

Microbiology

Notifiable diseases

by courses

Acute encephalitis
Acute infectious hepatitis
Acute meningitis
Acute poliomyelitis
Anthrax
Botulism
Brucellosis
Cholera
Diphtheria
Enteric fever (typhoid or paratyphoid fever)
Food poisoning
Haemolytic uraemic syndrome (HUS)
Infectious bloody diarrhoea
Invasive group A streptococcal disease
Legionnaires' disease
Leprosy
Malaria
Measles
Meningococcal septicaemia
Mumps
Plague
Rabies
Rubella
Severe Acute Respiratory Syndrome (SARS)
Scarlet fever
Smallpox
Tetanus
Tuberculosis
Typhus
Viral haemorrhagic fever (VHF)
Whooping cough
Yellow fever

Urine Dipsticks and UTIs



1. Nitrite – high specificity
2. Leukocytes – lower specificity, higher sensitivity

- Nitrites:
 - Normal urine has nitrate - some bacteria can convert to nitrite
 - No bacteria = no nitrite

- *no bacteria = no nitrite*
 - Not sensitive, because some bacteria do not convert nitrate → nitrate
 - WCC
 - Can come from other sources e.g. vaginal, external etc - lower sensitivity
-

Varicella = the organism of herpes shingles and chickenpox

- Some are vaccinated for this
 - Healthcare staff who haven't had chickenpox
 - Relatives of individuals who are immunosuppressed (because immunosuppressed more likely to get infections and can pass on)

Pneumonia

- Typical: strep pneumoniae, H infl (less common due to vaccination schedule)
- COPD - above + moraxella catarrhalis
- Post-influenza flu - staph aureus
- Most common causes of HAP
 - Pseudomonas aeruginosa
 - Staph pneumoniae
 - Klebsiella
 - E coli
- Atypicals
 - Klebsiella - severe, cavitating lesions
 - Legionnaires pneumophilia
 - Gram -ve rod, motile
 - Lives in warm water - e.g. air conditioning, showers
 - 2-10 day incubation
 - Can be severe - renal failure and sepsis
 - 30% NO COUGH OR FEVER - may just present as 'ill' - GI features, fever, relative bradycardia (i.e. HR 80-90 despite pyrexia)
 - Mycoplasma -
 - younger people normally - flu like illness and dry cough
 - *Target lesions on body - erythema multiform*
 - Chlamydia pneumoniae
 - Pseudomonas aeruginosa - cystic fibrosis

CURB-65

1. Confusion
2. Urea >7
3. RR >30
4. SBP <90, DBP <60
5. ≥65 yo

Mild 0-1 = d/c home

- Amoxicillin 5 days

Mod 2 = admit

- Amoxicillin + macrolide 7-10 days

Severe >3 = ?ITU

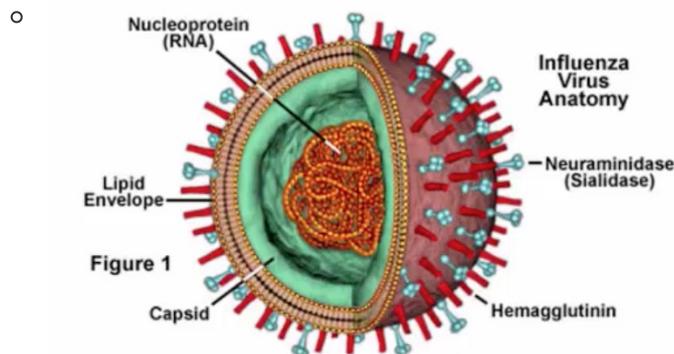
- Co-amoxiclav + macrolide (normally IV)

Ix (if mod-severe).

