem to be so many new vaccines. Shouldn't I wait until they've been in use for a few years and my child is older before getting him immunised?	15
■ Isn't it better for babies to develop natural immunity to serious childhood diseases? Isn't this a safer alternative to vaccination?	16
■ What about all the things added to vaccines? Aren't these dangerous?	18
References	20
Acknowledgements	21
Meningitis Research Foundation	Back cover

Introduction

Vital signs, Vital issues has three objectives:

- to assist early recognition of meningitis and septicaemia;
- to inform about meningitis vaccines and the diseases they prevent;
- to help practitioners reassure parents about vaccine safety.

It was developed in response to requests from community practitioners for help in recognising meningitis and septicaemia, and help with talking to parents about vaccination. Practitioners said that they were regularly faced with misplaced anxiety and suspicion about vaccines, and need information to deal with this. The booklet addresses these concerns.

Scope

This booklet deals with severe bacterial infections that are important causes of meningitis and septicaemia. It does not attempt to deal



with viral meningitis, which is generally a less serious disease. Reports of viral meningitis may underestimate the true number, but are relatively low – typically less than 100 cases per year¹, and have dropped significantly since introduction of MMR vaccine. Before MMR vaccine was introduced, mumps was the main cause of viral meningitis. MMR vaccine is outside the scope of this booklet, although some of the topics in the Q & A section (pages 14-19) often arise in relation to MMR. For comprehensive coverage of MMR vaccination and the issues surrounding it, go to <http://www.hpsc.ie/A-Z/VaccinePreventable/MMR/> or www.mmrthefacts.nhs.uk.

Increasingly, parents need reassurance about vaccine safety, and **Vital signs, Vital issues** aims to help you deal with their concerns. **Please use this booklet to discuss the facts with parents.**

Early recognition of meningitis and septicaemia

Meningitis and septicaemia can kill in hours and take tens of thousands of lives worldwide each year². Meningococcal disease is the leading infectious cause of death in children, and fatality rates are even higher for other, less common types of bacterial meningitis. The two main clinical presentations, **septicaemia** and **meningitis**, can occur on their own but often appear together. **Septicaemia without signs of meningitis is more life-threatening.**

Early recognition depends on knowing what to look for:

Observations

- Temperature
- Heart rate
- Respiratory rate
- Capillary refill time: press for 5 seconds on the nail of the big toe or finger, forehead or sternum so it blanches, and count the seconds it takes for colour to return.
 - ▶ >2 seconds on forehead or sternum is abnormal
 - ▶ ≥4 seconds on peripheries, especially if heart rate/resps increased, suggests shock
- Conscious level **AVPU** – Assess the best response patient can make:
 - Alert? Remember, even an alert child may be very ill with septicaemia.
 - Responds to **Voice**? **Should be seen by doctor urgently**
 - Responds to **Pain**? **Medical emergency**
 - Unresponsive? **Medical emergency**
- Check all over for rash
- Blood pressure: check this if other signs outside normal (in children, only if paediatric cuff available)
- Oxygen saturation (if pulse oximeter available)

Non-blanching rash - typical of septicaemia

If a non-blanching rash is pressed firmly with a glass tumbler, the marks will not fade. You will be able to see the marks through the glass.



The Tumbler Test

NORMAL VALUES OF VITAL SIGNS³

Age (years)	Heart rate/min	Respiratory rate/min	Systolic Blood Pressure
<1	110-160	30-40	70-90
1-2	100-150	25-35	80-95
2-5	95-140	25-30	80-100
5-12	80-120	20-25	90-110
12+	60-100	15-20	100-120

Oxygen Saturation: normal value is >95% in air.

Watch out for red or brown pin-prick marks, purple blotches, bruises or blood blisters.



Scanty petechial rash of septicaemia



Classic petechial/purpuric rash*

Rash is typically seen in meningococcal infection, occasionally also in other septicaemias. However, it may be absent (especially in pure meningitis), scanty, or rapidly evolving (in septicaemia).

*Courtesy Dr A. Fioridan

Up to 30% of cases start with a blanching macular rash.



Early, blanching maculopapular rash with scanty petechiae*

The rash can be more difficult to see on dark skin, but may be visible in paler areas, especially the soles of the feet, palms of the hands, abdomen, conjunctivae or palate.



Purpuric rash on dark skin

Findings

SEPTICAEMIA

Septicaemia causes shock which can lead to multi-organ failure.

Look for

- Pallor
- Tachycardia
- Tachypnoea
- Cold hands and feet, mottling
- Conscious level:
 - ▶ **early in shock**, children often alert & able to speak



Child lucid despite advanced septicaemia

- ▶ **as shock advances**, babies – limp & floppy, older children & adults – unable to stand

Late signs

- Impaired consciousness – more likely to be late in children
- Hypotension
- Cyanosis

MENINGITIS

Meningitis causes raised intracranial pressure, which can lead to coning (brain stem herniation) and brain death.

