

Aeromonas hydrophília. streptococcus pneumonía Neisseria gonorrhea Pasteurella multocída Staphylococcus aureus



AEROMONAS HYDROPHILIA



- <u>A heterotrophic</u>, <u>Gram-negative</u>, rod-shaped bacterium mainly found in areas with a warm climate.
- t can be found in fresh or brackish water.
- t can survive in <u>aerobic</u> and <u>anaerobic</u> environments
- Can digest materials such as gelatin and hemoglobin.



Aeromonas hydrophilia

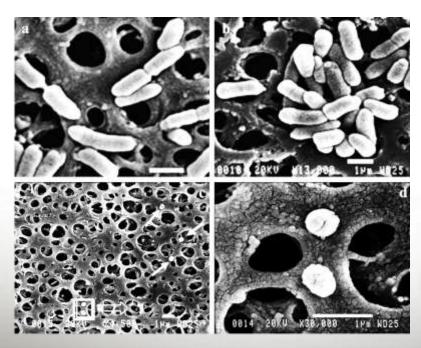
Under Proteobacteria Kingdom



STRUCTURE

• Aeromonas hydrophila are Gram-negative straight rods with rounded ends (bacilli to coccibacilli shape) usually from 0.3 to 1 micrometer in width, and 1 to 3 micrometers in length. Aeromonas hydrophila can grow in temperatures as low as four degrees Celsius

Aeromonas hydrophila under El.Microscope



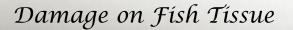


PATHOLOGICAL CHARACTERISTICS

When it enters the body of its victim, it travels
through the bloodstream to the first available organ.
It produces <u>Aerolysin</u> Cytotoxic Enterotoxin (ACT), a
toxin that can cause tissue damage.

Causes pathogenic strain which can cause disease

both in human and fish.



HUMAN DISEASE

• It occurs most in young children and people who have compromised immune systems or growth problems

This bacterium is linked to two types of gastroenteritis:

•First >> disease similar to cholera, which causes rice-water diarrhea

 Second >> disease is dysenteric gastroenteritis, which causes loose <u>stools</u> filled with blood and mucus

OUTBREAKS & COMPLICATIONS

 Aeromonas hydrophila can cause serious diseases, there have never been serious outbreaks recorded.

Also, if not eliminated Early, it can do serious damage to the tissues



Severe Case Of Tissue Damage



TREATMENT

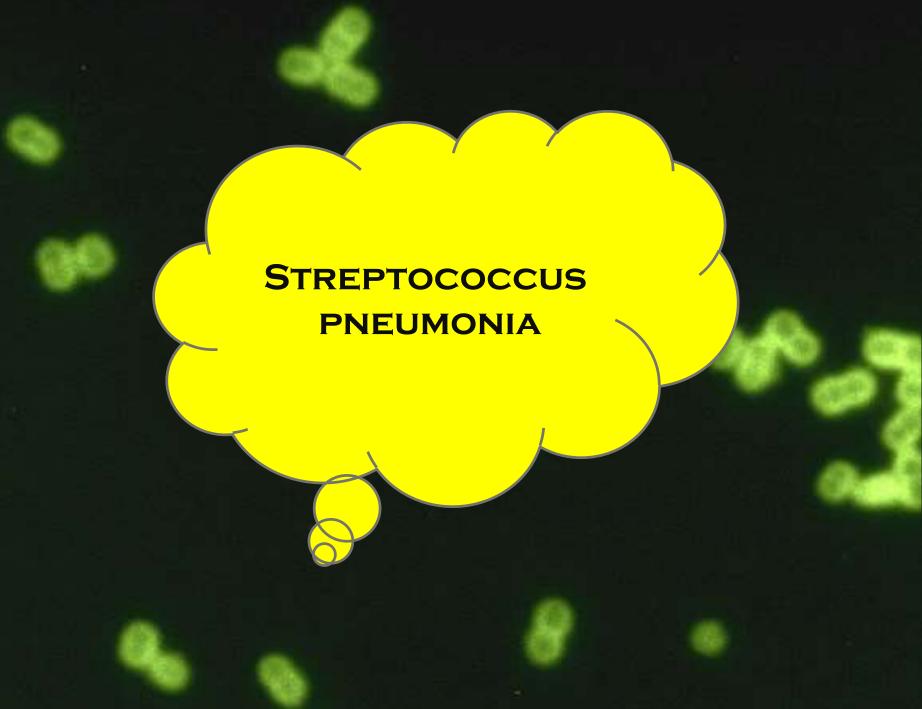
- It can be eliminated using one percent <u>sodium</u> <u>hypochlorite</u> solution and two percent <u>calcium</u> <u>hypochlorite</u> solution
- Antibiotic agents such as <u>chloramphenicol</u>