- Urine - legionnaires and pneumococcal may be present
- B/C
- Sputum culture

Influenza

- Influenza A, B and C (A = most severe)
- 15 H (hemagglutinin) and 9 N (neuraminidase) subtypes (e.g. H1N1)



- Antigenic shift = each subtype changes year by year
 - Drift - antigenicity slightly changes, may have some crossover immunity
 - Shift - dramatic antigenic change - now have no immunity to it
 - Shift may get bird → human transmission
 - Epidemics can occur after a shift
- Vaccination:
 - H1N1, H3N2, B subtypes
 - The specific antigenic strain changes year on year, as does the vaccine
 - Recommendations can be sub-accurate - based on estimates, can never be 100% cover

Meningitis

- Organisms
 - Bacterial
 - *Neisseria meningitides* (meningococcus / meningococcal meningitis) - lives in nasopharynx
 - Most common = **group B** - causes septicaemia illness (50% mortality)
 - Group B and C on decline - due to vaccinations through childhood
 - Strep pneumoniae - mainly elderly, high mortality rate

- TB meningitis
- AGES:
 - Neonatal meningitis
 - Group B strep
 - E. coli
 - Infants / elderly
 - *Listeria monocytogenes* (v young and v elderly)
 - *Haemophilus influenzae* - HiB vaccination has reduced this
 - E coli
 - *Strep pneumoniae*
 - Adolescents / young adults
 - *Neisseria meningitidis*
 - *Strep pneumoniae*
- Viral
 - Mainly enteroviruses
 - Many will be quite mild
 - Herpes simplex meningitis in neonates can be fatal
 - CMV in immunocompromised = rare cause, but can be serious

CSF

- Normal values:
 - *Opening pressure 10-20 cm H₂O*
 - *White cells < 5/mm³*
 - *Protein < 0.4 g/l*
 - *Glucose > 50% serum glucose*

Meningitis mortality normally due to the inflammatory reaction

- Profound immunological response → morbidity
- DEXAMETHASONE - give to reduce this extreme immune reaction
 - 0.15mg/kg

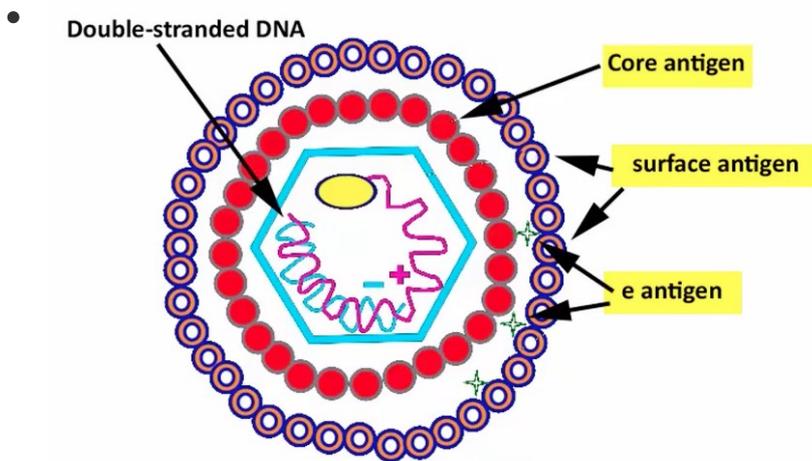
HEPATITIS

A

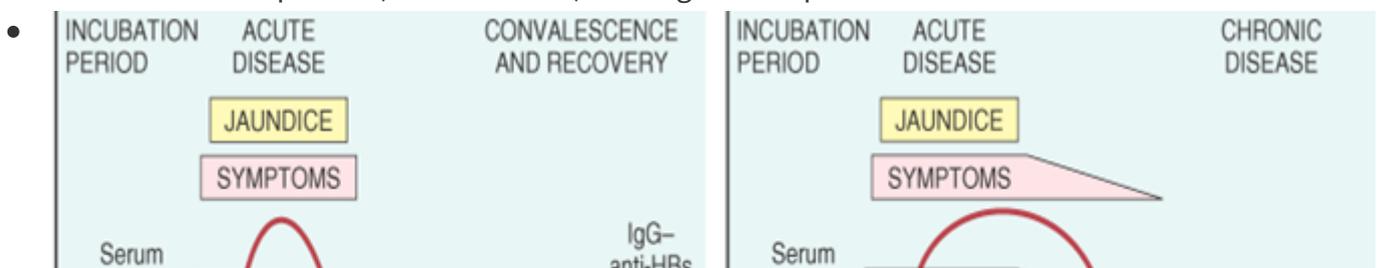
- Faeco-oral route.
- Incubation 4/52, symptoms around 2/52 - fatigue for 2/12
 - Flu like sx, malaise etc
 - Jaundice, dark urine, liver pain
 - Younger = less severe, older more severe sx
 - 0.1% → fulminant liver failure

