

## Please read this section 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: **MT-13/00142**.

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.

## MICROBIOLOGY LEGEND

### CYCLE 34 ORGANISM 6

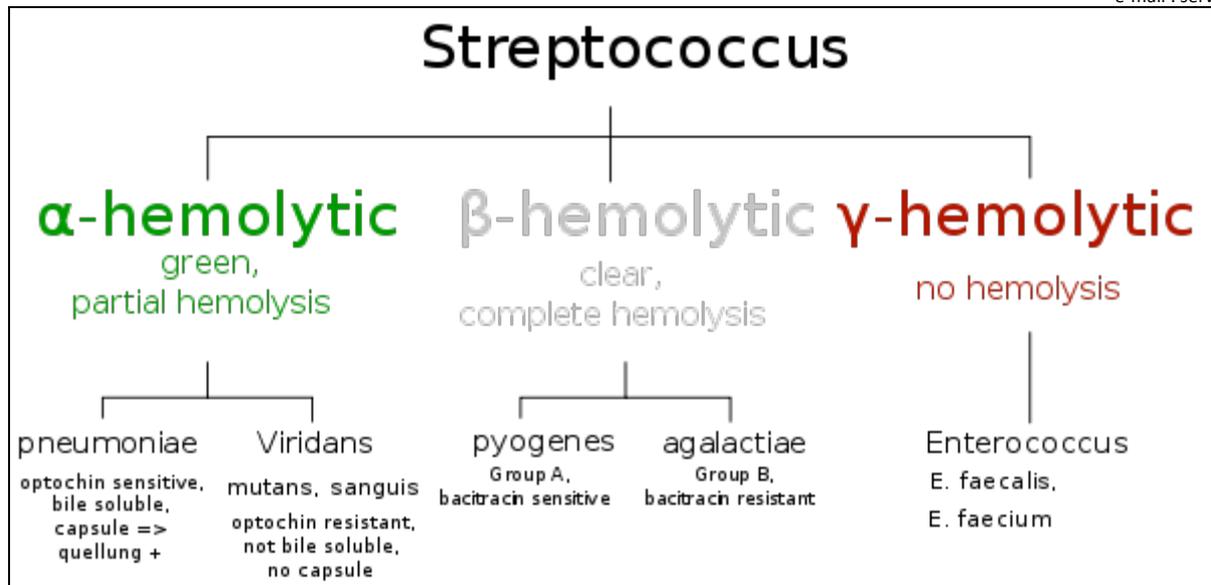
## Streptococcus viridans

Streptococcus is a genus of spherical Gram-positive bacteria belonging to the phylum Firmicutes and the lactic acid bacteria group. Cellular division occurs along a single axis in these bacteria, and thus they grow in chains or pairs, hence the name—from Greek streptos, meaning easily bent or twisted, like a chain (twisted chain). Contrast this with staphylococci, which divide along multiple axes and generate grape-like clusters of cells. Most streptococci are oxidase- and catalase-negative, and many are facultative anaerobes. In 1984, many organisms formerly considered Streptococcus were separated out into the genera Enterococcus and Lactococcus. There are currently over 50 species recognised in this genus.

### Pathogenesis and classification

In addition to streptococcal pharyngitis (strep throat), certain Streptococcus species are responsible for many cases of pink eye, meningitis, bacterial pneumonia, endocarditis, erysipelas and necrotizing fasciitis (the 'flesh-eating' bacterial infections). However, many streptococcal species are nonpathogenic, and form part of the commensal human microbiome of the mouth, skin, intestine, and upper respiratory tract. Furthermore, streptococci are a necessary ingredient in producing Emmentaler ("Swiss") cheese.

Species of Streptococcus are classified based on their hemolytic properties. Alpha hemolytic species cause oxidization of iron in hemoglobin molecules within red blood cells, giving it a greenish colour on blood agar. Beta hemolytic species cause complete rupture of red blood cells. On blood agar, this appears as wide areas clear of blood cells surrounding bacterial colonies. Gamma-hemolytic species cause no hemolysis. In the medical setting, the most important groups are the alpha-hemolytic streptococci *S. pneumoniae* and Streptococcus Viridans-group (SVG), and the beta-hemolytic streptococci of Lancefield groups A and B (also known as "Group A strep" and "Group B strep").