PREVENTING INFECTION

Care with fish that may be infected & checking carefully for it ...

also Oxygen levels should be maintained to avoid contamination & the use of Disinfectant ...





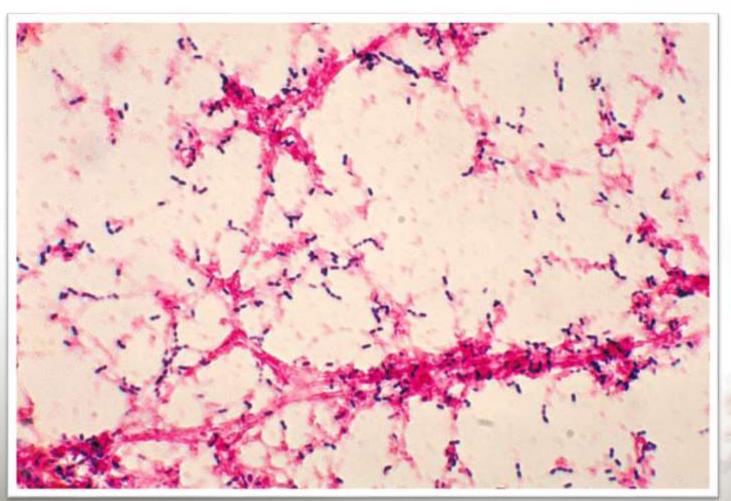
STREPTOCOCCUS PNEUMONIA

It is a <u>Gram-positive</u>, <u>alpha-hemolytic</u>, <u>aero</u>
 <u>tolerant</u>, <u>aerobic</u> member of the <u>genus</u> <u>Streptococcus</u>; A significant human <u>pathogenic bacterium</u>, *S. pneumonia* was recognized as a major cause of <u>pneumonia</u>

GRAM-STAIN



GRAM-STAIN OF BLOOD BROTH CULTURE





TRANSFORMATION IN S. PNEUMONIAE

 Natural bacterial transformation involves the transfer of DNA from one bacterium to another through the surrounding medium

PATHOGEN
FOUND TO
INFECT THE
INNER EAR



INFECTION

- 5. pneumoniae is part of the normal <u>upper respiratory</u> <u>tract flora</u>, but, as with many natural flora, it can become pathogenic under the right conditions, like if the immune system of the host is <u>suppressed</u>.
- Invasins, such as <u>pneumolysin</u>, an anti-<u>phagocytic capsule</u>, various <u>adhesins</u> and <u>immunogenic cell wall</u> <u>components</u> are all major <u>virulence factors</u>.

DIAGNOSIS

<u>Diagnosis</u> is generally made based on <u>clinical suspicion</u> along with a positive culture from a sample from virtually any place in the body. An ASO Titre of >200 units is significant. S. pneumoniae is, in general, <u>optochin</u> sensitive, although optochin resistance has been observe

S.PNEUMONIAE IN OTITIS MEDIA



PNEUMOCOCCAL VACCINE

Polysaccharide vaccine

- The polysaccharide vaccine most commonly used today, consists of purified polysaccharides from 23 serotypes
- Immunity is induced primarily through stimulation of B-cells which release IgM without the assistance of T cells
- The vaccine is ineffective in children less than two years old, presumably due to their less mature immune systems.





