

INFECTIOUS DISEASE NOTES

MALARIA

Cerebral malaria is only caused by *Plasmodium falciparum*. Falciparum malaria can also cause hepatitis, gastrointestinal symptoms (diarrhoea), glomerulonephritis/acute tubular necrosis and blackwater fever.

Plasmodium ovale is the rarest of the four species and is apparently more restricted in distribution. However, it is common in the West African countries of Ghana, Liberia, and Nigeria.

Plasmodium vivax and ovale are the only ones which have liver parasite dormancy. Hypnozoites in the liver spread to the bloodstream and become trophozoites in the rbc and progress through asexual reproduction to merozoites which are released.

Plasmodium vivax and ovale only infect reticulocytes whilst falciparum infects erythrocytes of all stages and malariae infects mature erythrocytes. The *Duffy blood group* is essential for vivax spread as the merozoites of these attach to the Duffy receptor on red blood cells.

Plasmodium malariae causes quartan fever (every 72 hours or fourth day) whereas the other species cause tertian fever (every 48 hours or third day).

Quinine can be given orally to treat falciparum malaria. Intravenous quinine is indicated in complicated malaria e.g. cerebral malaria and hyperparasitaemia (>2%). Hypoglycaemia is an important side effect of quinine therapy (causes insulin release) and BMs should be checked 2 hourly.

MENINGITIS

Meningococcal meningitis: Immunisation is available against strains A, C and W135 of this bacterium, however strain B is the most often implicated in meningococcal meningitis in the UK. Rifampicin, ciprofloxacin and ceftriaxone can be used for prophylaxis.

Pneumococcal meningitis is caused by gram positive diplococci (meningococcus = gram negative diplococci). The young and elderly are most at risk. Nerve deafness is likely, paralysis can occur and mortality rate is high among the elderly. Intravenous penicillin or ceftriaxone should be given. Vancomycin and rifampicin can also be used. Dexamethasone is indicated in early infection to prevent neurological sequelae.

Tuberculous meningitis: Symptoms are headache, vomiting, photophobia, and fever. The duration of presenting symptoms may vary from 1 day to 9 months. CSF typically shows elevated protein level, markedly low glucose, and a pleocytosis, initially polymorphs then lymphocytes. Treatment of TBM includes isoniazid (INH), rifampicin (RIF), pyrazinamide (PZA), and ethambutol (quadruple therapy). Steroids are usually also indicated (except in mild cases) to prevent neurological sequelae.

Viral meningitis: A combination of lymphocytosis, normal or mildly elevated protein and normal glucose suggests viral meningitis. Common causes include enterovirus and mumps.

Listeria meningitis is generally associated with multiple cranial nerve deficits, particularly of the VIth and VIIth nerves, as well as hemiparesis, ataxia and respiratory abnormalities often leading to respiratory arrest. High dose (eg 2g qds IV) ampicillin or amoxycillin are the treatment of choice.

FUNGAL DISEASES

Candida infection commonly causes mucosal disease (eg. Vulvovaginitis and oral thrush). Ophthalmitis (causing blindness if not rapidly diagnosed) and line related sepsis can also occur. **Disseminated candidiasis** can cause fever and painless red papular lesions in the upper and lower limbs, especially in the immunocompromised (e.g. post transplantation). The diagnosis can usually be made on blood cultures but the organisms can be seen in the lesions on biopsy. Common sites of dissemination include the head, eyes, renal parenchyma (fungal balls), liver, and spleen.

Coccidioides manifests similar to histoplasmosis and spreads to the lymph nodes. Intradermal tests are diagnostic. Treatment is with amphotericin.

Pityriasis versicolor (also called tinea versicolor) is a skin infection caused by a fungus called *Malassezia furfur*. The treatment is topical selenium sulphide or miconazole cream.

Griseofulvin is not active against *Candida albicans* or *aspergillus*. It is active against trichophytons (tinea or ringworm) and other dermatophytes. It is metabolised in liver (hence caution in liver rather than renal failure).

