



- **Pneumococcal infection:**

- Streptococcus pneumoniae (“pneumococcus”) is the commonest cause of community-acquired pneumonia and a common cause of bacteremia and meningitis.

- **Epidemiology:**

- Around 5000 invasive pneumococcal infections are reported annually in the UK, but true incidence is much higher, e.g. pneumococcal pneumonia is estimated to affect 0.1% of adults per annum. All ages are affected, but the distribution is bimodal: half of cases occur in the over 65-year-olds but rates are also high in infants. Pneumococcal pneumonia and meningitis are both more common in the winter. Pneumococcal infection is more common in smokers, heavy drinkers and those who live in overcrowded sleeping quarters. Incidence increases during influenza epidemics.
- Although the incidence of pneumococcal meningitis is highest in young children, its relative importance is highest in middle-aged and elderly adults, in which it is the most common cause of bacterial meningitis. Reported national rates in Europe in 1996 varied from 0.04/100,000 in Greece to 2.6/100,000 in Iceland.
- Resistance to antibiotics such as erythromycin (15% in England in 2000), penicillin (7%) and cephalosporins has been increasing in most European countries and is particularly high in Spain and Malta, but generally lower in Germany and the Netherlands.
- Pneumococcus is the most important bacterial cause of otitis media, which is particularly common in children under 3 years of age. Overall, one recent study estimated that pneumococcal infection causes 2 million GP consultations (93% due to otitis media, mostly children), 75,000 hospitalizations (72% due to pneumonia) and 17,000 deaths (93% from pneumonia, mostly elderly) a year in England and Wales.

- **Clinical feature:**

- Approximately a third of pneumococcal infections affect the respiratory tract, a third are focal infections (mostly otitis media) and a third are fever or bacteremia without obvious focus. The most common symptoms of pneumococcal pneumonia are cough, sputum, and fever. Factors that may suggest pneumococcal rather than “atypical” pneumonia in an outbreak include mucopurulent or blood-stained sputum, pleuritic chest pain and prominent physical signs. Respiratory symptoms may be less obvious in the elderly. Many cases have predisposing illnesses such as chronic respiratory, cardiac, renal or liver disease, immunosuppression of diabetes. Bacteremia may occasionally lead to meningitis. Case fatality for bacteremia or meningitis is 20% and for pneumonia is about 10% (higher in the elderly).

- **Laboratory confirmation:**

- Gram staining and culture of good quality sputum specimens is the mainstay of diagnosis of pneumococcal pneumonia, although they are only 60% sensitive and 90% specific. Twenty-five per cent of cases of pneumonia will also have a positive blood culture, which can be useful confirmation that the pneumococcus is a pathogen rather than a co-incidental commensal. Antigen detection in sputum or urine may be available in some laboratories. Gram positive diplococci in CSF suggest pneumococcal meningitis. Serotyping of strains is available. There are over 90 serotypes of varying pathogenicity. The most common pathogenic serotypes in Europe in 1999 were 14, 9, 19, 6, 23, 3, 1, 8, 4 and 7 (six of which are in the conjugate vaccine), but serotype distribution showed variation by age-group and country. Serology may be available for retrospective clinical diagnosis.



- **Transmission:**

- Pneumococci find their ecological niche by colonizing the human nasopharynx. Carriage is common, ranging from about 10% in adults to 50% in children in day-care centers, and is higher in winter. However, not all serotypes are pathogenic. Transmission requires extensive close contact with cases or carriers and is usually by droplet spread, but may also be via direct oral contact or articles.
- Soiled by respiratory discharges. Pneumococci remain viable in dried secretions for many months and may be cultured from the air or dust in hospitals, although the importance of this transmission is unclear. In hospitals, spread is usually to patients in the next one or two beds. Staff may also be colonized.
- Cases of pneumococcal meningitis are viewed as sporadic; indeed many cases are autoinfections.

- **Acquisition:**

- The incubation period for exogenous infection is probably about 1-3 days. However, endogenously acquired invasive disease in asymptomatic carriers also occurs, giving an “incubation period of weeks”
- The infectious period probably lasts as long as there are viable in nasal, oral or respiratory secretions. However, penicillin renders patients with susceptible organisms non-infectious in 48 hours.
- Type-specific immunity follows infection and is long lasting. Colonization may also lead to immunity: one study estimated that two-third of those who became colonized developed antibody within 30 days. Risk of infection is higher in those with splenic dysfunction, (including sickle-cell and coeliac disease) and immunodeficiency, e.g. due to chemotherapy, diabetes and HIV.

- **Prevention:**

- A single-dose polysaccharide vaccine with 50-70% efficacy for bacteremia in those over 2 years of age is available (effectiveness for pneumonia, otitis media and exacerbations of bronchitis remains unproven). Current UK recommendations (and those of most other European countries) are that vaccine should be given to all those in whom pneumococcal infection is likely to be more common and/or dangerous. This includes all those aged over 65 year of age and those with chronic renal, heart, lung and liver disease, splenic dysfunction, immunosuppression, diabetes, cochlear implants or CSF Shunts. The present vaccine covers 23 serotypes that are responsible for 96% of serious infections, including all common antibiotic resistant strains.
- A multi-dose conjugate vaccine covering seven common serotypes (responsible for 82% of serious infections in children and 66% in adults) is also available and is recommended in the UK for at-risk children aged between 2 months and 5 years. Conjugate vaccine reduces the risk of pneumococcal meningitis, bacteremia, pneumonia and otitis media. Polysaccharide vaccine should also be given when the child reaches 2 year of ages. The conjugate vaccine may be introduced into routine childhood immunization schedules in the future.
- Avoid overcrowding in institutions such as hospitals, day-care centers, military camps, prisons and homeless shelters.
- Safe disposal of discharges from nose and throat.

- **Surveillance:**

- Single cases of meningitis are Notifiable in many European countries, including England, Wales, Northern Ireland, Republic of Ireland, Denmark and Norway.
- Possible outbreaks of pneumococcal infection should be reported to local public health authorities.
- Isolates from blood, CSF or other normally sterile sites should be reported to national surveillance systems. Isolates from sputum are not usually reported because of their uncertain clinical significance.
- Antibiotic sensitivity (especially penicillin) should be given for all reported cases.



- **Response to a case:**

- Safe disposal of discharges from nose and throat.
- Antibiotic therapy as appropriate to clinical condition and sensitivity will reduce infectivity.
- There may be some value in separating patients from others with an increased risk of serious disease until 48 hours of appropriate antibiotics received.
- Immunization of children under 5 years of age who have suffered pneumococcal meningitis or bacteremia.

- **Investigation of a cluster:**

- Organize serotyping of strains.
- Check for links via institutions. Otherwise no action usually necessary.

- **Control of an outbreak:**

- Immunize all contacts that are at higher risk of serious infection; polysaccharide vaccine usually protects more quickly than conjugate.
- Check antibiotic sensitivity and serotype of isolates.
- If outbreak in institution/ward, vaccinate all residents (unless known to be strain not in vaccine). Institute case finding and early treatment of symptomatic for a least 7-10 days.
- Ensure adequate environmental decontamination.