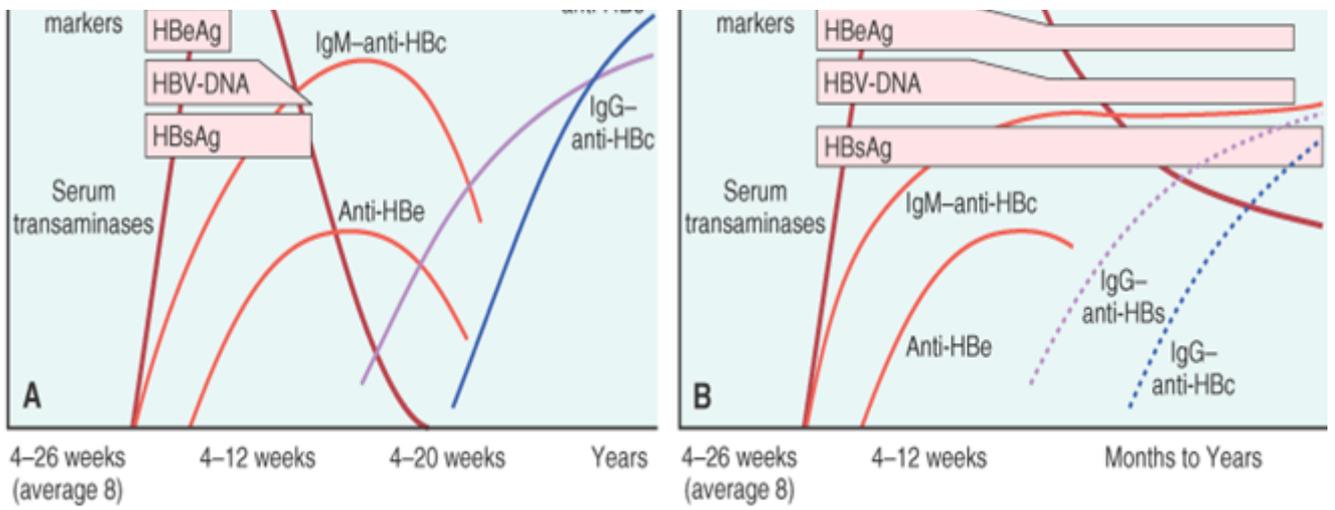
- Dx - IgM
- Vaccination - 2 doses 6 months apart

B



- 3 main antigens = core, surface and e
- Blood borne - vertical and horizontal transmission
- Incubation 2-3/12
- AGE severity variation
- Of patients that contract hepatitis B the following are true:
 - 60-65% show subclinical disease
 - 60-65% make a full recovery
 - 20-25% develop acute hepatitis
 - 5-10% develop chronic hepatitis
- **Cure is variable across individuals**
- 90% adults clear the infection, 90% infants do NOT
- Severe symptoms/response likely to clear it, milder disease likely to become chronic
- Chronic - (more likely in younger)
 - May be totally asymptomatic, but be chronically infected and transmissible
 - cirrhosis,
 - 30% active hepatitis (liver inflammation chronic) from ongoing active antigen
 - hepatoma, varices, liver disease etc
- Tx
 - Interferon may clear chronic infection
 - Vaccination:
 - 0,1,6 months
 - 10% non-responders → do repeat course, usually solves it
 - Acute exposure (if not immune) - HbV IgG and rapid vaccination course





- HBsAg = surface. Present in vaccinated and infected/cured
- HBeAg = ACTIVE infection ongoing, *nasty one*
- HBcIgM = only present in infected patients (not vaccinated). Persists. Cant actually detect HBcAg, only the antibody.
 - May still be infection with core antibody

<i>anti-HBs</i>	previous infection, vaccination, no longer infectious
<i>HBsAg</i>	earliest marker of infection, in absence of e-antigen may indicate carrier state
<i>HBeAg</i>	marker of infectivity, and (disappearance) marker of recovery
<i>anti-HBc</i>	persists for life in both carriers and those who have cleared the infection, may still be infectious