DIARRHOEA

The differential is wide for a patient with diarrhoea following a holiday. These include:

Infection – gastroenteritis versus sepsis. Fever > 38.5 degrees is unlikely to occur in simple gastroenteritis and alternative diagnoses should be considered e.g. enteric fever, malaria, respiratory infection etc

Post-infectious malabsorptive processes e.g. disaccharide intolerance, bacterial overgrowth

Post-infectious irritable bowel

Chronic GI disease unmasked by infection: e.g. inflammatory bowel disease, coeliac disease, colorectal carcinoma, HIV infection

Traveller's diarrhoea is an extremely common occurrence, affecting up to half of travellers to high risk areas such as Africa, Asia and South America. The commonest infective cause world-wide is *Escherichia coli*.

Shigella, *salmonella*, *campylobacter* and *amoebic dysentery* may be bloody.

Cholera (profuse rice-water stools – several litres/day) and *Giardia* (explosive) diarrhoea are never bloody.

Giardia lamblia infection can present with abdominal pains and diarrhoea or steatorrhoea. Duodenal aspirate +/- biopsy can confirm the diagnosis. Villous atrophy is associated.

Bacillus cereus food poisoning is caused by toxin release. There are two types of toxin, - the Diarrhoeal (causing diarrhoea) and the Emetic (causing vomiting). Symptoms with the diarrhoeal toxin are nausea, cramp-like abdominal pains hours after ingestion usually of rice and watery diarrhoea. The diagnosis is confirmed by a laboratory test on a faecal specimen.

Cryptosporidium is water borne and is a protozoan parasite. Swimming in hot tubs and pools, lakes, ponds are risk factors. It can also be spread via uncooked food. Treatment is conservative. Symptoms typically last for 1-2 weeks but longer in immunocompromised e.g. HIV.

VIRUS INFECTIONS

Cytomegalovirus (CMV), a type of herpesvirus, is very common. Blood tests show that 60 to 90% of adults have had a CMV infection at some time. Usually this infection produces no symptoms but it may cause a glandular fever-like illness in young adults. Serious infections occur in the immunocompromised. Manifestations include pneumonitis, haemorrhagic colitis, hepatitis, retinitis, leucopenia and thrombocytopenia. Diagnosis is made by detection of CMV antigen or with polymerase chain reaction (PCR) in blood. Tissue biopsy classically shows "owls eye" inclusion bodies.

Ganciclovir, valganciclovir, cidofovir or foscarnet may be given. For people with **CMV retinitis**, a small device containing sustained-release ganciclovir can be implanted in the eye.

Polyoma virus BK is associated with interstitial nephritis in patients with renal transplantation and may cause fever and haematuria, but more commonly presents with impairment of renal function. Treatment of the infection at present is by reduction of immunosuppression.

Dengue fever is a flavivirus transmitted by *Aedes* mosquitoes. It is present in South East Asia, Africa (rare), the Middle East and the Indian sub-continent. The disease has an incubation period of less than 7 days. Headaches, retro-orbital pain, musculoskeletal pains and a maculopapular rash occur. Treatment is conservative with antipyretics and bedrest. Serious disease occurs with reinfection with a different serotype (there are 4) resulting in dengue haemorrhagic fever and dengue shock syndrome.

Human T-cell Lymphotropic Virus (HTLV-1) is a retrovirus common in the Caribbean. It is also present in Africa and in IVUDs in the USA. It is transmitted via blood, semen and breast milk. It infects T-cells and may result in PCP pneumonia due to immunosuppression although is not cytolytic. It may cause adult T cell leukemia, tropical spastic paraparesis (a demyelinating disease that causes spasticity and weakness usually in middle-aged women in the Caribbean), arthritis and polymyositis

Measles is increasing in incidence in young adults in the UK due to lack of uptake of MMR. It causes serious disease in African children (worse in vitamin A deficiency), although immunisation has greatly reduced the incidence. Presentation is with fever,

dry cough, conjunctivitis, a descending rash (head travelling down trunk) and lymphadenopathy. White/blue-grey spots on the buccal mucosa are known as *Koplik spots* and are pathognomonic but only occur in early infection. In young children, latent infection can involve the central nervous system - known as subacute sclerosing panencephalitis. Treatment is with supportive care.

