Complacency About Diseases, Anxiety About Vaccines

Linda Glennie, Meningitis Research Foundation

A Webber Training Teleclass

Complacency
about diseases
Anxiety
about vaccines

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Unfounded suspicion about vaccine safety threatens prevention of meningitis

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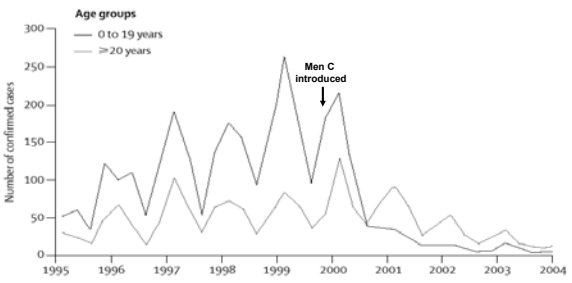
Impact of MenC vaccine
on Group C meningococcal disease



From Trotter et al. Lancet 2004; 364: 365-67

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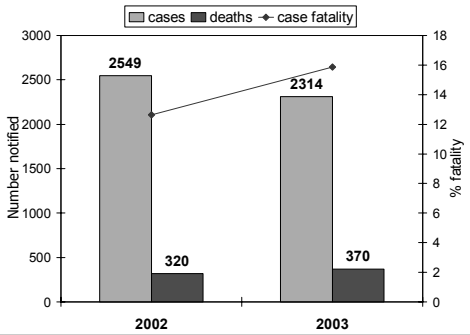
Bacterial meningitis and
meningococcal septicaemia: UK



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Downside of success? complacency

→2003 student awareness survey

→50% believed that if they had MenC vaccine, they couldn't catch meningitis or septicaemia at all

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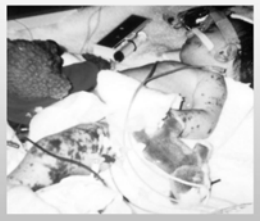
Misunderstanding extent of protection

The day before, she did wonder if her daughter could have meningitis…"*I was in total shock when I found out it was meningitis, as she had been immunised.*"

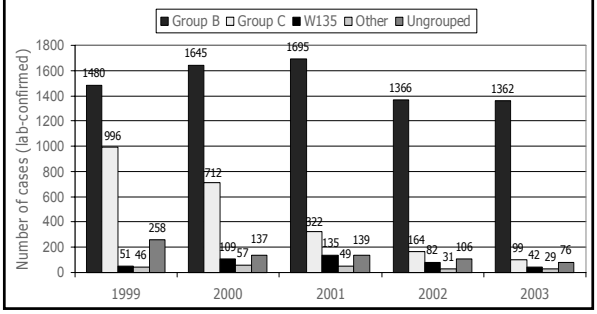
Group B meningococcal disease



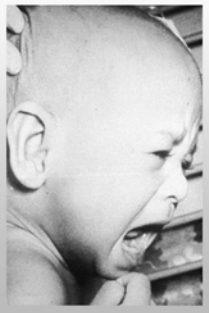
- Always more common than Group C meningo
- Strikes suddenly – can bring a child to death's door in hours
- Strikes without warning – anyone of any age, mostly young & healthy
- Can cause severe disability – amputations, scarring, permanent organ damage, deafness, brain damage

No vaccine available (against UK strains)

Meningococcal disease 1999 - 2003



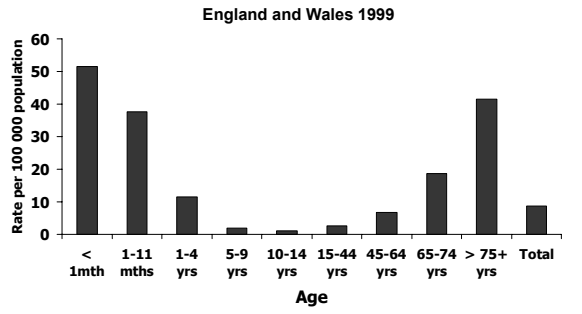
Pneumococcal disease



- Meningitis, septicaemia, severe pneumonia, lung empyema & spectrum of non-invasive disease
- 2nd most common kind of meningitis
- Most life-threatening major kind of meningitis, fatality = 15-20%
- >50% of survivors have permanent disability: deafness, mental impairment, speech/language problems, hemi-paresis, cerebral palsy, epilepsy, blindness