Look for

- Neck stiffness, headache, photophobia in older children & adults
 - ▶ neck stiffness, photophobia uncommon in young children – their absence should not be reassuring
- All children – poorly responsive, staring, difficult to wake. Parents may report poor eye contact
- Babies – irritable with a high pitched cry, particularly when handled
- Babies – stiff body, jerky movements, abnormal tone
- Teenagers & adults may be confused or aggressive – you may suspect drug or alcohol use
- Seizures

Late signs

- Raised Intracranial Pressure:
 - ▶ ↑ BP ↓ Pulse rate
 - ▶ Impaired consciousness
 - ▶ Dilated, unequal, or poorly reacting pupils
 - ▶ In babies – tense/bulging fontanelle

MENINGOCOCCAL DISEASE

Meningococcal Disease – non-specific symptoms of illness may be present.

Particularly **ask about:**

- Pain – in joints, muscles, limbs. Isolated limb pain is a well established symptom of septicaemia, especially in the leg. Pain may be very severe
- GI disturbance – nausea, vomiting, diarrhoea, sometimes abdominal pain
- Rigors – in septicaemic patients
- Fever – or history of fever if afebrile on presentation

Action

Suspected meningitis or septicaemia, with or without a rash

- In surgery or health centre: call doctor, ensure antibiotics are given. Patient should be transferred to hospital by quickest means of transport, usually emergency ambulance.
- In the patient's home, summon urgent medical help, usually emergency ambulance, and stay with patient until help arrives.

Ambulance control and hospital staff need to know that meningitis/septicaemia is suspected, whether the patient has a non-blanching rash, and whether there are serious signs such as rapidly evolving rash, shock or impaired conscious level.

Patients with meningococcal septicaemia are likely to become very ill within the first 24 hours of symptoms starting. If seen early in the course of disease, symptoms may be non-specific and the patient may be sent home with information about symptoms of serious illness (see back page for contact details to order patient information). In this case, the patient or parent should be positively encouraged to seek medical help again if the patient deteriorates, even if this is shortly after the patient was seen.

BENZYLPENICILLIN

In the community, benzylpenicillin should be given as quickly as possible in any suspected case of meningococcal disease.

Dosage (BNF):

Adult and child aged 10 or older: 1200 mg

Child 1-9 years: 600 mg

Infant: 300 mg

Route:

IV if possible or IM into a part of the limb which is warm and well perfused.

Recommended unless there is a history of immediate allergic reaction after previous penicillin administration⁴.

Public Health

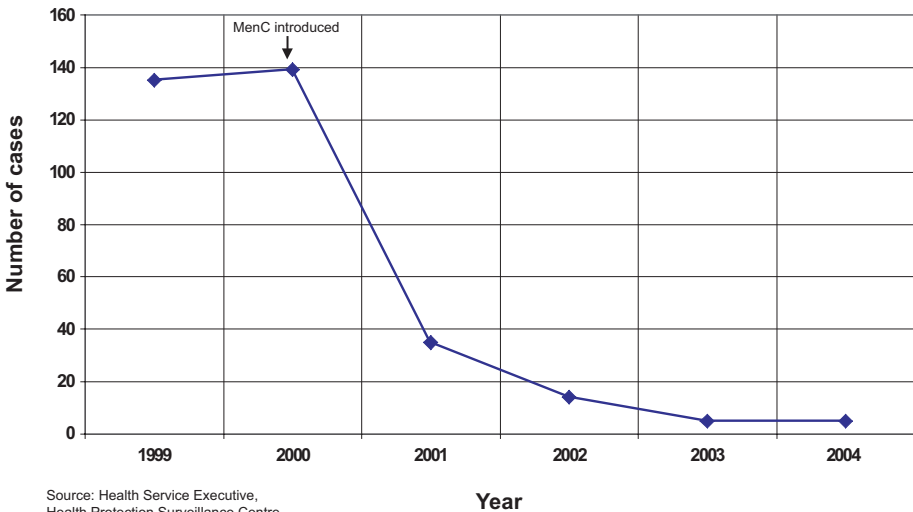
- Doctor immediately notifies any suspected case of meningitis or meningococcal septicaemia by phone to the Public Health Department within the Health Service Executive Area. This is the legal duty of the doctor who makes or suspects the diagnosis – usually the hospital doctor, but surgeries/health centres may wish to check that it has been done.
- After a single case, only the following contacts require antibiotic prophylaxis⁴: close contacts living in the same household as the case in the 7 days before disease onset (including babysitters); kissing contacts; and those who were in the same nursery/creche as the patient (including adult carers), if the nature of contact is similar to that for household contacts. This is only required when meningococcal or (in some cases) Hib disease is the most likely diagnosis – it is not necessary in suspected viral cases being treated “just in case”. Prophylaxis is not necessary in pneumococcal and viral meningitis.
- Healthcare staff only require prophylaxis if their mouth or nose has been directly exposed to infectious respiratory droplets or secretions within one metre of a probable or confirmed case, within 24 hours of the commencement of antibiotics⁴. This is unlikely to occur except when using suction during airway management, inserting an oro/nasopharyngeal airway, intubating, or if the patient coughs in your face.
- Public Health arranges for prophylactic antibiotics to be prescribed to contacts as necessary. Rifampicin is the drug of choice, but ciprofloxacin (not in children under 5 or in pregnancy) or ceftriaxone are alternatives, although not licensed for this purpose. Ceftriaxone can be given to pregnant contacts. Rifampicin interferes with the oral contraceptive pill and stains body fluids – including urine and saliva – orange, and permanently stains soft contact lenses. Some individuals may experience rash or stomach upset.
- Antibiotic prophylaxis should eliminate carriage, but if the contact is already incubating the bacteria, he or she can still get the disease. Close contacts of a case should be advised that they are at increased risk of meningitis and septicaemia, alerted to the symptoms, and given a leaflet on meningitis and septicaemia (see back page).
- Public Health will:
 - ▶ arrange for the next of kin to be interviewed to establish other close contacts and arrange prophylaxis for them, and for later immunisation of all close contacts if indicated;
 - ▶ ensure information is disseminated to appropriate local schools, work places and general practitioners;
 - ▶ be responsible for early detection of clusters and outbreaks of disease.