Conjugated Vaccine

The conjugated vaccine consists of capsular polysaccharides covalently bound to the diphtheria toxoid CRM197, which is highly immunogenic but non-toxic. This combination provokes a significantly more robust immune response by recruiting CRM197-specific type 2 helper T cells, which allow for immunoglobulin type switching (to produce non-IgM immunoglobulin) and production of memory B cells



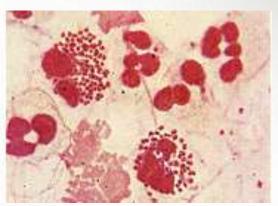




NEISSERIA GONORRHOEAE

N. gonorrhoea was first described by Albert Neisser in 1879

known as *gonococci* (plural), or *gonococcus* (singular), is a species of Gramnegative coffee bean-shaped diplococcibacteria responsible for the sexually transmitted infection gonorrhea



Neisseria gonorrhoeae is a Gram-negative coccus, 0.6 to $1.0~\mu m$ in diameter, usually seen in pairs with adjacent flattened sides (Figure 1 Left and Fig 2 below). The organism is frequently found intracellularly in polymorphonuclear leukocytes (neutrophils) of the gonorrhea pustular exudate (Figure 1 Right). Fimbriae or pili, which play a major role in adherence, extend several micrometers from the cell surface

Symptoms of infection with *N. gonorrhoeae* differ, depending on the site of infection. Note also that 10% of infected males and 80% of infected females are asymptomatic.

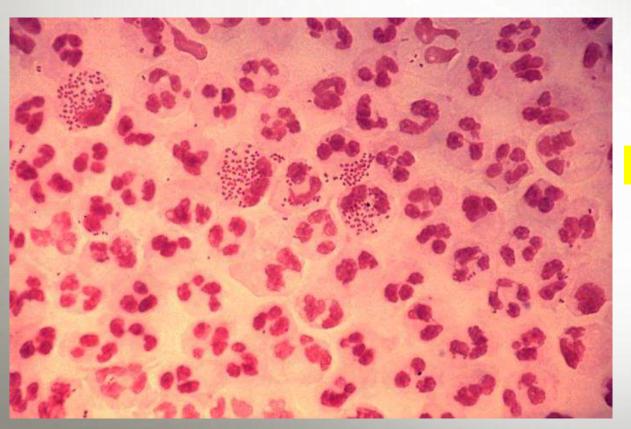
Infection of the genitals can result in a purulent (or <u>pus</u>-like) discharge from the genitals, which may be foul-smelling. Symptoms may include inflammation, redness, swelling, and <u>dysuria</u>

N. gonorrhoeae can also cause <u>conjunctivitis</u>, <u>pharyngitis</u>, <u>proctitis</u> or <u>urethritis</u>, <u>prostatitis</u>, and <u>orchitis</u>.



INFECTION

Infections are acquired by sexual contact and usually affect the mucous membranes of the urethra in males and the endocervix and urethra in females, although the infection may disseminate to a variety of tissues. The pathogenic mechanism involves the attachment of the bacterium to non-ciliated epithelial cells via pili and the production of lipopolysaccharide endotoxin.



NEISSERIA GONORRHEA

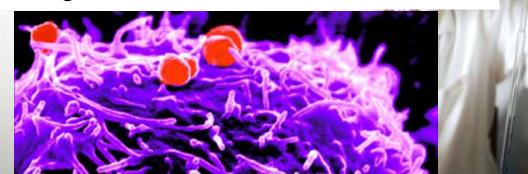
TREATMENT

If N. gonorrhoeae is resistant to the penicillin family of antibiotics, then ceftriaxone (a third-generation cephalosporin) is often used. Sexual partners should also be notified and treated

Note

<u>Conjunctivitis</u> is common in <u>neonates</u> (newborns), and <u>silver</u> <u>nitrate</u> or <u>antibiotics</u> are often applied to their eyes as a preventive measure against gonorrhea. Neonatal gonorrheal conjunctivitis is contracted when the infant is exposed to *N. gonorrheae* in the birth canal and can lead to corneal scarring or perforation, resulting in blindness in the neonate.

