Infections of the Eye

Part One - Bacteria
Eyelid Infection - STAPHYLOCOCCI

- **STAPHYLOCOCCUS AUREUS**
  - Multiplies in hair follicles (eye lashes).
Eyelid Infection - STAPHYLOCOCCI

- Persistent infection sees extended pathology – Blepharitis
Eyelid Infection - STAPHYLOCOCCI

- Pus from lesion on slide then Gram stained and seen under the microscope shows:
  - Numerous pus cells and
  - Gram +ve Cocci in clumps – STAPHYLOCOCCI
Eyelid Infection - STAPHYLOCOCCI

- Staphylococci grow as pale, circular colonies on BcVod Agar plates
Pathogenic Staphylococci aureus produce toxins and enzymes (e.g. coagulase), which confers pathogenicity.
Staphylococcus aureus has properties, which differentiate it from non-pathogenic species of the genus.
Staphylococcus Aureus can be further differentiated by phage-typing for contact tracing.
CONJUNCTIVITIS I - NEISSERIA GONORRHOEAE

- Infection contracted at birth from mother’s genital tract; occurs from 1 – 2 days of age.
CONJUNCTIVITIS I - NEISSERIA GONORRHOEAE

- Pus from the eye put on slide and stained by Gram stain shows
  - Numerous pus cells and
  - Gram –ve, Diplococci occurring inside the pus cells – NEISSERIA
Neisseria grown on chocolate agar shows small, white circular colonies.
CONJUNCTIVITIS I - NEISSERIA GONORRHOEAE

- Neisseria Gonorrhoeae differentiated from other Neisseria by Bio-chemical tests

- Treat with Penicillin or Chloramphenicol ointment. If untreated causes corneal damage and blindness
CONJUNCTIVITIS II - HAEMOPHILUS

Infection by Haemophilus Influenza can occur at any age, either sporadically or as an outbreak involving a number of persons.

- Pus from the infected eye(s) placed on a slide and Gram stained
  - Pus cells and
  - Gram –ve rods, which are Pleomorphic (some very short-like Cocci and some long).
CONJUNCTIVITIS II - HAEMOPHILUS

- For growth Haemophilus require Haematin (found in blood) and/or DPN (obtained from a supplied source (produced and secreted by Staphyloccci)). Thus, on blood agar Haemophilus influenza grow as satellite colonies around colonies of Staphyloccci – termed Satellitism.
Only 3 species on Haemophilus occur, and are identified by Haematin and/or DPN requirement. Only Haemophilus influenza causes conjunctivitis.
CONJUNCTIVITIS III - STAPHYLOCOCCUS

“Sticky eye” infection in neonates due to Staphylococcus is a conjunctivitis, which occurs 5 – 10 days after birth can be associated with an outbreak of Staphylcoccal infection in a maternity unit, or introduction of bacteria from patient’s nose or skin by fingers. Treat with appropriate antibiotics as infecting agent is commonly resistant to some antibiotics.

For diagnosis, see slides on eyelid infection.
CONJUNCTIVITIS IV - PSEUDOMONAS AERUGINOSA

Pseudomonas Aeruginosa is not an invasive pathogen, but is commonly found in water (baths, sinks, toilets, eye drops, soap dishes, nail brushes and solutions). It can infect the eye if there is damage to the eye, after eye surgery, the presence of a foreign body or lower immune status in the patient.

- Accumulation of infected pus containing gram-ve, rod-shaped bacteria
CONJUNCTIVITIS IV - PSEUDOMONAS AERUGINOSA

- When grown on nutrient Agar, produces a blue green fluorescent pigment: it is the only bacteria with this property.

- Difficult to treat as is resistant to a wide range of antibiotics: Thus, best avoided by elimination or control of potential sources in wards, theatres and outpatient departments.
CONJUNCTIVITIS V - STREPTOCOCCUS PNEUMONIAE

STREPTOCOCCUS PNEUMONIAE can cause conjunctivitis either following injury or by invasion following introduction from the throat (coughs or fingers).

- Accumulation of pus
CONJUNCTIVITIS V - STREPTOCOCCUS PNEUMONIAE

- Pus on slide, gram stained and view under the microscope shows
  - Pus cells and
  - Gram +ve

- DIPLOCOCCI
  - The Diplocci are surrounded by a clear, unstained space which mark the presence of the capsule. It is the capsule which confers on the bacteria the ability to invade tissues and resist phagocytosis?
**CONJUNCTIVITIS V - STREPTOCOCCUS PNEUMONIAE**

- When grown on blood Agar and in the presence of the opticain®, the colonies show v-haemolyis and sensitivity to the opticilin (specific identification).
Leptospira is a common (and sometimes fatal) infection of rats: the infection is widespread in the rat body and is excreted by the rat in faeces and, in particular urine. Since rats live commonly near water, and rats are themselves common, waters are in turn commonly infected: this includes rivers, streams, country parks, lakes, etc. If a person swims, paddles, etc. in such waters infection by Leptospira may occur via swallowing water, contamination of mucous membrane or through breaks in the skin.

- Following 2 – 4 weeks incubation period, clinical multi-organ infection occurs, known as Weil’s disease. One site of the infection is the liver. Liver infection and cell-destruction leads to jaundice.