Mumps is an RNA virus (like rubella). Its incubation period (time between infection and first symptom) is 7 days. It may cause parotitis, orchitis (affecting fertility in around 5% of bilateral cases), lymphocytic meningitis and occasionally pancreatitis. Bilateral parotitis occurs in 75% of patients.

Rubella is a togavirus and an RNA virus. Its incubation period is 18-21 days. Common features of rubella are rash on the forehead, suboccipital lymphadenopathy, polyarthritides and polyarthralgia and Guillain-Barre syndrome. Termination is offered if infection occurs in the first 16 weeks (4 months) due to the high probability of foetal abnormality (>90%).

Features seen in **congenital rubella** are :

Microphthalmia , Microcephaly, Cataracts, Patent ductus arteriosus, Peripheral pulmonary artery stenosis, Hepatosplenomegaly, Thrombocytopenia, Maculopapular rash and Deafness

Infectious mononucleosis is caused by the **Epstein Barr** virus. Fever, sore throat and lymphadenopathy are common, splenic rupture (requiring surgery), bacterial infections and hepatitis may occur.

There are raised titres of **heterophile antibodies** (which recognise a variety of antigens) in 75% of infectious mononucleosis cases. This forms the basis of the Paul Bunnell and Monospot tests which detect foreign red blood cell agglutination with patient IgM antibodies.

Herpes simplex viruses (HSV-1 and HSV-2) cause cold sores (usually HSV-1), and painful genital ulcers (usually HSV-2). HSV encephalitis manifests with a triad of fever, seizures and obtundation. The temporal lobe is most commonly involved, as in this case. It may result in long-term memory problems.

Herpes simplex virus infection of the skin causes **eczema herpeticum**. Vesicles can form and coalesce after 7 days from infection. Pyrexia is common during this time. Neurological spread, sepsis and secondary bacterial infection can occur, especially in children.

Herpes simplex encephalitis: There is more inflammation around the temporal lobe, and the EEG changes of discharges at 2Hz occur. Aciclovir should be commenced upon clinical suspicion as PCR result may be a few days.

Keratitis, iritis, iridocyclitis, conjunctivitis, dendriform ulcers on the cornea and secondary glaucoma can occur in **Herpes Zoster Ophthalmicus** which is caused by varicella zoster virus.

Herpes virus is a double stranded DNA virus. Herpes encephalitis can be confirmed with PCR .

The **influenza** virus belongs to the orthomyxovirus group and comprises of three types:

Influenza A is the cause of world wide epidemics and pandemics (including avian influenza). Haemagglutinin, a surface glycopeptide aids attachment of the virus to host cells. Viral neuraminidase helps in release of replicated viruses through the cell membrane.

Influenza B causes smaller and milder outbreaks.

Type C rarely produces disease in humans.

Japanese encephalitis is caused by a RNA virus which endemic in India, East Asia, Malaysia and the Phillipines. Previous infection by a pathogen which a member of the flavivirus family may help to protect against serious disease.

Parvovirus infection or fifth's disease causes the 'slapped cheek syndrome'. There is a cheek rash with swollen wrists, hands and knees. Diagnosis can be confirmed with an IgM antibody to parvovirus B19. It may also cause severe anaemia in patients with haemoglobinopathies and in the foetus causing hydrops foetalis.

Rabies virus belongs to the genus *Lyssavirus* within the family Rhabdoviridae. Dogs remain the principal host (other wild animals can transmit) and transmitter of rabies to humans. If bitten by a dog in an endemic area, anti rabies immunoglobulin should be administered, followed by a course of rabies vaccine over 2 weeks.

West Nile virus is a mosquito-borne flavivirus. It is an emerging infection affecting to Africa, Asia, Europe, and Australia. It presents as fever, myalgia, nausea and vomiting. It may cause meningoencephalitis and can present with a Guillain Barre like syndrome (depressed tendon reflexes and weakness). IgM antibody against West Nile Virus is diagnostic. Treatment is supportive.

HUMAN IMMUNODEFICIENCY VIRUS

There are 2 forms of HIV, 1 and 2. The genome contains RNA and it is a retrovirus.

The HIV genome contains the genes: tat and rev along with nef, env, gag and pol.