NEISSERIA GONORRHEA



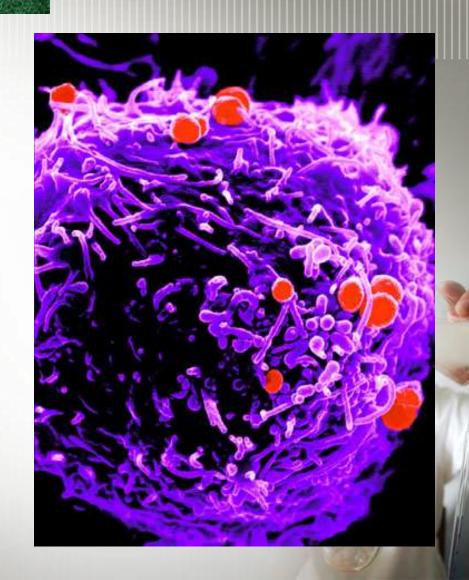
SURVIVAL OF GONOCOCCI

The exudates from infected individuals contain many polymorphonuclear leukocytes (PMN) with ingested *gonococci*. These *gonococci* stimulate the PMN to release an internal oxidative burst involving reactive oxygen species in order to kill the *gonococci*. However, a significant fraction of the *gonococci* can resist killing and are able to reproduce within the PMN phagosomes.



DISCOVERY

- Stohl and Seifert showed that the bacterial RecA protein, that mediates recombinational repair of DNA damage, plays an important role in gonococca/survival
- The protection afforded by RecA protein may be linked to transformation, the process by which recipient gonococci take up DNA from neighboring gonococci and integrate this DNA into the recipient genome through recombination. Michod et al. have suggested that an important benefit of transformation in N. gonorrhoeae may be recombinational repair of oxidative DNA damages caused by oxidative attack by the hosts phagocytic cells



ZXLF2-INFOFM2LION

Neisseria gonorrhoeae possesses a typical Gram-negative outer membrane composed of proteins, phospholipids, and lipopolysaccharide (LPS). However, neisserial LPS is distinguished from enteric LPS by its highly-branched basal oligosaccharide structure and the absence of repeating O-antigen subunits. For these reasons, neisserial LPS is referred to as **lipooligosaccharide** (LOS). The bacterium characteristically releases outer membrane fragments called "blebs" during growth. These blebs contain LOS and probably have a role in pathogenesis if they are disseminated during the course of an infection. N. gonorrhoeae is a relatively fragile organism, susceptible to temperature changes, drying, uv light, and other environmental stresses. Strains of *N. gonorrhoeae* are fastidious and variable in their cultural requirements, so that media containing hemoglobin, NAD, yeast extract and other supplements are needed for isolation and growth of the organism. Cultures are grown at 35-36 degrees in an atmosphere of 3-10% added CO₂.



PASTEURELLA MULTOCIDA

Pasteurella multocida was first found in 1878 in cholera-infected birds. However, it was not isolated until 1880, by Louis Pasteur - the man in whose honor Pasteurella is named

<u>Gram-negative</u>, nonmotile, <u>penicillin</u>-sensitive <u>coccobacillus</u> belonging to the <u>Pasteurellaceae</u> family

Pasteurella multocida is the cause of a range of diseases in mammals and birds including fowl cholera in poultry, atrophic rhinitis in pigs and bovine hemorrhagic septicemia in cattle and buffalo

It can also cause a <u>zoonotic</u> infection in humans, which typically is a result of bites or scratches from domestic pets. Many mammals and birds harbor it as part of their normal respiratory microbiota including domestic cats

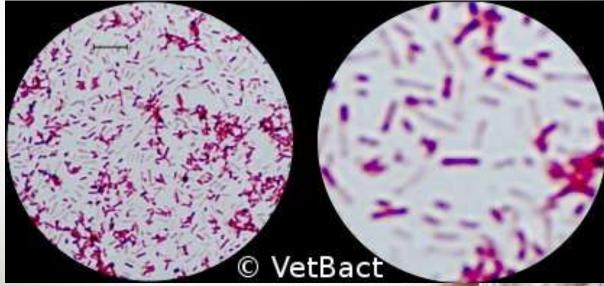
A **zoonosis** (also spelled **zoönosis**) is an <u>infectious disease</u> that is transmitted between species (sometimes by a <u>vector</u>) from<u>animals</u> other than <u>humans</u> to humans or from humans to other animals

P. multocida causes a range of diseases in wild and domesticated animals, as well as humans. The bacterium can be found in birds, cats, dogs, rabbits, cattle and pigs. In birds, P. multocidacauses avian or fowl cholera disease