Prevention: the only way to defeat meningitis and septicaemia

Immunisation saves more lives than any other action that can be taken in primary care - along with clean water, it is the public health intervention that has the most positive impact on the world's health⁵.

Vaccines are a tremendous success story: for example, before the MenC vaccine was introduced Group C meningococcal disease affected approximately 130 people in Ireland each year⁶, killing approximately one in ten affected and leaving many more permanently disabled.

Impact of MenC vaccine on Group C meningococcal disease



Source: Health Service Executive,
Health Protection Surveillance Centre

Meningitis vaccines in the routine infant immunisation schedule and the diseases they prevent

(For the current routine immunisation schedule go to <http://www.ndsc.ie/hpsc/A-Z/VaccinePreventable/Vaccination/Publications/ImmunisationGuidelines/>)

Meningococcal Disease and MenC Vaccine

Meningococcal disease can kill in hours.

- It can affect anyone of any age, but mainly strikes babies, small children and young people – in order of risk the highest is among infants under 1 year of age, followed closely by 1 to 5 year olds and then young people aged 15 to 19.

- Most often it strikes without warning at children who were previously perfectly healthy.
- Whilst fewer than 5% of cases die of meningococcal meningitis, the case fatality rate for meningococcal septicaemia is nearer 20% and can rise to 50% if the patient is already in shock when they reach medical help.
- People who recover may be left with disabilities that dramatically alter their lives – brain damage, deafness and seizures, amputations, severe skin scars. A quarter of survivors report a reduced quality of life due to the disease⁷.

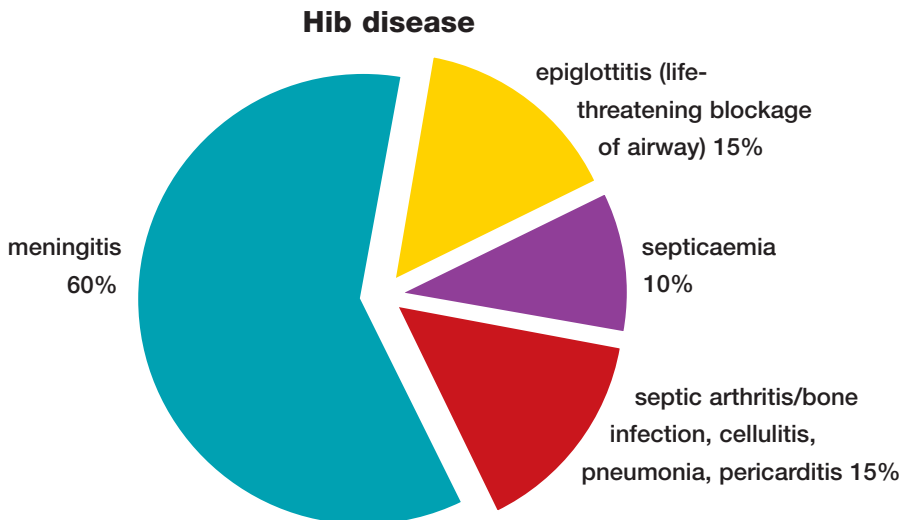
MenC vaccine was introduced in the Republic of Ireland in October 2000.