C

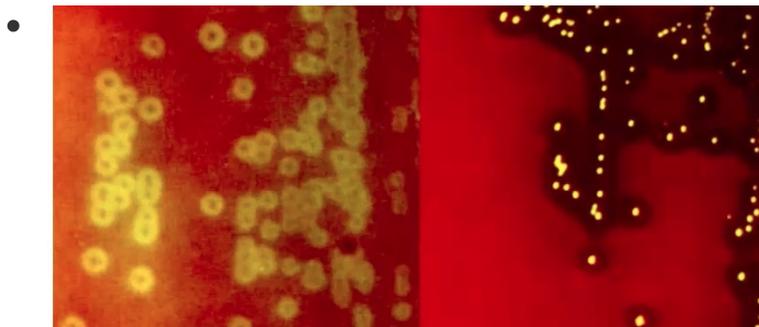
- Mostly blood-borne, e.g. IVDU
- 250k in UK have HCV
- Largely sub-clinical, many don't know they have it
 - Ongoing low-grade hepatic inflammation → 30% develop cirrhosis
- Anti-viral therapy is effective - interferon, ribavirin etc
- Serology for diagnosis

Type of bacteria	Notable examples
	<i>Staphylococcus aureus</i>

Facultative anaerobe	<i>Staphylococcus spp.</i> <i>Streptococcus spp.</i> <i>Escherichia coli</i> <i>Listeria spp.</i>
Obligate aerobe	<i>Mycobacterium tuberculosis</i> <i>Pseudomonas aeruginosa</i> <i>Bacillus spp.</i>
Obligate anaerobe	<i>Bacteroides spp.</i> <i>Clostridium spp.</i> <i>Treponema spp.</i> <i>Actinomyces spp.</i>
Micro-aerophile	<i>Campylobacter jejuni</i> <i>Helicobacter pylori</i>

Gram POSITIVE bacteria

Streptococci



Alpha-haemolytic

Beta-haemolytic

- appearances on agar plates

- **Alpha-haemolytic**

- Strep viridans
 - Commensural in mouth - causes dental carries
 - Sub-acute bacterial endocarditis
 - *acute* endocarditis tends to be staph au in e.g. IVDU
- Strep pneumoniae
 - Many have commensurate in nose and sinuses
 - Affects mainly young/old/immunocompromised
 - Produces factors to help with cell adhesion, invasion, and has capsule to avoid phagocytosis
 - Meningitis, pneumonia

- **Beta-haemolytic**

- Most strep are beta-haemolytic
- Group A (strep).
 - Most are group A
 - Sub-types

- **MOSTLY strep pyogenes** - asymptomatic carry in 5-30% population's nasopharynx - respiratory droplet spread
 - Invasive -
 - cellulitis, necrotising fasciitis, pneumonia, bacteraemia
 - Non-invasive -
 - pharyngitis
 - Immune mediated disease -
 - glomerulonephritis, rheumatic fever, guttate psoriasis
- Toxic shock syndrome
 - Group A strep and staph aureus - toxins produced cause a shock syndrome
- Necrotising fasciitis (flesh eating bacteria coinage)
 - Clinical syndrome
 - Group A strep and staph
 - Generally starts around perineum or lower abdomen, can happen post-surgical procedure
 - Rapidly progressive through deep fascia, septic → need urgent surgery + abx
- Group B (strep)
 - Mostly occurs during time of vaginal delivery

Staphylococci

(coagulase - causes blood to clot)

- Staph aureus (coagulase positive)
 - Classic wound infection
 - Usually above the waist / below the knee wounds
 - Wound sepsis, abscess, cellulitis, septic arthritis, osteomyelitis, discitis
 - Can seed into other parts of body via blood spread
- Staph epidermidis (coagulase negative)
 - Can live on plastics - central IV lines, valves etc
 - Cause of contamination on b/c samples (poor technique) - is on everyone's skin

Tuberculosis

- Mycobacterium tuberculosis
- Slow growing (so hard to treat), highly aerobic (prefers lung apices) bacteria
- Transmitted in droplets
 - 1/3 world affected at some time
 - 1% incidence per year - 10% of those → become active disease
 - 90% pulmonary, but can spread to testis, kidneys, meninges, heart ect
- Pathophysiology
 - Macrophages "wall off" bacteria → granulomatous lesions
 - Usually apices of lungs
 - Bacteria can live for years in these granulomas - most patients contain the primary infection
 - → can spread in lymphatics
 - → eventually when older may have post-primary infection if escape cavity