P. multocida causes atrophic rhinitis in pigsit also can cause pneumonia or bovine respiratory disease in cattle

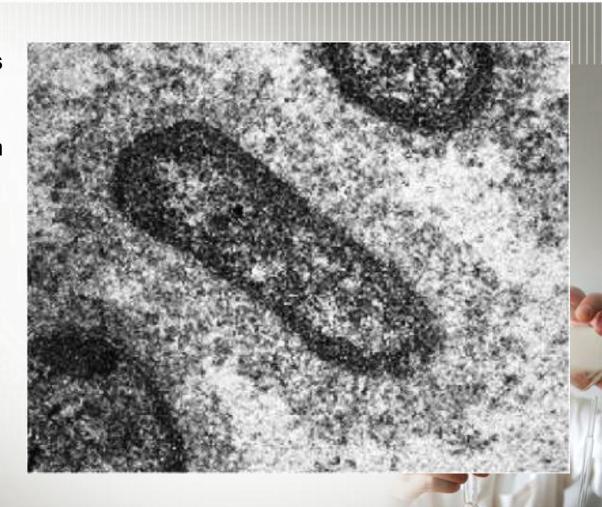
In humans, *P. multocida* is the most common cause of infection from wound infections after dog/cat-bites. The infection usually shows as soft tissue inflammation within 24 hours. High <u>leukocyte</u> and <u>neutrophil</u> counts are typically observed, leading to an inflammatory reaction at the infection site (generally a diffuse, localized <u>cellulitis</u>). It can also infect other locales, such as the respiratory tract, and is known to cause regional lymphadenopathy (swelling of the lymph nodes). In more serious cases, abacteremia can result, causing an <u>osteomyelitis</u> or <u>endocarditis</u>. The bacteria may also cross the <u>blood-brain</u> barrier and cause <u>meningitis</u>.





DIAGNOSIS

Diagnosis of the bacterium in humans was traditionally based on clinical findings, and culture and seriological testing, but false negatives have been a problem due to easy death of *P. multocida*, and serology cannot differentiate between current infection and previous exposure. The quickest and most accurate method for confirming an active *P. multocida* infection is molecular detection using PCR



TREATMENT

This bacterium can be effectively treated with beta-lactam antibiotics, which inhibit cell wall synthesis. It can also be treated with <u>fluoroquinolones</u> or <u>tetracycli</u> nes; fluoroquinolones inhibit bacterial **DNA** synthesis and tetracyclines interfere with protein synthesis by binding to the bacterial 30S <u>ribosomal</u> subunit