- It provides excellent protection against meningitis and septicaemia caused by Group C meningococcal bacteria, and has reduced cases by over 95%.
- Before it was introduced, clinical trials involving over 25,000 people worldwide demonstrated the MenC vaccine to be safe with no serious side effects. At least 28 million doses of MenC vaccine have been given. As with all licensed drugs, safety is continuously monitored.

MenC vaccine has been enormously successful. However, it is important to remember that **it cannot prevent all forms of meningitis and septicaemia**. Group B meningococcal disease was more common even before MenC vaccine was available, and no available vaccine can protect against it.

Hib (Haemophilus influenzae b) meningitis and Hib vaccine

Hib causes a range of potentially fatal illnesses⁸



- Those most at risk are children under age 4, especially babies 6 to 12 months of age⁹.
- Five percent of children who get Hib meningitis will die, and up to 45% will have long-term neurological damage, including deafness, intellectual impairment, seizures, and blindness¹⁰.

Before introduction of the conjugate Hib vaccine in 1992, Hib was the most common cause of bacterial meningitis in children, causing up to 100 cases each year¹¹.

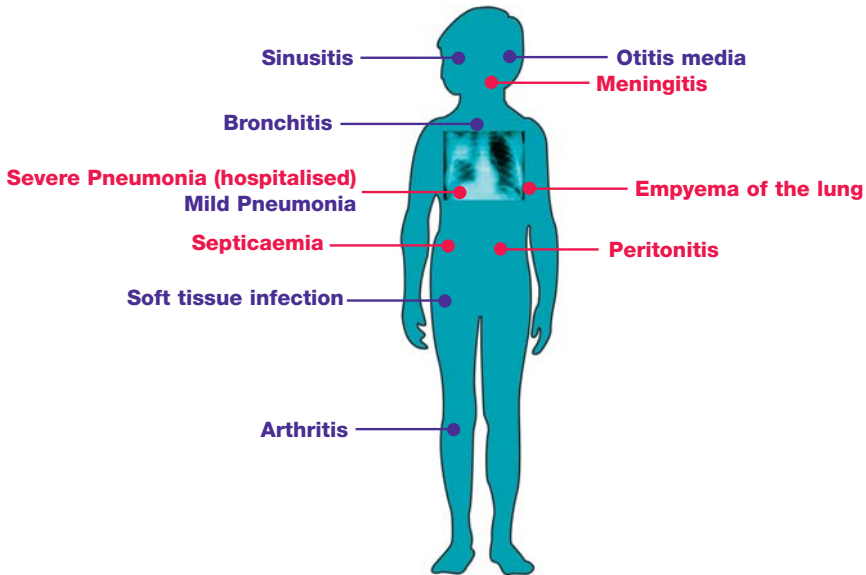
- After immunisation was introduced, confirmed cases in children under 5 fell by over 90%¹¹.
- Millions of doses of Hib vaccines given to children worldwide over nearly two decades have established an excellent safety record.
- Currently, most babies are immunised against Hib with the 5-in-1 DTaP/IPV/Hib vaccine, which also protects against diphtheria, tetanus, whooping cough and polio. This vaccine has been in use in Ireland since 2001 and is also used in several other countries.
- After 2004 there was a small but significant resurgence of invasive Hib disease, although the number of cases was still much lower than before Hib vaccine was introduced. As an interim measure to boost immunity in children and reverse this trend, there was a catch-up campaign in 2005 in which all children aged between 1 and 4 years of age were offered an extra Hib vaccine. Now a routine Hib booster is offered to all children at 12 months of age along with the MMR vaccine.
- Single Hib vaccine is also recommended to provide extra protection for people who either have no spleen or splenic dysfunction, and for children under age 4 who have not previously had a Hib vaccine⁴.

Meningitis vaccines currently outside the routine schedule and the diseases they prevent

Pneumococcal disease

Pneumococcal infection causes a range of illnesses, from **life-threatening, invasive illnesses** to **common, non-invasive illnesses**:

Spectrum of pneumococcal infection



Adapted with permission from an illustration by Prof David Goldblatt

Pneumococcal infection is more common in young children and the elderly, and generally over 50% of cases of **pneumococcal meningitis** are in young children⁶.

- Pneumococcal meningitis is the second most common type of bacterial meningitis in Ireland, after Group B meningococcal disease.
- It is the most life-threatening major form of meningitis, 15-20% of those affected will die.
- Survivors have a higher rate of after effects, including deafness, intellectual impairment, speech and language problems, paralysis, cerebral palsy, epilepsy and blindness, than in other forms of meningitis – over half of them are left with some level of permanent disability¹³. Even those who appear to recover well from pneumococcal meningitis have substantial risk of neuropsychological problems¹⁴.