- Military spread
 - If primary TB infection spreads to vascular route → can have widespread seeding through lungs and body
 - Military mottling appearance on lung XR - hundreds of small foci/granulomas
- Ix
 - Mantoux test
 - CXR
 - Nucleic acid amplification test
- Rx
 - BCG can give some protection against TB - only given to high risk groups in UK
 - 1. The **initial phase** lasts two months and the treatment combination of choice is isoniazid, rifampicin, pyrazinamide, and ethambutol
 2. The **continuation phase** usually lasts four months and the combination of choice is isoniazid and rifampicin

Multi-drug resistance TB (MDR-TB) - IVDU, poor compliance etc

Clostridia (e.g. c. diff)

- Gram +ve, obligate anaerobe
- Important ones:
 - C diff
 - 2% gen population are carriers
 - Antibiotics select out c diff and it thrives
 - Spore forming - so can shed into environment e.g. toilet seats, hands etc
 - *NOT* killed by alcohol gel - handwashing *will* kill it
 - Pseudo-membranous colitis is a complication
 - → diarrhoea (→AKI), toxic megacolon, bowel perforation and sepsis = related complications
 - Dx from stool toxin
 - Oral metronidazole or oral Vancomycin to treat
 - C tetani (tetanus)
 - 6 case / yr in UK
 - 10% case fatality rate in UK
 - IVDU sharing needles, neonate infection via contamination of cord stump, unvaccinated individuals (e.g. elderly in garden wounds)
 - Widespread in soil - can colonise wounds
 - Tetanospasm - often starts in jaw, face, then arching of back muscles etc. Autonomic over activity
 - Clinical diagnosis, supportive ITU management. Often needs paralysis and large amounts of IgG
 - *Metronidazole* abx treatment
 - C perfringens
 - Gas gangrene, in soil
 - 



- Necrosis, rhabdo, renal impairment
 - Aggressive abx and surgical rx
 - C botulinum
 - Food contamination with toxin already formed - e.g. poor canning process
 - Flaccid paralysis → death from respiratory failure
 - Rare in western world
 - Rare botulism in infants (<6mo old) through gut - after 6mo age have protective mechanisms
 - e.g. honey may have c botulinum in it
-

GRAM NEGATIVE

E coli

- Natural gut commensal, large amounts naturally in gut
- e coli - Enterotoxigenic
 - Travellers diarrhoea
 - Toxin related
 - Self-limiting
 - No PR blood or fever
 - Spasm, pain, diarrhoea
- e coli - verotoxin
 - From gut of cows - slaughtered cows with poor processing can have e coli in food
 - **Produce verotoxin - bloody diarrhoea - 10% get haemolytic uraemia syndrome**
- e coli - UTIs
 - majority of UTIs
 - e coli can produce a biofilm over urothelial cells, with poor penetration by abx
 - → relapses common after recovery, repeat UTIs
 - Can ascend to cause pyelonephritis
- e coli - meningitis
 - Neonatal meningitis

Klebsiella

- Commensal oropharyngeal
- Pneumonia - atypical pathogen, severe cavitating lesions
- Can gain resistance readily
 - Plasmid mediated resistance - can spread resistance to abx from bacteria to bacteria

Pseudomonas

- Pseudomonas aeruginosa - common cause of HAP
- Very robust, plasmid-mediated resistant microbe - can acquire abx resistance easily. Difficult to get rid of once colonised
- Flagella
- Can cause:
 - Pneumonia in CF
 - Infections in burns patients
 - Otitis externa
 - UTIs - catheters etc

H.pylori

- Around 50% have this - 10-20% have lifetime risk of peptic ulcer
- Dx - breath tests, serology
- Triple rx - PPI, amoxicillin, macrolide