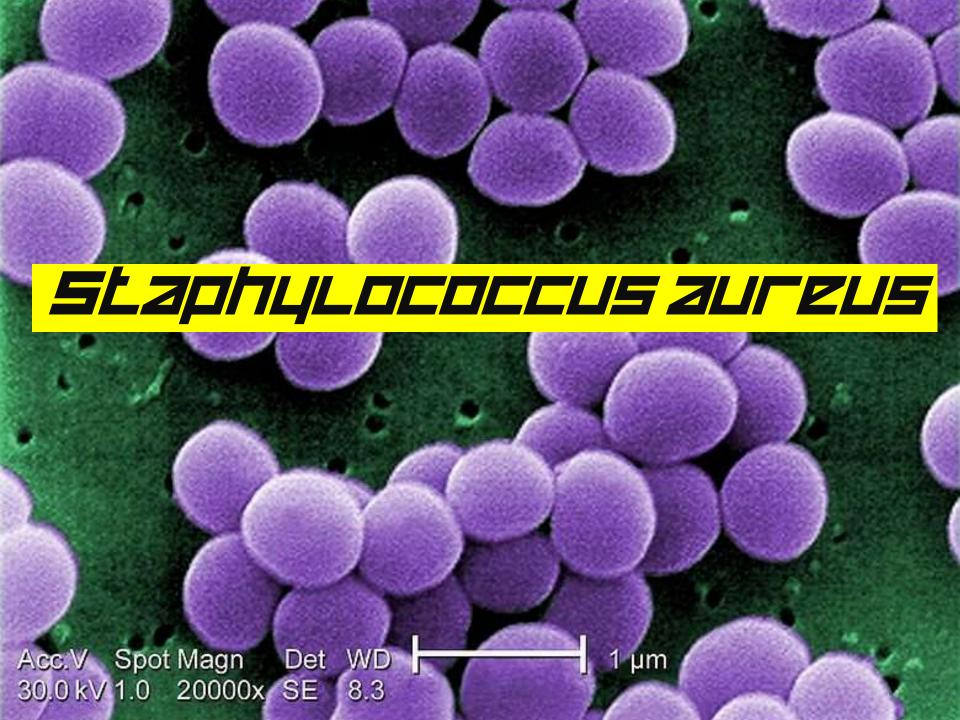
Notes

P. multocida expresses a range of virulence factors including a polysaccharide capsule and the variable carbohydrate surface molecule, lipopolysaccharide (LPS). The capsule has been shown in strains belonging to serogroups A and B to help resist phagocytosis by host immune cells and capsule type A has also been shown to help resist complement-mediated lysis. [8][9] The LPS produced by P. multocida consists of a hydrophobic lipid A molecule (that anchors the LPS to the outer membrane), an inner core and an outer core, both consisting of a series of sugars linked in a specific way. There is no O-antigen on the LPS and the molecule is similar to LPS produced by "Haemophilus influenzae" and the lipooligosaccharide of "Neisseria meningitidis". A study in a serovar 1 strain showed that a full length LPS molecule was essential for the bacteria to be fully virulent in chickens.[10]

NOTES

Pl Strains that cause atrophic rhinitis in pigs are unique as they also have Pasteurella Multocida Toxin (PMT) residing on a bacteriophage. PMT is a toxin that is responsible for the twisted snouts observed in pigs infected with the bacteria. This toxin activates RhoGTPases, which bind and hydrolyze GTP, and are important in actin stress fiber formation. Formation of stress fibers may aid in the endocytosis of *P. multocida*. The host cell cycle is also modulated by the toxin, which can act as an intracellular mitogen. P. multocida has been observed invading and replicating inside host amoebae, causing lysis in the host. P. multocida will grow at 37°C on blood or chocolate agar, but will not grow on MacConkey agar. Colony growth is accompanied by a characteristic "mousy" odor due to metabolic products.

Being a <u>facultative anaerobe</u>, it is <u>oxidase-positive</u> and <u>catalase-positive</u>, and can also <u>ferment</u> a large number carbohydrates in anaerobic conditions. The survival of *P. multocida* bacteria has also been shown to be increased by the addition of salt into their environment. Levels of sucrose and pH also have been shown to have minor effects on bacterial survival



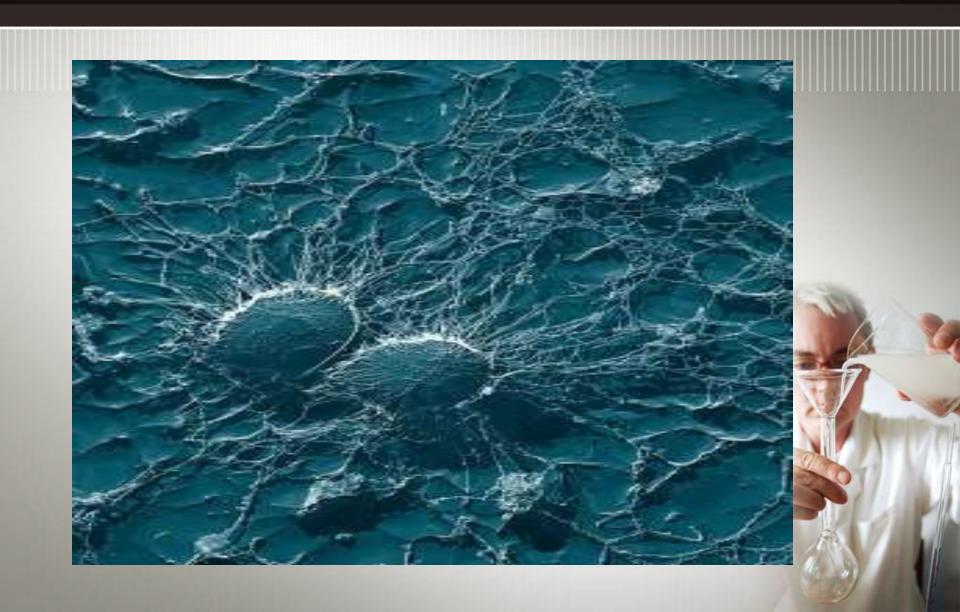
STAPHYLOCOCCUS AUREUS

Staphylococcus was first identified in 1880 in Aberdeen, United Kingdom, by the surgeon Sir Alexander Ogston in pus from a surgical abscess in a knee joint.