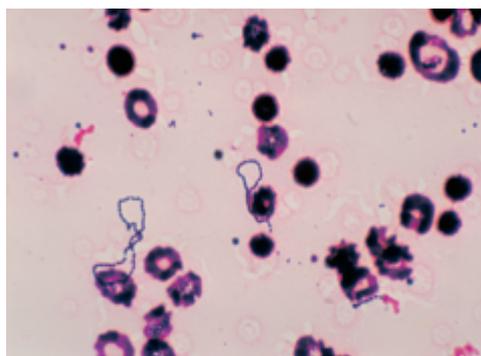
The non-pyogenic streptococci are subdivided into the Mitis, Anginosus, Salivarius, Mutans, and Bovis groups, of which the first three are often referred to as viridans streptococci. The Mitis group currently includes the important pathogen *S. pneumoniae* and twelve other validly described species, *S. australis*, *S. cristatus* (formerly *S. crista*), *S. gordonii*, *S. infantis*, *S. mitis*, *S. oligofermentans*, *S. oralis*, *S. parasanguinis* (formerly *S. parasanguis*), *S. peroris*, *S. pseudopneumoniae*, *S. sanguinis* (formerly *S. sanguis*) and *S. sinensis*.

The Anginosus group includes three recognized species, *S. anginosus*, *S. constellatus* (including two subspecies subsp. *constellatus* and subsp. *pharyngis*) and *S. intermedius*.

The Salivarius group includes *S. salivarius*, *S. vestibularis*, and *S. thermophilus*.

### Viridans streptococci

The viridans streptococci are a large group of commensal streptococcal bacteria species that are either  $\alpha$ -hemolytic, producing a green coloration on blood agar plates (hence the name "viridans", from Latin "vīrīdis", green), or non-hemolytic. The pseudotaxonomic non-Linnean term *Streptococcus viridans* is often used to refer to this group of species, but writers who do not like to use the pseudotaxonomic term (which treats a group of species as if they were one species) prefer the terms viridans streptococci or viridans streptococcal species. These species possess no Lancefield antigens. In general, pathogenicity is low.



Streptococcus group viridans (SGV) bacteria grown in a blood culture

## Identification

Viridans streptococci can be differentiated from *Streptococcus pneumoniae* using an optochin test, as viridans streptococci are optochin resistant; they also lack either the polysaccharide-based capsule typical of *S. pneumoniae* or the Lancefield antigens of the pyogenic members of the genus.

	Viridans streptococci	<i>Streptococcus pneumoniae</i>
Solubility in bile	Insoluble	Soluble
Fermentation of inulin	Not a fermenter	Fermenter with acid production
Sensitivity to optochin	Not sensitive	Sensitive
Pathogenicity to mice	Non-pathogenic	Pathogenic
Quellung test	Negative	Positive

## Pathology

VGS are considered to be normal flora of the oropharyngeal, urogenital, and gastrointestinal microbiota. One member of the group, *S. mutans*, is the etiologic agent of dental caries in most cases and populations. Others may be involved in other mouth or gingival infections. They are not typically thought of as organisms with high pathogenic potential; however VGS infection can be associated with significant morbidity and mortality. If they are introduced into the bloodstream, they have the potential of causing endocarditis, particularly in individuals with damaged heart valves. They are the most common causes of subacute bacterial endocarditis.

Although VGS disease can occur in healthy hosts, it most commonly manifests in those with underlying conditions, such as being immunocompromised or having cardiac abnormalities. Viridans streptococci have the unique ability to synthesize dextrans from glucose, which allows them to adhere to fibrin-platelet aggregates at damaged heart valves. This mechanism underlies their ability to cause subacute valvular heart disease following their introduction into the bloodstream (e.g., following dental extraction).

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## References

1. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3020876/>
2. [http://en.wikipedia.org/wiki/Viridans\\_streptococci](http://en.wikipedia.org/wiki/Viridans_streptococci)
3. <http://en.wikipedia.org/wiki/Streptococcus>

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## Questions

1. Discuss the morphological characteristics of Viridans streptococci.
  2. Discuss the role of VGS in disease.
  3. Discuss the lab diagnosis of VGS.
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