

## Please read this bit first

The HPCSA and the Med Tech Society have confirmed that this clinical case study, plus your routine review of your EQA reports from Thistle QA, should be documented as a "Journal Club" activity. This means that you must record those attending for CEU purposes. Thistle will **not** issue a certificate to cover these activities, nor send out "correct" answers to the CEU questions at the end of this case study.

The Thistle QA CEU No is: **MT00025**.

Each attendee should claim **THREE** CEU points for completing this Quality Control Journal Club exercise, and retain a copy of the relevant Thistle QA Participation Certificate as proof of registration on a Thistle QA EQA.

## Cycle 23 Organism 12:

### *Streptococcus pyogenes*

*Streptococcus pyogenes* (Group A streptococcus) is a Gram-positive, non-motile, non-sporeforming coccus that occurs in chains or in pairs of cells. Individual cells are round-to-ovoid cocci, 0.6-1.0 micrometer in diameter (Figure 1). Streptococci divide in one plane and thus occur in pairs or (especially in liquid media or clinical material) in chains of varying lengths. The metabolism of *S. pyogenes* is fermentative; the organism is a catalase-negative anaerobe (facultative anaerobe), and requires enriched medium containing blood in order to grow. Group A streptococci typically have a capsule composed of hyaluronic acid and exhibit beta (clear) haemolysis on blood agar.

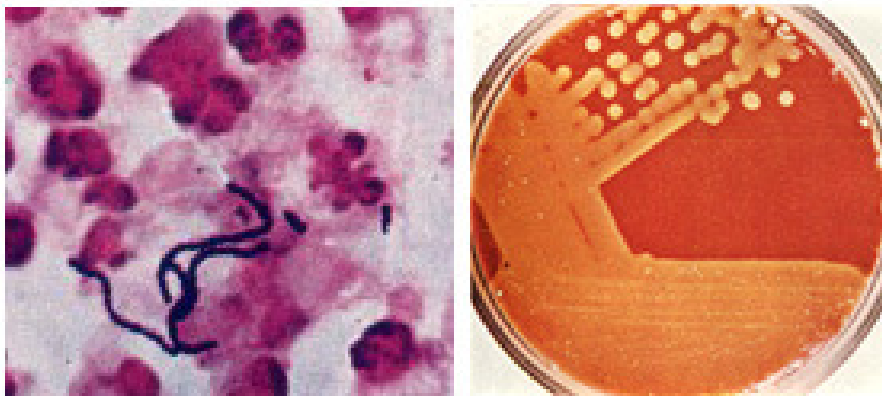


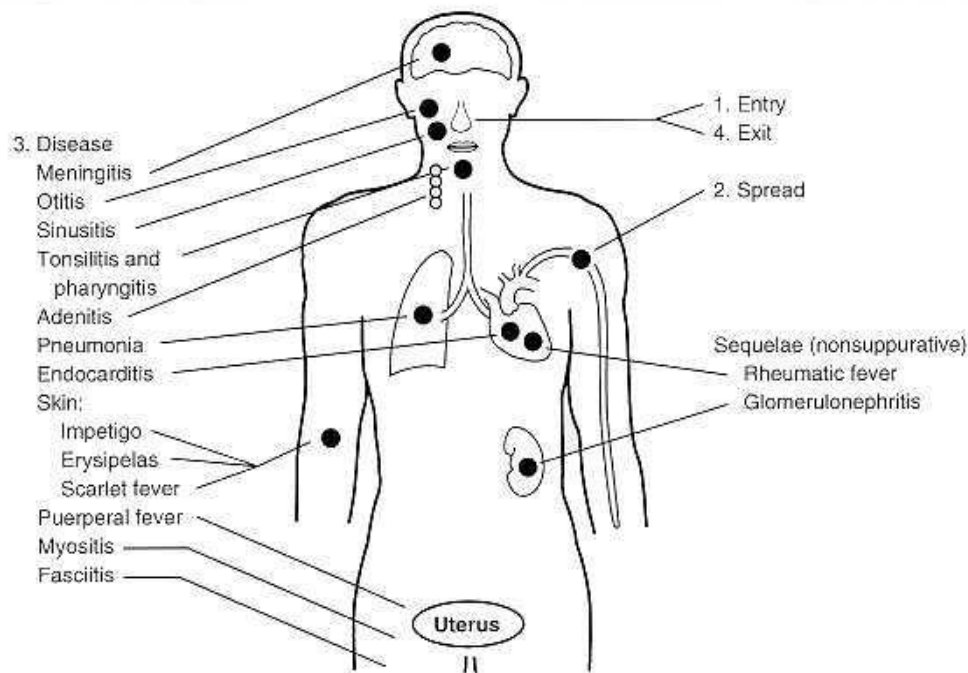
Figure 1. *Streptococcus pyogenes*. Left. Gram stain of *Streptococcus pyogenes* in a clinical specimen. Right. Colonies of *Streptococcus pyogenes* on blood agar exhibiting beta (clear) haemolysis.