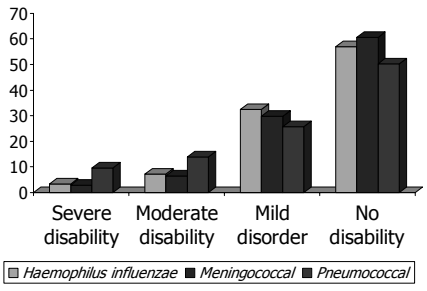
2 vaccines available, offered only to those with clinical risk factors, and the elderly.

Invasive Pneumococcal Disease



George AC & Melegaro A CDR Weekly 2001 11(21)

Sequelae of bacterial meningitis in infancy



Bedford H et al BMJ 2001 323 533-536

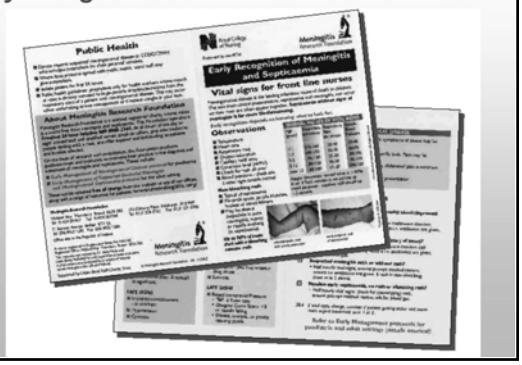
Types of Meningitis

Bacterial
- → Not common
- → Life-threatening
- Meningococcal
- Pneumococcal
- Group B Streptococcal
- E coli
- Listeria
- Hib
- TB

Viral
- → Probably common
- → Not normally life-threatening
- Enteroviruses = coxsackie and echovirus
- Mumps
- Herpes
- Insect-borne

Fungal
- → Rare in UK/RoI
- → Life-threatening
- → Associated with AIDS/HIV
- Cryptococcal (mainly)

Absence of universal protection: early recognition and treatment

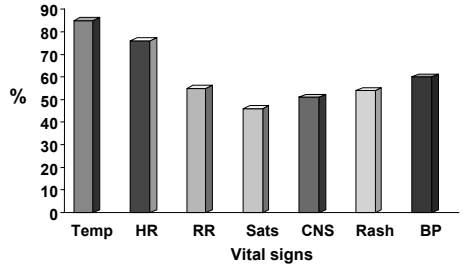


Healthcare delivery and the outcome of meningococcal disease in children – national study

Aim: **to determine critical stages which could change the course of the illness and save the life of a child**

- Documented every death from MD over 15 months: compared standard of health care delivery in fatal and non-fatal cases
- Examined all stages in recognition, diagnosis and treatment
- Data collection – parents, GPs, hospitals
  - A&E records
  - Medical notes
  - Nursing notes
  - Observation charts
  - Intensive care charts
- Which vital signs recorded and time done noted