Vaccines against pneumococcal disease

There are two vaccines against pneumococcal disease, which are recommended for 'at-risk' people – those with conditions where the disease is either more common or more dangerous (see table opposite).

- 23-type polysaccharide vaccine
 - ▶ provides protection in most adults against disease caused by the most common 23 types of pneumococcal bacteria, which account for 96% of cases
 - ▶ not effective in children under 2 years old, less effective in people with immune deficiencies and the under-fives
 - ▶ recommended since 1992 for people over 2 years of age with at-risk conditions
 - ▶ universally recommended for everyone aged over 65 in the Republic of Ireland
 - ▶ since it was licensed in the 1980s, millions of doses have been given worldwide, establishing its safety.
- 7-type 'conjugate' vaccine
 - ▶ provides stronger protection than the plain polysaccharide vaccine, even in babies, against the major types of pneumococcal bacteria that account for approximately 71 - 86%¹⁵ of serious disease in children under 5
 - ▶ recommended for all children aged 2 months to 5 years with at-risk conditions
 - ▶ similar to the successful Hib and MenC vaccines, which are also conjugate vaccines (see page 15).

Since June 2000, the routine use of this vaccine in the USA has established a solid safety record and strong evidence of its efficacy and highly beneficial effect on population immunity¹⁶. Further evidence of its safety and effectiveness is mounting from other countries where it is also now offered routinely, including Australia, Austria, Canada, Greece, Italy, Luxembourg, the Netherlands, Norway, Qatar, Spain, Switzerland and the UK. The National Immunisation Advisory Committee* of the Royal College of Physicians Ireland has recommended introducing this vaccine into the routine childhood immunisation programme. This is expected to happen in 2008.

<http://www.immunisation.ie/en/ChildhoodImmunisation/PneumococcalDisease/>¹

Community nurses need to be aware of the recommendations listed in the table opposite. Not all patients in these categories will be under the care of a paediatrician or other specialist.

Children who receive the 7-type conjugate vaccine should be offered the 23-type polysaccharide vaccine after their second birthday to provide them with additional protection against more types of pneumococcal bacteria. The 23-type vaccine should be given at least 8 weeks after their final dose of 7-type conjugate vaccine.

*The expert committee that advises the government on vaccines.

At-risk recommendations for pneumococcal vaccines

Asplenia or severe dysfunction of the spleen, including surgical splenectomy
Chronic renal disease or nephrotic syndrome
Chronic heart, lung, or liver disease including cirrhosis
Diabetes mellitus
Sickle cell disorder
Immunodeficiency or immunosuppression due to disease or treatment including HIV infection at all stages
Patients with CSF leaks, either congenital or complicating skull fracture or neurosurgery
Patients with, or about to have, cochlear implants ¹⁷

Patients about to have splenectomy, should ideally be vaccinated at least two weeks beforehand⁴.

Hyposplenic or asplenic individuals

Hyposplenic or asplenic individuals are at an increased lifelong risk of infection from pneumococcal, meningococcal and Hib bacteria, which the spleen would normally help fight.

The incidence of disease in this group is up to 10-50 times higher than that within the normal population¹⁸. Such individuals should therefore be offered the MenC and Hib vaccines as well as pneumococcal vaccine (before splenectomy if possible or as soon as possible afterwards)⁴.

Other immunocompromised patients

There is specific advice for vaccination of immunocompromised patients, including patients undergoing cancer therapy and organ transplant^{4,19}.

Travel & Pilgrimage: Protection against other serogroups of meningococcal disease

ACWY quadrivalent vaccine (polysaccharide)

For pilgrims travelling to Saudi Arabia for Hajj or Umrah and seasonal workers in Hajj areas, quadrivalent ACWY meningococcal vaccination is now a visa requirement.²⁰

- This protects against four meningococcal strains: A, C, W135 and Y.
- Although the older AC polysaccharide vaccine had been compulsory for pilgrims to the Hajj for many years, since 2000 there have been outbreaks of W135 meningococcal disease among pilgrims worldwide. As protection is serogroup specific, neither the older AC polysaccharide vaccine nor the MenC conjugate vaccine can prevent Group W135 infection: only the quadrivalent vaccine provides protection.
- Pilgrims must be vaccinated at least 10 days before arriving in Saudi Arabia.
- Immunity lasts for about 3-5 years. The vaccine provides 80-90% protection to adults but it is generally less effective in young children. It is not effective against Group A in children under 3 months of age and protection against Group W135 in children under 2 years is limited.
- This vaccine is not currently licensed in Ireland but is prescribed on a named patient basis.