Salmonella

- 2 types
 - Non-typhoidal - can affect humans *and* animals
 - Chickens and eggs most common
 - Stomach acid provides some protection, so need certain bacterial load to cause infection
 - 1-2 day incubation, 4-7/7 illness
 - 'Mint sauce' diarrhoea
 - Can spread in blood stream, can be severe in some
 - Typhoidal - can only affect humans
 - NOT gastroenteritis - only human to human contact
 - Spread to blood stream
 - *Cough, abdominal pain, fever (no diarrhoea or vomiting)*
 - Relative bradycardia
 - Rose spots on pale skin
 - 3rd week - necrosis of Peyer's patches → peritonitis → 1-3% mortality
 - Rx with fluoroquinolones

Shigella

- Similar to e coli
- Contaminated food and water
- Very infectious - low load needed to cause infection
- → infects large bowel, necrosis of colon epithelium → painful spasm and dysentery

Campylobacter

- Poultry and meat association
- Spasm, pain (<5yo can be bloody)
- Usually self limiting in few days

Usually self-limiting in few days

- 50% of Guillain-Barre have evidence of recent campylobacter

Reactive Arthritis

Reactive arthritis (Reiter's Disease)

1. Arthritis
2. Conjunctivitis
3. Urethritis

(also iritis, circinate balanitis, keratoderma blennorrhagicum-soles of feet)

HLA B27 linked

Causes

Diarrhoea: salmonella, campylobacter, shigella

STDs: chlamydia, gonorrhoea

- Usually only 1-2 joint arthritis (but may be more)
- Circinate balanitis = ulceration around glans penis
- Much more common in HLA B27

Viruses

Rotavirus

- Gut virus - D+V - can be severe
- Incubation period - 1-2 days
- 6 mo to 2 yo = most common period
- Lasting immunity once had it
- Vaccination now used - 2 and 3 months schedule
 - large case reduction since 2013

Norovirus

- Hospital acquired infection
- D+V
- *Winter vomiting bug* - around 1 million case per year in UK
- Usually self limiting - 1-2 week illness, but immunity **only** lasts couple of months
- Easily spread e.g. in hospital, care homes etc.

STDs

N Gonorrhoea

- Gram negative diplococcus
- 50% women asymptomatic
- 5-7 day incubation
- Associated chlamydia common
- IM ceftriaxone 500mg +/- 1g azithromycin orally
- *If untreated* - chronic -
 - urethral strictures in men, PID in women -
 - can spread to bloodstream → septic arthritis, epididymo-orchitis, bacterial endocarditis
 - May cause reactive arthritis

Chlamydia (trachomatis)

- Long incubation period (weeks)
- Tendancy for chronic infection - many can clear. If don't clear:
 - PID in women - half of asymptomatic women go on to have PID
- Men usually symptomatic - urethritis, epididymo-orchitis, urethral discharge
- Rx - doxycycline or macrolide

Vaccination illnesses

Measles

- HIGHLY infectious
- 10-12 day incubation period, viral prodrome
- Koplik spots = first signs



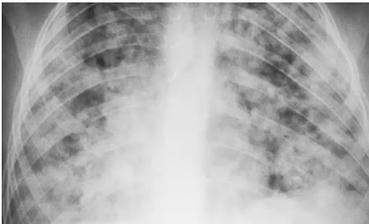
look like 'grains of salt'

- RASH
 - Starts face, spreads to rest of body
 - Morbiliform - confluent maculopapular rash
 - INFECTIOUS PERIOD = 4 days before and after rash onset
- Complications
 - Pneumonia encephalitis diarrhoea otitis media

• pneumonia, encephalitis, dermatitis, cerebellar

- Post exposure prophylaxis - check IgG first - if have then they are immune as have previously had. If don't have, need prophylaxis
 - - Give MMR vaccine and human Ig
 - Give WITHIN 3 days
 - Immunocompromised
 - Pregnant
 - Infants