*Streptococcus pyogenes* is one of the most frequent pathogens of humans. It is estimated that between 5-15% of normal individuals harbour the bacterium, usually in the respiratory tract, without signs of disease. In the last century, infections by *S. pyogenes* claimed many lives especially since the organism was the most important cause of **puerperal fever** (sepsis after childbirth). **Scarlet fever** was formerly a severe complication of streptococcal infection, but now, because of antibiotic therapy, it is little more than streptococcal **pharyngitis** accompanied by rash. Similarly, **erysipelas** (a form of cellulitis accompanied by fever and systemic toxicity) is less common today. However, there has been a recent increase in variety, severity and **sequelae** of *Streptococcus pyogenes* infections, and a resurgence of **severe invasive infections**, prompting descriptions of "flesh eating bacteria" in the news media. A complete explanation for the decline and resurgence is not known. Today, the pathogen is of major concern because of the occasional cases of rapidly progressive disease and because of the small risk of serious sequelae in untreated infections. These diseases remain a major worldwide health concern, and effort is being directed toward clarifying the risk and mechanisms of these sequelae and identifying rheumatogenic and nephritogenic strains of streptococci.

*Streptococcus pyogenes* produces a wide array of **virulence factors** and a very large number of diseases. Virulence factors of Group A streptococci include: (1) **M protein**, fibronectin-binding protein (**Protein F**) and **lipoteichoic acid** for adherence; (2) **hyaluronic acid capsule** as an immunological disguise and to inhibit phagocytosis; **M-protein** to inhibit phagocytosis (3) **invasins** such as **streptokinase**, **streptodornase** (DNase B), **hyaluronidase**, and **streptolysins**; (4) exotoxins, such as **pyrogenic (erythrogenic) toxin** which causes the rash of **scarlet fever** and systemic **toxic shock syndrome**.

The type of haemolytic reaction displayed on blood agar has long been used to classify the streptococci. **Beta - haemolysis** is associated with complete lysis of red cells surrounding the colony, whereas **alpha-haemolysis** is a partial or "green" haemolysis associated with reduction of red cell haemoglobin. Non-haemolytic colonies have been termed gamma-haemolytic. Haemolysis is affected by the species and age of red cells, as well as by other properties of the base medium. **Group A streptococci are nearly always beta-haemolytic**; related Group B can manifest alpha, beta or gamma haemolysis. Most strains of *S. pneumoniae* are alpha-haemolytic but can cause  $\beta$ -haemolysis during anaerobic incubation. Most of the oral streptococci and enterococci are non haemolytic. The property of haemolysis is not very reliable for the absolute identification of streptococci, but it is widely used in rapid screens for identification of *S. pyogenes* and *S. pneumoniae*.

*Streptococcus pyogenes* owes its major success as a pathogen to its ability to colonize and rapidly multiply and spread in its host while evading phagocytosis and confusing the immune system.



Penicillin is still uniformly effective in treatment of Group A streptococcal disease. It is important to identify and treat Group A streptococcal infections in order to prevent sequelae. No effective vaccine has been produced, but specific M-protein vaccines are being tested.

### CPD Questions:

1. Scarlet fever is rare today? Why? And what is it now called?
2. Discuss the differences between the various types of haemolysis demonstrated by Streptococci.
3. What is the role of streptokinase in streptococcal diseases?