ACWY vaccine is also recommended for travel to certain countries in sub-Saharan Africa, particularly for travellers living or working with local people or visiting during an outbreak. An up-to-date list of countries with potential risk can be obtained from The National Travel Health Network and Centre

http://www.nathac.org/pro/clinical_updates/meningitis300307.htm

A conjugate ACWY vaccine is now licensed in the USA.

Safety

The safety of meningitis vaccines is carefully established before they are introduced, as with all vaccines, by means of large trials involving thousands of healthy babies, children and adults. Once introduced, a comprehensive monitoring system builds up further evidence of safety as millions of doses are given over the years. All meningitis vaccines now in use in the Republic of Ireland are also used in other countries, which further contributes to the enormous bank of safety data.

As with nearly all drugs, vaccines can cause side effects, mostly local injection-site reactions, low-grade fevers, and irritability. Very rarely, serious reactions are reported – it is never possible to be certain that a child will not react seriously to any medicine or vaccine. However, the risk of anaphylactic reaction to childhood vaccines is tiny – about 1.5 per million immunisations²¹. **Having children vaccinated is far safer than not having them vaccinated.**

Contraindications to vaccination^{4,22,23}

The only absolute contra-indication to meningitis vaccines in the routine infant schedule and to pneumococcal vaccines is a confirmed anaphylactic reaction to the vaccine or any component of the vaccine⁴.

Although there is no evidence to suggest that inactivated subunit vaccines, such as MenC and pneumococcal vaccines, are not safe in pregnancy, they are not recommended for pregnant women unless there is a high risk of disease.

Vaccination should be postponed in cases of acute illness – not because it isn't safe, but to avoid confusion about what is or is not a side-effect of vaccine.

Children under 12 months of age generally receive their Hib vaccine as a combination with DTaP/IPV. The HPSC Immunisation Guidelines⁴ have additional advice about contraindications to DTaP vaccine.

Where there is a history of febrile convulsions, parents need to be given advice about prevention and management of fever.

More detailed information on all aspects of immunisation in the Republic of Ireland, including side effects and contraindications, can be found in the Immunisation Guidelines:

<http://www.ndsc.ie/hpsc/A-Z/VaccinePreventable/Vaccination/Publications/ImmunisationGuidelines/>

“Your child’s immunisation – a guide for parents” can be obtained from Health Protection Surveillance Centre (info@hpsc.ie or Phone: 01-876-5300) and contains further information regarding vaccine safety.

Reassuring parents about vaccine safety

In recent years speculative media stories have raised parental anxiety about vaccination. Nurses are now increasingly faced with parents who are concerned that vaccination is in some way more hazardous than the diseases themselves. This is not correct. This section of the booklet aims to help you deal with these concerns and some of the myths that have developed.

Q: Do multiple vaccines, either combinations or separate vaccines given at the same time, weaken or overload a baby's immune system?

No – every day of their life, babies are naturally exposed to far more immune challenges from the environment around them than from all of the vaccines contained in the routine immunisation schedule added together. They are able to deal with these immune challenges just as they are able to deal with the vaccinations we give them.

- From the moment a baby emerges from the nearly sterile environment of the womb, through the cervix and birth canal, he or she enters a world teeming with bacteria and other microbes.
- Within hours of birth, a baby's gastro-intestinal and respiratory tracts are heavily colonised with bacteria²⁴.
- A baby's contact with other people exposes him or her to multiple immune challenges – on average there are²⁵
 - ▶ 1,000 bacteria on each cm² of your skin
 - ▶ 1,000,000 bacteria on each cm² of your scalp
 - ▶ 100,000,000 bacteria per gram of saliva
 - ▶ 10,000,000 bacteria per gram of nasal mucus

In fact the bacteria in your body outnumber your own cells: the human body is composed of 10 trillion cells, and contains 100 trillion bacteria.

- Our immune systems respond to antigens – these can be proteins found on the surface of bacteria and other microbes, or may be contained in vaccines. Bacteria that babies are commonly exposed to have many more antigens than all the vaccines in the routine schedule:
 - ▶ Streptococcus – 1,838 protein antigens
 - ▶ Staphylococcus – 2,467 protein antigens
- When a baby gets a cold, its immune system has to respond to 4-10 antigens. When its intestines are colonised by just one bacterial strain, its immune system must respond to 15-50 antigens²⁶.
- A baby's immune system has an enormous capacity to fight the thousands of bacteria, viruses and other pathogens that it is bombarded with every day – a baby could, in

theory, respond to around 10,000 vaccines at any one time. If, for example, 11 vaccines were given to a baby at once, this might only occupy about a 1,000th of the immune system (in Ireland the current routine immunisation schedule for babies delivers only 6 vaccines at any one visit). But, since the cells of the immune system replenish themselves at such a tremendous rate, a vaccine can never 'use up' part of the immune system²⁴.