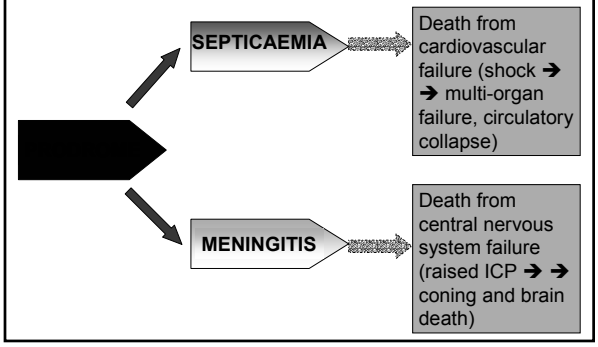
Vital signs measured w/in first hour

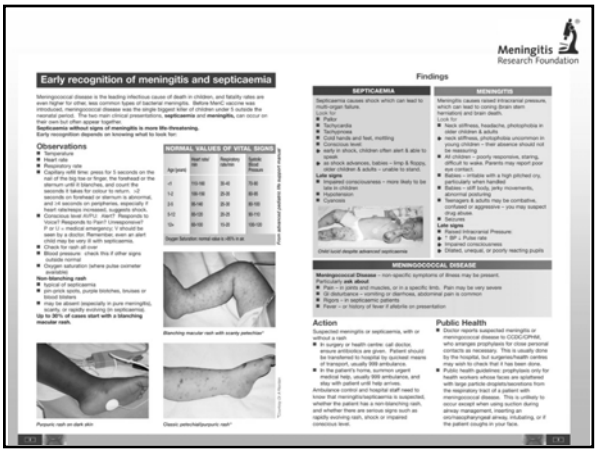


Septicaemia caused most deaths

- 190 deaths over study period:
  - Meningitis – 23 cases (12%)
  - Septicaemia – 155 cases (82%)
  - Uncertain – 11 cases (6%)
- 496 complete sets of notes obtained – 143 deaths, 353 survivors

Disease Pathway





4 year old girl, sudden onset fever and painful R hand, presenting to A&E

- **Triage**: 1) ? Injury soft tissue 2)Unwell, pyrexia
  - ➔ Triage assessment: sudden onset pain R hand. No hx trauma, reluctant to have it touched. Generally unwell. Spots erupting on arm and back. Last had calpol 2.5 hrs ago.
  - ➔ Obs: Temp 39.9 C
- **A&E SHO assessment** – 2 hours later
  - ➔ Presenting complaint: R hand painful and swollen, hand painful for 4 hrs, no history of trauma.
  - ➔ Contact with chickenpox 5 days previously
  - ➔ Pyrexial
- **On Examination**
  - ➔ Temp 40.1 55 min after Calpol & Brufen
  - ➔ Small spots blanching
  - ➔ ENT Clear, Abdo Clear. No photophobia

Dx Probable Chickenpox Rx Calpol, brufen, home

Outcome: child died 14 hours later of meningococcal septicaemia

Discussion:

- No vital signs recorded by Nurse or Doctor, child in dept for over 2 hours
  - ➔ Full set of vital signs should have been measured; child may have had raised HR, RR
  - ➔ Time delay between triage and SHO assessment???
- Poorly hand or poorly child? Full history not taken to seek explanation of painful hand. Limb/joint pain well-recognised symptom of MD
- Lack of response to antipyretics not taken seriously
- Beware red herrings: chickenpox incubation period 10-14 days – unlikely Dx
- False reassurance that blanching rash cannot be MD, absence of photophobia in a young child should not have been reassuring.

Inadequate assessment allowed a serious illness to be missed.

"Febrile convulsion"

- **Triage**: 2 yr old. Child lethargic and shaking, unrousable for 1 hour. Looks very pale and unwell.
- **A&E SHO assessment**
  - ➔ On examination, wingy, slightly shallow breaths but well
  - ➔ Observations: Temp 38 C P 195 BP 76/53 RR 58 sats 94% BM low
- Diagnosis : Febrile convulsion – refer paeds
- **Paeds ward** 2 hours later
  - ➔ Observations: Temp 40 C P 192 RR39 BP 80 sats 97%
  - ➔ On examination: Pale. Chest /abdo/ CNS/ ENT clear
- Plan: Observe
- **6 hours later** " Much improved, temp down, parents reassured, for home"

Outcome
Child readmitted 2.5 hrs later, moribund, died of MD despite major resus attempts

Results when readmitted:

➔Hb 11.2 WCC 1.8 Pl 40; PT 38 APTT ?
Fibrinogen 0.3 ; PH 7.34 CO_2 3.16 HCO_3 12 BE -10

Discussion:

- Only nursing observation in the 6 hours before discharge: temp taken once
- Pulse, BP, RR not measured
- No medical examination of CVS in notes

Importance of repeat examination, looking for signs.
Not all children with MD have fever or history of fever.
Other signs: HR, RR, BP, Oxygen Saturation / CRT may have remained abnormal at discharge.