Chickenpox / H zoster

- Endemic in UK, most infections in childhood
- Vaccination only for:
 - Healthcare staff who aren't immune
 - Family's of children who are immunocompromised (may acquire infection from their family)
- Chickenpox
 - 2 week incubation with viral prodrome
 - Macules → papules → vesicles → pustules → ulcers
 - Infectious *until the last spots appear*
 - Complications
 - Staph aureus infection
 - Encephalitis - cerebellar signs, Rx acyclovir
 - Pregnancy
 - First trimester - H zoster can cross placenta and cause *congenital varicella syndrome (really bad)*
 - Important to test for chicken pox immunity early in pregnancy
 - Second-third trimester - if acquire at this stage = much more severe - chickenpox pneumonia
 - 
- Pregnant women need POST EXPOSURE PROPHYLAXIS - HZIG
- Vulnerable/immunocompromised individuals
 - Treat with anti-virals if get chickenpox as condition can become more severe
- Shingles (reactivation of H zoster)
 - Some risk of transmitting chickenpox by virus shedding from skin rash
 - Ophthalmic shingles - *if tip of nose is affected then 75% of eye involvement*
 - Any rash that crosses the midline is not shingles
 - Ramsay-Hunt syndrome
 - Facial (geniculate ganglion) - Bell's palsy presentation + rash around ear canal
 - Aciclovir shortens duration of shingles but DOES NOT reduce **post-herpetic neuralgia**
 - Up to 20% will develop chronic post-herpetic neuralgia pain

Rubella / german measles

- Togavirus
- <100 annual cases in UK
- Mild illness - main issue is congenital rubella syndrome
- Congenital rubella
 - Issue in first trimester - microcephaly, deafness, blindness, growth retardation
 - Antenatal screening in antenatal clinics
 - IgM testing if any rubella-like rash <16 weeks

Mumps

- Paramyxovirus
- Many cases student age
- Presentation
 - *Does NOT spread across placenta - not teratogenic*
 - Normally sub-clinical and very mild
 - Unilateral parotitis most common feature - hot, painful swollen parotid.
 - Trismus, dry mouth, oedema down the neck
 - 
 - 3-4 days then starts to improve - but then often same problem develops other side
 - Complications
 - Other glands can be affected - testis (orchitis) and oophoritis
 - Meningitis, encephalitis
 - Pancreatitis, abdo pain

Pertussis (Whooping cough)

- Bordatella pertussis - gram -ve coccus
- Common cause of chronic coughs in older people (as the vaccination can wear off later on in life)
- Features
 - 100 day Cough -
 - Whoop from 2 weeks - worsens to paroxysms/spasms of uncontrollable coughing / vomiting
 - 2-3 months
 - Infants most severe (<12 mo)
- Rx - **macrolides** - clears up the bacteria but does not significantly alter the clinical course
 - Clarithromycin, erythromycin, azithromycin

Erythema infectiosum (slapped-cheek syndrome)

- Parvovirus B19 - not a notifiable disease
- 50% young adults immune
- Features

- Starts as non-specific febrile disease
- Bright red rash on cheeks - lasts few days then resolves
- Clinical course usually not severe and self-limiting
- Complications
 - High virus replication - affects bone marrow - if dependant on high marrow turnover for Hb then may → aplastic crisis
 - Sickle cell disease can dramatically drop Hb
 - Pregnancy - if fetus infected early in pregnancy can → profound anaemia. Fairly high placenta transmission
 - All pregnant patients with non-vesicular rash should be investigated - IgG and IgM
 - IgG = immunity, no problem
 - IgM = acute infection → need careful fetal monitoring ?for intrauterine blood transfusion

Bronchiolitis - RSV

- 80% get this virus, but only 2-3% get bronchiolitis
- Usually 3-6 months age
- Tachypnoea, wheezy
- No specific rx - often admitted for monitoring and supportive care

Croup - Parainfluenza virus

- 6 months to 5 yrs
- Normally self-limiting - usually just a couple of days or so
- Barking cough, can cause stridor - *often worse at night with bad coughing*
- Rx - steroids to reduce mucosal oedema

Herpes

HSV

- Type1 and 2:
 - Coldsore, mouth and genital
 - Vesicles→ulcers, with pain and tingling
 - 
 - Associated with later relapses
 - Both types can cause
 - Herpes meningitis
 - Herpes encephalitis
 - Eczema herpeticum

• Herpes encephalitis

- Herpes encephalitis
 - **HSV2** - main transmission is vertical, mum to kid if active lesions at time of vaginal delivery
 - Can be extremely severe, disseminated herpes + encephalitis
 - *Main cause of genital herpes*
 - **HSV1** = commoner cause of encephalitis
 - *Main cause of oral herpes (coldsore)*
 - Presumed spread via latent source from ganglion to brain
 - Majority of people have had HSV1 for years (common coldsores etc)
 - Frontal and temporal lobe features - can cause temporal lobe epilepsy (deja-vu etc)
 - *Can be shown on MRI*
 - 70% mortality if untreated - early acyclovir rx essential