- Even babies who are unwell can produce protective immune responses to vaccines.

A: It is a misconception that the immune system can be overloaded. Far from overwhelming the immune system, by providing protection against potentially fatal infections, vaccines help stimulate and strengthen it.

Q: There seem to be so many new vaccines. Shouldn't I wait until they've been in use for a few years and my child is older before getting him immunised?

Hib, meningococcal and pneumococcal polysaccharide vaccines have been around for decades (see box overleaf). What is fairly new is our ability to take these older vaccines, link them to proteins (which themselves have been around for many years) and make conjugate vaccines. By doing this we can protect the younger age groups that are so vulnerable to these diseases.

When babies are exposed to meningococcal, pneumococcal or Hib bacteria, they are much more likely to develop disease than older children and adults. Each of these bacteria is covered in a sugar (polysaccharide) coat, and although the infant immune system responds very well to protein antigens, it cannot respond very well to sugar antigens. This is (partly) why babies are particularly susceptible to Hib, meningococcal and pneumococcal infections.

The vaccines we now have for children against Group C meningococcal, Hib and pneumococcal infections are conjugate vaccines. **Conjugate** vaccines are made by linking a tiny fragment from the bacteria's sugar coat (which the infant's immune system cannot respond to) to a protein (which the infant's immune system can respond to). In this way the immune system is able to recognise the meningitis bacteria. Thus, conjugate vaccines are effective in babies as young as two months of age and trigger a long-lasting immune response.

A: Many of the vaccines in the Irish immunisation programme are not actually new but are improved formulations. Rigorous clinical trials have ensured these are safe to give to babies. Babies need protection early – their greatest risk of getting meningitis and septicaemia is in the first 12 months of life. To delay vaccination is to put them at risk.

Year of development and vaccine

- 1970s Haemophilus influenzae type b (Hib) polysaccharide
- 1972 Meningococcal polysaccharide
- 1977 Pneumococcal polysaccharide
- 1984 23-type Pneumococcal polysaccharide
- 1987 Haemophilus influenzae type b (Hib) conjugate
- 1999 Group C Meningococcal conjugate
- 2000 7-type Pneumococcal conjugate

Q: Isn't it better for babies to develop natural immunity to serious childhood diseases? Isn't this a safer alternative to vaccination?

No. For diseases that can kill or cause serious disability this is a very risky way to develop immunity. It is far safer to be vaccinated.

There are two kinds of immunity: active and passive.

- Active immunity is when your immune system has been stimulated to make its own antibodies.
- Passive immunity is when you are given someone else's antibodies either in the form of immunoglobulin or naturally, as in from mother to baby.

Babies naturally get passive immunity when:

- Maternal antibodies cross the placenta – mainly during the 3rd trimester of pregnancy.
 - ▶ This provides some protection against infections to which mother is already immune, but this immunity quickly wanes.
 - ▶ Since antibodies are mostly passed to the baby late in pregnancy, premature babies receive less protection than full-term babies. These infants need the protection of vaccinations even more – waiting until they are bigger is not the right thing to do.
- They are breast-fed. Breast milk and colostrum mainly provide a class of antibody called IgA²⁴, which guards mucosal surfaces – important because it helps protect against gastrointestinal and respiratory²⁷ bugs. This provides limited protection against invasive infections like meningococcal, pneumococcal²⁸ and Hib²⁹ disease. Therefore whilst breast-feeding has a great many health benefits, it is not a replacement for immunisation.

Compared to active immunity, passive immunity is short-lived.

Active immunity is acquired through:

- natural exposure to infections
- vaccination, which mimics the process of acquiring active immunity by natural infection.

When a child is naturally exposed to meningococcal, pneumococcal or Hib bacteria, the child may:

- carry the bacteria harmlessly in the back of their throat for a few weeks or months, or
- develop meningitis, septicaemia, or one of the less life-threatening diseases these infections can cause.

Both outcomes, carriage and disease, stimulate the production of antibodies against that particular strain of bacteria. If the child survives the infection, the antibodies they have produced should protect them against further infection with that strain. The immune system should 'remember' that infection, and produce specific immune memory cells, so that the immune system can respond very quickly, producing protective antibodies, if ever the child meets that particular strain of the infection again.

BUT the child may not survive the infection, or may be permanently affected by deafness, blindness, cerebral palsy, paralysis, amputations, scarring or one of the many other after effects these diseases can cause.