- Secondly, evidence of infection is seen in the eyes where bleeding, yellowing and impaired vision are manifest.
Histology shows infiltration of the eye by numerous corkscrew-shaped bacteria (Leptospira) together with cellular invasion.
Syphilis is a sexually transmitted infection, which is increasing in prevalence. Three stages in the disease can be considered: Primary syphilis is characterised as a flat ulcer, which appears on the genitilia; it contains numerous corkscrew organisms, called Trepanema Pallidum. These ulcers tend to heal spontaneously or with treatment in some 50% of persons. Secondary syphilis occurs when organisms from the primary ulcer disperse throughout the body commonly causing a widespread rash (see below), but may present with a wide range of symptoms. However, this stage may resolve without further symptoms naturally or following treatment. Tertiary Syphilus is partly a continuation or secondary disease and partly immune reaction: here neurological symptoms occur such as Tabes Dorsalis and general paralysis of the insane.

Chronic, persistent infection in women can result in congenital syphilis in offspring: this is characterised by a variety of congenital abnormalities, including interstitial keratitis leading to blindness, and may cause death.
Infections of the Eye

Part Two - Viruses, Chlamydia and others
CHLAMYDIA TRACHOMATIS

- Develops after infection from Mother at birth (see gonorrhoea): A kerato conjunctivitis occurring 4 – 7 days of age.
CHLAMYDIA TRACHOMATIS

- Chlamydia grown on tissue cultures: infected cells contain Chlamydia inclusion bodies. Infection treated with Chloramphenicol drops.
RUBELLA

- Contracted as a droplet infection.
  Incubation period 14 – 21 days

Incubation period 14 to 21 days
Onset  low grade fever and catarrh for 2 days
Rash   Maculopapular, begins on face and neck
General lymphadenopathy
Some cases very mild with no rash
Many sub-clinical cases
RUBELLA

- A very mild or asymptomatic infection
Primary infection in pregnancy causes Rubella syndrome in foetus (90%) in first trimester.
RUBELLA

- Intrauterine death may occur
Rubella syndrome includes cataracts and .......
RUBELLA

- Glaucoma
ADENOVIRUSES

• A group A 42 viruses share a common structure
ADENOVIRUSES

- The molecules shown white are common to all strains, but those shown black differ in all viruses of the group
ADENOVIRUSES

- Various viruses cause respiratory disease in children, an influenza disease in adults, swimming pool conjunctivitis and type-8 causes kerato-conjunctivitis among workers in metal and occasionally patients attending in ophthalmology clinics.
MOLUSCOM CONTAGIOSUM

- Causes small bladder-like lesions on neck, back, arms or legs of mainly young persons – usually painless.
MOLUSCOM CONTAGIOSUM

- Occasionally occurs on eye lids
MOLUSCOM CONTAGIOSUM

- Material from lesion does not contain pus (see staphylococci). But under the electron microscope large brick-shaped virus particles are seen.

- No treatment: should resolve spontaneously
Primary herpes simplex infection is acquired by contact from patients or carriers. It produces a blister/ulcer on the mouth (cold sore), face, etc.
HERPES SIMPLEX

- The virus from the face can be transferred by rubbing/scratching to other skin surfaces, e.g. near the eye
HERPES SIMPLEX

- From the eye it can enter the eye to cause conjunctivitis
The eye infection can produce dendritic ulcers, keratitis and blindness (Herpes is the 3rd most common cause of blindness in the UK)
HERPES SIMPLEX

- Is treated with Acyclovir

![Chemical structure of Acyclovir](image)
VARICELLA ZOSTER (CHICKEN POX)

- Spread by inhaling virus (dried from lesions or as droplets). Incubation period of 14 – 21 days. Ends with outbreak of respiratory symptom and rash (face and in hair; central body more then hands and feet).
Individual lesions (very itchy) are like blisters. Following recovery, virus remains in cervical ganglia for life.
VARICELLA ZOSTER (CHICKEN POX)

- Later (years) virus is reactivated to produce shingles; an intensely painful rash which usually erupts in nerves and associated skin surfaces associated with tight clothing.
VARICELLA ZOSTER (CHICKEN POX)

- Eruptions on the face, associated with trigeminal nerve can spread to the eye, and then along the optic nerve to the brain (Encephalitis).
AMOEBAE

Some free-living amoebae may rarely cause keratitis, usually associated with contact lenses which have not been cleaned with sterile saline solutions.
This is an African worm (microscopic) living in freshwater rivers. Taken up by simulian flies and transferred to man by biting. Parasite multiplies at site of bite to cause a swelling from which parasite migrates to all organs of the body.
ONCHOCERCA VOLVULUS

- Organism reaches the eye, initiates an intense immune reaction.
ONCHOCLERCA VOLVULUS

- Later keratitis and blindness. This is ‘River Blindness’. Can occur in >90% of adults in some African tribes.
This parasite commonly infects dogs, who excrete it in faeces. Children playing in parks etc. which dogs use can accidentally acquire this infection by accidental infection. Parasite migrates to the eye to cause a choroidoretinitis.
TOXOCARA

- A parasite similar to Toxoplasma but from cats forms a granuloma, and cause a peripheral eosinophilic reaction.
  The mass (granuloma) has been confused with malignant retinoblastoma.