Gp 120 is the major protein on the surface of HIV that interacts with host cells. It binds to CD4 receptors. HIV binds to cell surface CD4 but enters cells through chemokine co-receptors including CXCR4 and CCR5.

Viral protease (not host protease) cleaves products of gag and pol. Gag (group specific antigen) codes for antigens including Viral Capsid Antigen p24.

Pol (polymerase) codes for viral protease, reverse transcriptase and DNA POLYmerase.

Common organisms such as *entamoeba*, *salmonella*, *giarda*, *campylobacter*, *cryptosporidium*, *cyclospora*, *mycobacterium* and also viral causes can cause diarrhoea in **HIV positive patients**.

Opportunistic infections considered **AIDS defining diagnoses** are Pneumocystis, Mycobacterium avium intracellulare, CMV, cryptosporidium, JC virus (PMLE).

Pneumocystis jirovecii (carinii) may be identified on microscopy after
(a) methenamine silver staining which shows a cystic phase of the organism
(b) Giemsa staining which demonstrates sporozoites and trophozoites with small, punctate nuclei.

Pneumocystis pneumonia is the commonest AIDS defining illness in Europe. Interstitial shadowing which looks fluffy is common on the CXR which may be normal in appearance.

Mortality rate is around 20%, (not 50%) if untreated. Type I respiratory failure (hypoxia and low CO₂) is most common and can be treated with CPAP.

Prophylaxis with *co-trimoxazole* (or dapsone or pentamidine if allergic) is indicated when CD4+ counts are less than 200.

Progressive multifocal leukoencephalopathy (PML) is caused by chronic infection with JC virus, and causes white matter lesions in the brain. A CD4+ of <100 predisposes to the condition although it may occur at higher levels. JC virus invades oligodendrocytes, which manufacture myelin, causing demyelination. Hemiparesis, aphasia, cortical blindness, ataxia and altered mental state may occur with an insidious onset of dementia. Anti-retroviral therapy including a protease inhibitor is the main treatment for PML and *cidofovir* may also be used.

Antiretroviral therapy is initiated in asymptomatic patients when the CD4 count approaches 200. It is also initiated in patients with symptomatic disease and higher CD4 counts and considered in symptomatic seroconversion illness.

Protease inhibitors, such as **atazanavir**, **saquinavir**, **ritonavir** and **indinavir** (NB the exception is **abacavir** which is an NRTI) are associated with lipodystrophy, insulin resistance, and disturbed fat and glucose metabolism

Indinavir crystallises in the renal tract leading to renal impairment and stones

Nucleoside reverse transcriptase inhibitors (NRTIs) such as **AZT (zidovudine)** are associated with lactic acidosis, peripheral neuropathy, pancreatitis as a result of **mitochondrial toxicity**. **Lamivudine** is the least likely agent to cause symptoms and is generally well tolerated. **AZT (Zidovudine)** may cause bone marrow suppression leading to anaemia. It induces a grey discoloration of the nails in persons with pigmented skins. Peripheral neuropathy also occurs. It may also cause proximal myopathy. **DDI (Didanosine)** is a nucleoside analogue. It causes pancreatitis. **Abacavir** may cause a life-threatening hypersensitivity reaction including rash, diarrhoea and fever.

Non-nucleoside reverse transcriptase inhibitors (NNRTIs) inhibit reverse transcriptase non-competitively. **Nevirapine** may cause Stevens Johnsons syndrome/ rash and deranged LFTs. **Efavirenz** may cause severe depression and deranged LFTs.

VACCINES

Live vaccines (attenuated) – easiest to memorise these (all others=inactivated)

BCG

Mumps

Measles

Rubella

Yellow fever

Smallpox

Oral polio vaccine (this is a live vaccine) should not be given immunosuppressed children, their siblings or household contacts. Besides the "live" oral polio vaccine (Sabin), there is also an inactivated (**killed**) polio vaccine (Salk) given by injection which protects against polio after several shots.

Other vaccines

Meningococcal A/C +- W135 is a polysaccharide vaccine.

Cholera and hepatitis A are both inactivated viral vaccines.

Tetanus is a toxoid.