Natural infection is less reliable than vaccination for providing protective immunity against meningitis. Children who have had pneumococcal meningitis and septicaemia need pneumococcal vaccination – any immunity they have acquired from the infection will be specific to the strain they had, and there are 90 different strains of pneumococcal bacteria. Generally, people who recover from Hib or meningococcal C disease should have their antibody levels tested and be vaccinated if levels are not high enough¹⁷.

A: For serious, life-threatening childhood illnesses, acquiring active immunity through vaccination is a much safer way to protect babies and children than risking exposure to the diseases.

Q: What about all the things added to vaccines? Aren't these dangerous?

Additives are materials added to vaccines by the manufacturer for a specific purpose – to make them work better or to ensure safety. They might include:

- **Adjuvants:** these enhance and direct the immune response. The only adjuvants in vaccines used in Ireland are aluminium salts.
 - ▶ Aluminium is one of the most common elements on earth and is present in air, food and water, so all infants are exposed to it in the environment.
 - ▶ It is present in many foods: breast milk contains about 40 µg/l³⁰.
- **Stabilisers:** materials that help protect the vaccine from adverse conditions such as the freeze-drying process or heat; or stop the vaccine from sticking to the sides of the vial.
 - ▶ Can be sugars (e.g. lactose), amino acids, or proteins.
 - ▶ Some parents worry about lactose-containing vaccines in lactose-intolerant children, but lactose is only a problem for these children when it is ingested. Vaccines are given intramuscularly, and this does not bring on symptoms of lactose intolerance.
- **Preservatives:** prevent growth of bacteria & fungi.
 - ▶ In the past, the mercury-based preservative, thiomersal was used in DTP combination vaccines. It was there to prevent contamination when we used to use multi-dose vials which were repeatedly punctured when drawing up doses. The safety of thiomersal in vaccines has been firmly established through its use for over 70 years, and by several large studies in the UK³¹, the USA³² and Denmark³³. However, as part of a global goal to reduce the exposure of children to mercury from any avoidable source, there has been an international effort to eliminate thiomersal from vaccines where possible. MenC and pneumococcal vaccines do not contain thiomersal³⁴. The DTaP/Hib/IPV vaccine used in Ireland contains trace amounts below the limit of detection and is considered equivalent to thiomersal-free vaccines³⁵.
- **Residuals:** traces of substances used to make or inactivate vaccine components may remain in the final product.
 - ▶ **Antibiotics:** neomycin, polymyxin B, and streptomycin are used to prevent bacterial contamination during manufacturing and may be found in trace amounts in some childhood vaccines³⁰. Allergic reactions to these are very rare, but a previous confirmed anaphylactic reaction to one of these antibiotics is one of the very few contraindications to receiving DTaP/Hib/IPV vaccine⁴. It is important to remember that reported allergy to penicillin, for example, or to 'antibiotics' in general, is not a contraindication to vaccination.
 - ▶ Formaldehyde is used to inactivate viruses or toxins used in the manufacture of

some vaccines. It is also naturally present in the human body – our bodies need it to make amino acids and DNA. The barely detectable quantities of formaldehyde that may remain in some vaccines are less than one-tenth of the levels that circulate naturally in the bloodstream of a 2-month old baby³⁰.

- ▶ Materials derived from cattle, such as agar, casein and casamino acids, are used during the early stages of manufacture of MenC vaccines³⁴ and pneumococcal conjugate vaccine, but are not detectable in the finished product. All manufacturers source these products from countries certified BSE-free.

A: In the light of recent vaccine scare stories, it is not surprising that there may be public concern about vaccine additives. However, additives are only used when they are necessary and they are not dangerous. To vaccinate against the serious diseases of childhood is much safer than not to vaccinate.

Myths about vaccination continually appear in the media. It would be all too easy for this coverage to cloud our professional judgement about the safety of vaccines. We owe it to the families and children that we care for to correct these myths and misunderstandings.

Prevention through vaccination is the only way to defeat meningitis and septicaemia.

Vaccination is the safer alternative to these devastating diseases.

Please use this booklet to discuss the facts with parents.

Always remember that we do not yet have vaccines to protect us against every cause of meningitis and septicaemia, so recognition and early treatment are crucial.

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Meningitis Research Foundation's vision is a world free from meningitis and septicaemia.

The charity funds research to prevent meningitis and septicaemia, and to improve survival rates and outcomes. The Foundation promotes education and awareness to reduce death and disability, and gives support to people affected.

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An interpretation service is available in 120 languages.

Meningitis Research Foundation's helpline staff respond to calls at any hour of the day or night from people who want to know more about meningitis and septicaemia, including vaccines relevant to the diseases, or who are worried about someone who is ill. The helpline offers on-going support and befriending to people who are bereaved or recovering from the diseases.



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