Observations

Early recognition depends on knowing what to look for:

- **Temperature**
- **Heart rate**
- **Respiratory rate**
- **Oxygen saturation: >95% in air is normal**
- **Capillary refill time: <2 seconds is normal**
- **Conscious level (AVPU)**
- **Check for rash all over**
- **Blood pressure – check this if other signs outside normal**

Normal values of vital signs

From Advanced Paediatric Life Support Manual

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
Over 12	60-100	15-20	100-120

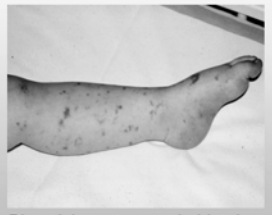
Examination

Check for rash all over the body

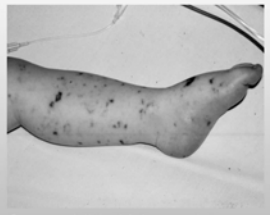
- Most patients with meningococcal disease get a rash
- Clear and important sign
- In meningitis it may be scanty or absent
- Early stages – may be blanching and maculopapular
- Usually develops into a non-blanching red-brownish petechial rash or purpura
- **A rapidly evolving petechial or purpuric rash is a sign of very poor prognosis.**

Observations

Non-blanching rash typical of septicaemia



Pin-prick spots, purple blotches, bruises or blood blisters: mixed petechial/ purpuric rash



Photos courtesy of Dr A Riordan

Same child, 12 hours later

Observations

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

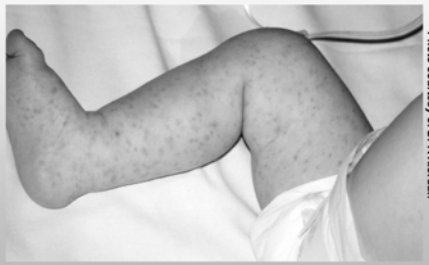


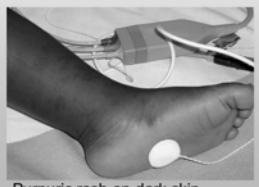
Photo courtesy of Dr A Riordan

Maculopapular (blanching) rash with a few petechiae (non-blanching)

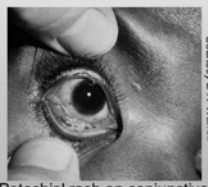
Observations

On dark skin rash more visible in paler areas:

- soles of feet
- palms of hands
- abdomen
- conjunctivae
- palate



Purpuric rash on dark skin

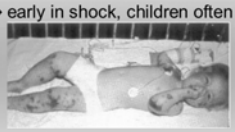


Courtesy D A Warrell

Petechial rash on conjunctivae

Septicaemia – *look for*

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



  - as shock advances
    - babies limp and floppy
    - older children and adults, unable to stand
- Metabolic acidosis – blood gas can confirm shock: base deficit worse than –5 mmol/l is significant

Meningitis – *look for*

- Older children & adults:
  - neck stiffness
  - headache
  - photophobia

  uncommon in young children-absence not reassuring
- Children:
  - poorly responsive, staring
  - difficult to wake
  - poor eye contact
- Babies:
  - irritable with high pitched cry, particularly when handled
  - stiff body, jerky movements, abnormal posturing
- Teenagers / adults may be combative, confused, aggressive – you may suspect drug abuse
- Seizures

Findings: late signs

SEPTICAEMIA	MENINGITIS
■ Hypotension ■ Cyanosis ■ Impaired consciousness in children	■ Raised intracranial pressure: ‣ ↑ blood pressure ‣ ↓pulse rate ‣ Impaired consciousness (GCS <8 or rapidly falling) ‣ Dilated, unequal or poorly reacting pupils ‣ Babies: tense fontanelle