The **UK immunisation schedule** is :

Haemophilus influenzae type b (Hib) 2, 3 and 4 months

Diphtheria/Pertussis/Tetanus (DPT)

Meningococcus Group C

Oral Polio vaccine (OPV)

Measles/Mumps/Rubella (MMR) 13 months

Further OPV, D/T at 5 years

BCG 10 - 14 years

Hepatitis B is also given to those at risk (those with infected family members)

Meningococcal Vaccines – recommended in those at high risk to exposures (contact or health workers), immunodeficiency and post splenectomy.

SEXUALLY TRANSMITTED DISEASES

Primary syphilis causes a chancre and inguinal lymphadenopathy in the first weeks.

Secondary syphilis (following few months) manifests as generalised lymphadenopathy, maculopapular rash (affecting hands and feet), fever, infectious papules around the perianal regions (condylomata lata) and snail track ulcers in the mucous membranes of the mouth. In **tertiary syphilis** (usually >2 years), gumma formation (granulomas) may occur cutaneously and in the mucosal region, liver, stomach and lungs. Cardiovascular syphilis may lead to aortic regurgitation as a result of a **dilated aortic root** and **quaternary syphilis** is manifested by neurological sequelae including general paralysis of the insane, focal neurology (syphilis is the "great imitator" and dementia).

Successful therapy may be monitored by a fall in VDRL or rapid plasma reagin (RPR) titre (if these were initially positive – 75% have positive VDRL in primary, 99% secondary and variable results in tertiary/quaternary syphilis).

In **toxocariasis**, granuloma forms around the larvae which are spread by dogs and cats. Fever, hepatomegaly and respiratory symptoms constitute visceral larval migrans. Treat with thiabendazole. Amoebiasis tends to abscess formation.

'**Elephantiasis**' affects the lymphatic system, causing swollen legs. The organisms are filariae called **Wuchereria bancrofti** or *Brugia malayi*. In acute infection, organisms

can be detected on a blood film, and filarial serology can be sent. Treatment is with diethylcarbamazepine (DEC) or ivermectin.

Gonorrhoeae infection. Can cause penile discharge and knee effusions with rash. The discharge and knee aspirate may grow gram negative diplococci. Treatment is with ceftriaxone IM single dose. Concurrent treatment for chlamydia should be given for 3-6 weeks, to include oral tetracycline 500 mg 4 times a day or oral doxycycline 100 mg twice a day.

A patient presenting with urethral discharge may have **gonococcal or non-gonococcal urethritis** (NGU). If there are no gram negative diplococci seen on microscopy, it is likely to be NGU.

The organisms causing NGU are as follows:

Chlamydia trachomatis 40% Ureaplasma urealyticum 20-40%

Trichomonas vaginalis (rare) < 2%

Candidiasis (rare) < 2%

Herpes simplex (rare) < 2%

The differential diagnosis of **genital ulceration** includes not only the lesions of chancroid, lymphogranuloma venereum and granuloma inguinale, but also those of herpes simplex virus infection and primary syphilis (**chancre**)

Multiple painful genital ulcers with localised lymphadenopathy may suggest **chancroid**, which is caused by Haemophilus ducreyi.

Treponema pallidum infection causes (syphilis), which presents as a solitary painless **chancre**.

Chlamydia trachomatis causes **lymphogranuloma venereum**, which presents as a painless ulcerating papule and regional lymphadenopathy.

Klebsiella granulomatis causes **Donovanosis**, which presents as a heaped up ulcerating lesion with prolific red granulation tissue on the external genitalia.

Trichomonas vaginalis is a protozoan. It is a very common sexually transmitted infection in the developing world. Men are only mildly symptomatic with urethritis and it is not a cause of genital ulceration.

HELMINTHS / WORMS

Note: Tissue invasive helminth (worm) infections may cause eosinophilia. Protozoan parasites e.g. malaria, amoebae do not.

Ascaris lumbricoides is a roundworm which infects the ileum and may cause GI symptoms. It also causes pneumonitis and bronchospasm when the larvae migrate via the bloodstream to the alveoli (Lofflers syndrome). Once mature they crawl back up the bronchi into the gut.

