MICROBIOLOGY OF SURGICAL INFECTION Common bacteria

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Streptococci Streptococci form chains and are Gram positive on staining (Figure 5.2a). The most important is the β -haemolytic Streptococcus , which resides in the pharynx of 5–10% of the Figure 5.2 (a) (b) Rebecca Graighill Lancefield , 1895–1981, American bacteriologist, classified streptococci in 1933. - sification, it is the group A Streptococcus, also called Streptococcus pyogenes, that is the most pathogenic. It has the ability to spread, causing cellulitis, and to cause tissue destruction through the). release of enzymes such as streptolysin, streptokinase and streptodornase. Streptococcus faecalis is an enterococcus in Lancefield group D. It is often found in synergy with other organisms, as are the γ -haemolytic Streptococcus and Peptostreptococcus , which is an anaerobe. Both Streptococcus pyogenes and Streptococcus faecalis may be involved in wound infection after bowel surgery , but the α -haemolytic Streptococcus viridans is not associated with wound infections. All the streptococci remain sensitive to penicillin and erythromycin. The cephalosporins are a suitable alternative in patients who are allergic to penicillin. Staphylococci Staphylococci form clumps and are Gram positive (Figure 5.2b). Staphylococcus aureus is the most important pathogen in - this group and is found in the nasopharynx of up to 15% of the population. It can cause suppuration in wounds and around implanted prostheses. Some strains are resistant to many common antibiotics (especially MRSA) and so are di ffi cult to treat. MRSA can be found in the nose of asymptomatic carriers among both patients and hospital workers, a potential source of infection after surgery . In parts of northern Europe, the prevalence of MRSA infections has been kept at very low levels using ‘search and destroy’ methods, which use screening techniques to look for MRSA in patients before they come in to hospital for elective surgery so that any carriers can be treated before their admission for surgery . Local policies on the management of MRSA depend on the prevalence of MRSA, the type of hospital, the clinical specialty and the availability of facilities. Widespread swabbing, ward closures, isolation of patients and disinfection of wards by deep cleaning must all be carefully considered.

(a) Streptococci. Staphylococcal pus. (b)

Figure 5.3 Staphylococcal infections are usually suppurative and localised. Most hospital Staphylococcus aureus strains are now β -lactamase producers and so are resistant to penicillin, but many strains remain sensitive to flucloxacillin, vancomycin, aminoglycosides and some

cephalosporins. Nowadays, sev eral novel and innovative antibiotics have become available that have high activity against resistant strains. Some have the advantage of good oral activity (linezolid), some have a wide spectrum (teicoplanin), some have good activity in bacteraemia (daptomy cin) but all are relatively expensive, and some have side e ff ects involving marrow , hepatic and renal toxicity . Their use is justified but needs to be controlled by tight local policies and guidelines that involve clinical microbiologists. Staphylococcus epidermidis (previously Staphylococcus albus also known as coagulase-negative Staphylococcus , was regarded as a non-pathogenic commensal organism commonly found on the skin, but is now recognised as a major threat in vascular and orthopaedic prosthetic surgery and in indwelling vascular cannulae/catheters. The bacteria form biofilms that adhere to prosthetic surfaces and limit the e ff ectiveness of antibiotics. Clostridia Clostridial organisms are Gram-positive, obligate anaerobes that produce resistant spores (Figure 5.3). Clostridium perfrin gens is the cause of gas gangrene, and Clostridium tetani tetanus. Clostridium di ffi cile (C. di ff .) is the cause of pseudomem branous colitis, in which destruction of the normal colonic bacterial flora by antibiotic therapy allows an overgrowth of the normal gut commensal C. di ff . to pathological levels. Any antibiotic may cause this phenomenon, although the quino lones such as ciprofloxacin seem to be the highest risk, espe cially in elderly or immunocompromised patients. In its most severe form, the colitis may lead to perforation and the need for emergency colectomy with an associated high mortality . Treatment in volves resuscitation and antibiotic therapy . The fibrinous exudate is typical and di ff erentiates the colitis from other inflammatory diseases. Theodor Escherich, 1857–1911 , Professor of Paediatrics, Vienna, Austria, discovered the Bacterium coli commune in 1886. Theodor Albrecht Edwin Klebs , 1834–1913, Professor of Bacteriology successively at Prague, Czechoslovakia, Zurich, Switzerland and The Rush Medical College, Chicago, IL, USA. ing either C. di ff . glutamate dehydrogenase (GDH) antigen or C. di ff . toxin A/B. The Clostridium di ffi cile GDH Ag Rapid test qualitatively detects for the presence of C. di ff . GDH antigen in faeces. On the other hand, the Clostridium di ffi cile Toxin A/B rapid test qualitatively detects for the presence of C. di ff . toxins A and B in faeces. These rapid tests apply lateral flow immuno - chromatography and are for professional in vitro diagnostic use. Results are usually returned from this rapid testing in less than 30 minutes. Empirical treatment with metronidazole or vancomycin is recommended while awaiting results. Aerobic Gram-negative bacilli These bacilli are normal inhabitants of the large bowel. Esch - erichia coli and Klebsiella spp. are lactose fermenting; Proteus is non-lactose fermenting. Most organisms in this group act in synergy with Bacteroides to cause SSIs after bowel operations (in particular, appendicitis, diverticulitis and peritonitis). Esch - erichia coli is a major cause of urinary tract infection, although most aerobic Gram-negative bacilli can be involved, particu - larly in relation to urinary catheterisation. There is increasing concern about the development of ESBLs in many of this - group of bacteria, which confer resistance to many antibiotics, particularly cephalosporins . Pseudomonas spp. tend to colonise burns and tracheostomy wounds, as well as the urinary tract. Once Pseudomonas has colonised wards and intensive care units (ICUs), it may be dif - ficult to eradicate. Surveillance of cross-infection is important in outbreaks. Hospital strains become resistant to β -lactamase as resistance can be transferred by plasmids. Wound infec - tions need antibiotic therapy only when there is prog ressive or), spreading infection with systemic signs. The aminoglycosides and the quinolones are e ff ective, but some cephalosporins and penicillin ma y not be. Many of the carbapenems (e.g. mero - penem) are useful in severe infections. Bacteroides Bacteroides are non-spore-bearing, strict anaerobes that colonise the large bowel, vagina and oropharynx. Bacteroides fragilis is the principal organism that acts in synergy with aerobic Gram- - negative bacilli to cause SSIs, including intra-abdominal causes abscesses

after colorectal or gynaecological surgery . They are sensitive to the imidazoles (e.g. metronidazole) and some - cephalosporins (e.g. cefotaxime).

Clostridium tetani (drumstick spores).

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