Meningococcal disease – *ask about*

- Pain – in joints and muscles or specific limb: may be very severe
- GI disturbance – vomiting, diarrhoea, abdominal pain
- Rigors (septicaemic patients)
- Fever (or history of fever)

Factors that may confuse diagnosis and delay recognition

- Purpuric areas – look like bruises – may be confused with injury or abuse
- Disorientation ◆ impaired consciousness ◆ confusion look like drug / alcohol abuse
- Joint / bone aches common in meningococcal septicaemia. Children have been diagnosed with fractures due to intensity of pain
- Maculopapular rashes are often explained as viral in origin.
- URTI symptoms do not exclude meningitis or septicaemia

Public Health Action

- Doctor reports suspected meningitis or MD to CCDC / CPHM who arranges prophylaxis for close personal contacts as necessary (restricted to contacts of cases of MD, sometimes Hib)
- Where local protocol agreed with public health, ward staff may give prophylaxis
- Isolate patient with MD for first 24 hours

Risk of infection to health workers

- Meningococcal bacteria fragile; do not survive outside the body
- Prophylaxis only for health workers whose mouth/nose directly exposed to large particle droplets/secretions from respiratory tract of meningococcal disease patient
- Exposure unlikely except when using suction during airway management, inserting an oro/nasopharyngeal airway, intubating, or if the patient coughs in your face

Remember…

- ◆Children with meningitis and septicaemia may look relatively well & alert until late in illness.
- ◆Signs must be looked for.
- ◆Rash may be late, may blanch at first, and in pure meningitis, may be absent. Harder to detect on dark skin. Not usually seen in pneumococcal, Hib or other bacterial meningitis.
- ◆Neck stiffness, photophobia not usually seen in meningococcal septicaemia. Often absent in young children even with pure meningitis.

How to recognise meningitis and septicaemia

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- Take a history: Examine the patient
- Record all vital signs
- Repeat the observations
- Understand the observations
- Meningitis or septicaemia? Look for signs of shock, raised ICP

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Prompt recognition and action can save lives

- St Mary's protocol: 425 children, 72 hospitals mortality reduced from 29% to 2% over 6 yrs, against predicted mortality of 30%.
- Liverpool: 123 children, mortality 8.9% against predicted mortality of 24.9%.
- Use of standard management protocol in RCTs reduces overall mortality so that differences between placebo and treatment harder to detect.

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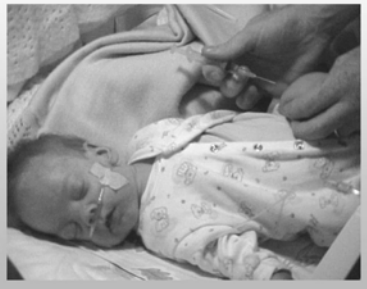
Prevention is better than cure…



Slowly he would cruise the neighborhood, waiting for that occasional careless child who confused him with another vendor.

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Why so much parental concern?

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Dramatic fall in the burden of infection since 1900

- Major reduction in infectious burden in industrialised nations
- 100 fold reduction in infant mortality since 1900
- Life expectancy has doubled
- Images of infectious diseases have gone from the public mind
- Focus is on vaccine safety

Immunity

- Active Immunity: when your immune system has been actively stimulated to make antibodies
  - Acquired through having the natural infection
  - Acquired through vaccination
- Passive Immunity: when you have been given someone else's antibodies
  - Acquired naturally across the placenta
  - Acquired artificially as immunoglobulin

Active immunity

Through natural infection
→ Individual has disease
→ Afterwards left with some protection (antibodies)
→ Immune system remembers the past infection (memory cells)
→ Immune system responds rapidly when it encounters the organism again
→ BUT! May not survive infection, or may be permanently disabled by after effects.