Ankylostoma duodenale/Necator americanis are hookworms. They hook to the intestine and secrete anticoagulants to ingest blood. They enter the lungs via lymphatics after penetration through the skin, and also ascend the bronchi to enter the gut when mature. *Cutaneous larva migrans*, caused by various Ankylostoma (hookworm) species is characterised by a slowly lengthening, serpiginous, intensely itchy rash. **Strongyloides** is a helminth which may be acquired both via the skin as with hookworms or by ingestion.

Taenia solium is the pork tapeworm which is spread by ingesting undercooked pork. The eggs of the worm spread through the gut, liver and encyst in the CNS, muscles and eye to cause cysticercosis. Hence it may result in epilepsy and cranial nerve palsy, muscle hypertrophy and blindness. It does not affect the lung. **Taenia saginata** is the beef tapeworm and does not cause cysticercosis.

Schistosoma larvae (cercariae) released from snails swim in water and penetrate human skin, enter the bloodstream to spread to both the lungs and liver. Hepatic and pulmonary fibrosis occurs and also the specific manifestations of the different species (mansoni, japonicum and haematobium).

Echinococcus is the cause of hydatid cysts. It is ingested into the gut after handling of dogs (dog tapeworm) and enters both portal and pulmonary circulation. Hydatid cysts and alveolar cysts form. Treatment of choice is surgical excision plus albendazole and praziquantel with a high risk of cystic rupture with metastatic spread of organisms and anaphylaxis.

MISCELLANEOUS

Amoebiasis is caused by *Entamoeba histolytica* is spread by faeco oral route. It can present months or even a year after infection. RUQ and referred pain to the shoulders (not always present) and fever are common presentations. RUQ discomfort may be worsened by alcohol.

Amoebic dysentery (bloody diarrhoea) is treated with oral **metronidazole** or **tinidazole**. Trophozoites invade the intestine to penetrate the liver via the portal circulation causing **liver abscess** (often without diarrhoea). Cysts cause re-infection and spread to other people (and do not reach the liver). Cysts are not treated with metronidazole and **diloxanide** may be used to eradicate these. Liver abscesses can be solitary or multiple and usually affect the right lobe. Liver abscesses require treatment with metronidazole. Surgical drainage is indicated if they are near to the capsule of the liver or very large.

Actinomyces is a gram positive bacillus which behaves like a fungus, causing actinomycetoma – deep tissue infection which is granulomatous. Nodules develop under the skin and erupt to discharge grains.

Nocardia is another gram positive bacillus which may appear acid-fast. It causes infection in immunosuppressed individuals causing “fungal-like” activity of mycetoma formation in the lungs and other organs. It is treated with co-trimoxazole.

Arthropod borne infections. Arthropods comprise of ticks, spiders and insects.

Babesiosis is transmitted by tick bites.

Trypanosomiasis is spread by the tsetse fly.

Yellow fever is spread by the Aedes mosquito.

Onchocerciasis (river blindness) is spread by blackflies. In onchocerciasis, there are skin nodules occurring due to an inflammatory reaction and also severe keratitis / conjunctivitis.

Loa loa is spread by the Chrysops fly and causes Calabar swellings and conjunctival worms which may be seen by the patient crawling across the eye.

Anthrax is caused by a gram positive, aerobic, bacillus called *Bacillus anthracis*. In humans, **cutaneous anthrax** commonly causes a painless, black, indurated eschar

typically with massive surrounding oedema. Mortality from cutaneous disease is 20% if untreated whereas inhalational anthrax may have a mortality of 90% if untreated.

Inhalational anthrax has a poor yield from sputum culture and characteristically causes a haemorrhagic mediastinitis. The prodrome includes high fever and rapid deterioration follows. Treatment is with IV penicillin. Prophylaxis is with ciprofloxacin.

Botulism typically produces a descending paralysis which starts with diplopia or blurred vision due to cranial nerve involvement, difficulty with accommodation and progresses to weakness of the neck, arms and respiratory muscles. Botulism is caused by the neurotoxins of *Clostridium botulinum* and in rare cases, *Clostridium butyricum* and *Clostridium baratii*. These gram-positive spore-forming anaerobes can be found in soil samples and marine sediments throughout the world. Therapy consists of approximately 10,000 IU of antibodies against toxin types A, B, and E to neutralize serum toxin concentrations, and also supportive care (e.g. ventilation). It may be acquired by ingestion of toxin or more commonly in the UK wound infection as a result of intravenous drug use.