EBV

Epstein–Barr virus

Glandular fever

Fever

Tonsils may have exudate

Lymphadenopathy

Risk of splenic rupture in sport

Monospot



CMV

Widespread in the world

Transmission in bodily fluids

Vertical transmission

Mild illness

Persists in latent form

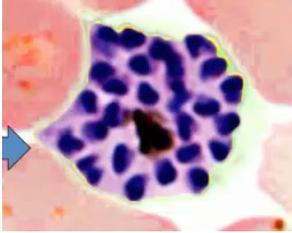
May reactivate in the immunocompromised

Retinitis, hepatitis, colitis, pneumonitis

Malaria

- Around 1000 cases / yr

- **Sporozoites = in liver**
- **Merozoites = when rupture from RBCs**
- Female anopheles mosquito → injects sporozoites → travel to liver and enter hepatocytes → incubate for 14 days → multiply to >20,000 merozoites → rupture from hepatocytes into circulation → enter RBCs and undergo schizogony (rupture of red cell to rupture and release hundreds of merozoites)



= RBC full of merozoites undergoing schizogony

- Schizogony - sticky adherent RBCs → blockage of microcirculation → destruction of capillaries and mini-infarcts → pulmonary oedema, cerebral malaria, kidney failure
- Falciparum
 - Infects young red cells - high parasite count facilitated
 - Quinine + tetracycline
- Vivax and ovale
 - Dormant phase within liver - risk of relapse as some hepatocytes don't rupture for up to 5 yrs
 - Quinolones
 - Primaquine to prevent relapse
- Malariae
 - Rarest
 - Longest incubation (months to years)
 - Associate with nephrotic syndrome in children
 - Chloroquine

Leptospirosis

- Weil's disease - Fever, jaundice, renal failure (rapidly fatal)
- Rat urine - contact through skin

Lyme disease (borellia)

- Deer disease, passed via ticks



- target lesion (erythema chronicum migrans)

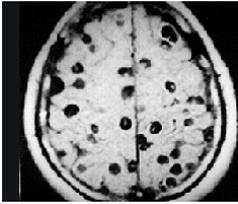
- Chronic untreated - malaise, anxiety, arthralgia, dementia, conduction cardiac problems
-

Threadworms (*enterobius vermicularis*)

- Mainly children
- Faeco-oral route
- Peri-anal itching

Tapeworms

- *Taenia solium* - pork
- *Taenia saginata* - beef
- Cysticercosis - from *taenia SOLIUM* (*saginata* don't form cysticerci in humans)
 - Oncospheres infect pig/cow muscles and soft tissues → develop into cysticerci
 - → humans ingest uncooked meat, the oncospheres/cysticerci infect brain/eyes/tissues
 - → cysticerci break open → lava form of tapeworm emerges



- cysticerci in brain



- cysticerci in heart

Roundworms (*ascaris*)

- Eggs ingested, eggs through intestinal wall → into alveoli → up larynx and swallowed → into intestine → mature into larger worms
- Mebendazole

Hookworms

- Nematodes *Ancylostoma duodenale* and *Necator Americanus*
- Nematodes - larvae penetrate through sole of foot → capillaries → lungs → mucocilliary ladder → stomach and mature in intestine where they attach themselves
- Can cause anaemia
- Rx with mebendazole

HIV/AIDS

- RNA virus - RNA injected into lymphocyte with reverse transcriptase
- 70% seroconversion illness in 1-6 weeks. glandular fever like illness

- May have significant immunocompromise
- Produce Ab against HIV virus → suppression of virus - sx usually last 1-2 weeks then recovery of sx
- Thereafter → virus targets CD4 (helper) cells → gradually ↓↓ over time.
- CD8 (killer) cells ↑↑
- Dx
 - HIV eliza
 - P24 antigen (antigen of virus capsid)
- CD4 <350: start triple therapy
- CD4 <200: AIDS
- AIDS defining illnesses
 - Toxoplasmosis
 - CMV retinitis
 - Disseminated candida
 - Kaposi's sarcoma