Active immunity

By vaccination
→ Disease causing organism is modified (antigen)
→ However it can still stimulate an immune response
→ Antibodies & memory cells produced
→ Able to protect the individual should they be exposed to the organism in the future

Acquiring active immunity through vaccination is a much safer way to protect babies than risking exposure to diseases.

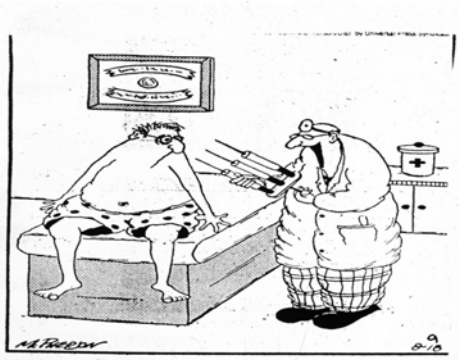
Passive immunity

Naturally acquired:

- Immune system not fully developed in newborns so need additional protection
- Maternal antibodies transferred through placenta
- Type & level of antibodies dependent on Mum's exposure, vaccination history & carriage
- Most passed over during third trimester: premies less protected than full-term babies→ waiting until they are older to vaccinate is NOT the right thing to do.
- Quickly wanes
- Colostrum & Breast milk passes IgA - guards mucosal surfaces, limited protection against invasive disease

Immune overload

Does it exist?



Immune overload myth

- Infant is exposed to multiple antigens from the moment of birth → cervix, birth canal → emerges into a world teeming with microbes
- Within hours baby's GI tract heavily colonised with bacteria
- Able to meet these challenges
- Every day, babies naturally exposed to far more immune challenges from the environment that from all vaccines in routine schedule added together

Number of bacteria in different areas

Part of body	Bacteria
Scalp	1,000,000/cm^2
Surface of skin	1000/cm^2
Saliva	100,000,000/g
Nasal mucus	10,000,000/g
Faeces	Over 100,000,000/g

Immune overload?

- Streptococcus – 1838 protein antigens
- Staphylococcus – 2467 protein antigens
- Pertussis – 3260 protein antigens
- TB – 4196 protein antigens

Balance of bacteria

- Number of bacterial cells
  100 trillion (10^{14})
- Number of human cells
  10 trillion (10^{13})

Do multiple vaccines overwhelm or weaken the infants immune system?

- In theory, a baby could respond to 10,000 vaccines at any one time
- If 11 vaccines given to an infant at any one time, about a thousandth of the immune system would be occupied
- However, naïve B & T cells are continually replenished, therefore a vaccine never really "uses up" part of the immune system

Immune overload myth

- Multiple recommended childhood & adolescent immunisations can be given safely at the same time
- Far from overwhelming the immune system, vaccines stimulate and strengthen the immune system.
  Offit et al Addressing parents concerns: Do multiple vaccines overwhelm or weaken the infants Immune system? Pediatrics 109 (1) 124- 129

What else is in vaccines?

Additives - materials added by the manufacturer for specific purpose

- Adjuvants – enhance and direct the immune response (eg, aluminium salts)
- Stabilisers – materials that help protect the vaccine from adverse conditions such as the freeze-drying process (sugars, proteins)
- Preservatives – prevent growth of bacteria & fungi inadvertently introduced into a vaccine (eg, thiomersal)
- Residuals – traces of substances used in manufacture: antibiotics, formaldehyde, bovine material

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

- → Myths about vaccination continually appear in the media
- → Must not allow such myths to cloud our judgment
- → For the health of children, we need to correct these myths and misunderstandings
- → To vaccinate against the diseases of childhood is much safer than not to vaccinate.

Please give us your feedback

Download booklet and questionnaire
www.meningitis.org

Other resources for health professionals and patients can also be downloaded or ordered.

In-depth befriending and support for families of patients: Freefone 24 hour helpline 080 8800 3344

Acknowledgements: Linda Diggle, Oxford Vaccine Group; Dr Nelly Ninis, Great Ormond Street, Linda Bailey, Imperial College London

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