Staphylococcus aureus is a bacterium that is a member of the Firmicutes, and is frequently found in the human respiratory tract and on the skin. Although

S. aureus is not always pathogenic, it is a common cause of skin infections (e.g. boils), respiratory disease (e.g. sinusitis), and food poisoning

STAPHYLOCOCCUS AUREUS



STRUCTURE

Facultative anaerobic Grampositivecoccal bacterium, also known as "golden staph" and Oro staphira. In medical literature the bacteria is often referred to as *S. aureus* or *Staph aureus*

10 µm

S.aureus appears as grape-like clusters when viewed through a microscope, and has large, round, golden-yellow colonies, often with hemolysis, when grown on blood agar plates

S. aureus reproduces asexually by binary fission. The two daughter cells do not fully separate and remain attached to one another. This is why the cells are observed in clusters.



INFECTION

S. aureus is responsible for many infections but it may also occur as a commensal

S. aureus can infect tissues when the skin or mucosal barriers have been breached. This can lead to many different types of infections including furuncles and carbuncles (a collection of furuncles).

Deeply penetrating *S. aureus* infections can be severe. Prosthetic joints put a person at particular risk of septic arthritis, and staphylococcal endocarditis (infection of the heart valves) and pneumonia.

Strains of *S. aureus* can host phages, such as Φ-PVL (produces Panton-Valentine leukocidin), that increase virulence.

ENZYMES

Coagulase (bound and free coagulases) which clots plasma and coats the bacterial cell to probably prevent <u>phagocytosis</u>.

Hyaluronidase (also known as spreading factor) breaks down hyaluronic acid and helps in spreading of *Staphylococcus aureus*.

S.aureus also produces DNAse (deoxyribonuclease) which breaks down the DNA, lipase to digest lipids, staphylokinase to dissolve fibrin and aid in spread, and beta-lactamase for drug resistance.

Toxins

the strain, *S. aureus* is capable of secreting several exotoxins, which can be categorized into three groups

Superantigens

induce toxic shock syndrome (TSS) Symptoms include nausea, vomiting, diarrhea, and major abdominal pain

Exfoliative toxins

EF toxins are implicated in the disease staphylococcal scalded-skin syndrome (SSSS), which occurs most commonly in infants and young children.

Other toxins

alpha toxin, beta toxin, delta toxin, and several bicomponent toxins(Panton-Valentine leukocidin (PVL) is associated with severe necrotizing pneumonia in children.

OTHER IMMUNOINVASIVE STRATEGIES

- > Protein A
- Staphylococcal Pigments

Treatment and antibiotic resistance

The treatment of choice for *S. aureus* infection is penicillin

however, penicillin resistance is extremely common, and first-line therapy is most commonly a penicillinase-resistant β-lactam antibiotic (for example, oxacillin or flucloxacillin). Combination therapy with gentamicin may be used to treat serious infections, such as endocarditis but its use is controversial because of the high risk of damage to the kidneys. The duration of treatment depends on the site of infection and on severity.



			THE RESERVE TO SHARE		
Binomial name:	Aeromonas hydrophila	Streptococcus pneumoniae	Neisseria gonorrhoeae	Pasteurella multocida	Staphylococc us aureus
Kingdom:	<u>bacteria</u>	<u>Bacteria</u>	<u>Bacteria</u>	<u>Bacteria</u>	Eubacteria
Phylum:	Gammaprote obacteria	<u>Firmicutes</u>	<u>Proteobacteria</u>	<u>Proteobacteria</u>	Firmicutes
Class:	Aeromonadales	<u>Bacilli</u>	Beta Proteobacteria	<u>Proteobacteria</u>	Bacilli
Genus:	Aeromonas	Streptococcus	<u>Neisseria</u>	<u>Gamma</u> <u>Proteobacteria</u>	Staphylococcus
Species:	A. hydrophila	S. pneumoniae	N. gonorrhoeae	Pasteurella multocida	S.Aureus
Gram Stain:	<u>Gram-</u> <u>negative</u>	Gram-positive	<u>Gram-</u> <u>negative</u>	Gram- negative	Gram - Positive
Under Microscope:					چارور