Brucellosis is caused by G –ve coccobacilli which spread through untreated milk and raw beef and may affect all systems. *B. abortus* (cattle), *B. suis* (swine), *B. melitensis* (goats), *B. canis* (dogs) are the different organisms. Detection of brucella requires extended blood culture of up to 6 weeks. Leucopenia is common. Detection of Brucella agglutinins also helps confirm the diagnosis. Spondylitis or osteomyelitis, endocarditis, pneumonia, liver granuloma and jaundice and pyelonephritis. Treat with doxycycline and rifampicin or aminoglycoside for synergistic effect.

Diphtheria: *Corynebacterium diphtheriae* causes **diphtheria**. It is a gram positive rod. It may present with sore throat, fever and lymphadenopathy, heart failure or neurological damage. A greyish pseudomembrane can also form on affected areas such as the skin, pharynx and conjunctivae. The illness is still present in Eastern Europe and Russia. Treatment is with diphtheria antitoxin, penicillin or erythromycin.

Klebsiella pneumonia is a disease commonly affecting middle aged to older men with alcoholism. *Klebsiella pneumonia* characteristically affects one of upper lobes of the lung. There is an increased tendency toward abscess formation.

Mycoplasma pneumoniae infections have a more insidious onset, affect younger patients e.g. in barracks and is associated with systemic symptoms esp headache.

Legionnaire's disease is usually due to infection with **Legionella pneumophila** type 1. Male sex, smoking, high alcohol intake, pre-existing immunocompromise and COPD are risk factors. Rifampicin alone increases resistance and is not as effective as 3 weeks of erythromycin

Leishmaniasis (Kala Azar) is spread by bites from sandflies. Cutaneous lesions can occur at the site of the bite. Visceral leishmaniasis can occur, causing massive hepatosplenomegaly. Smears from bone marrow/spleen show Donovan bodies (amastigotes of *Leishmania donovani*).

Cutaneous leishmaniasis may be divided into that of the Old World (Africa, Mediterranean, Afghanistan) and cutaneous leishmaniasis of the New World (Central and South America). Cutaneous leishmaniasis can be caused by several *Leishmania*

species, including *L. braziliensis*, *L. mexicana* and *L. panamensis*. The incubation period is variable, ranging from 2 weeks to several months.

Cutaneous leishmaniasis of the Old World heals in 4-18 months leaving a scar. No serious sequelae occur. It may be left alone but is usually treated with intra-lesional sodium stibogluconate therapy. New World cutaneous leishmaniasis should be treated due to the risk of **muco-cutaneous disease** and sodium stibogluconate is given intravenously.

Visceral leishmaniasis is most commonly caused by *Leishmania donovani*. Fever, malaise, anaemia, weakness and weight loss are common. Hepatosplenomegaly develops gradually and the skin may become grey.

Listeria monocytogenes is an aerobic and facultatively anaerobic gram-positive bacillus. The risk of listeriosis is markedly increased in immuno-compromised patients, particularly among those undergoing renal transplantation, receiving high doses of corticosteroids, or suffering with AIDS or cancer. Ampicillin or penicillin has generally been recommended as the treatment of choice. It causes septicaemia in pregnant women and meningitis in older men.

Neurocysticercosis is caused by **Taenia solium** (pork tapeworm). There may be seizures due to localised inflammation that accompanies their degeneration in the cerebral cortex when calcified cysts occur. This disease is found in South America and Asia. Neurocysticercosis typically is benign, and most lesions resolve spontaneously within 2-3 months. CT or MRI of the head may show granulomatous cysts. An enzyme-linked immunotransfer blot (EITB) assay of a patient's serum may confirm the diagnosis. Approximately 65-80% of children diagnosed with neurocysticercosis present with seizures, most often focal in nature. Increased intracranial pressure (due to hydrocephalus, which can occur in 15-25% of cases) causes other common clinical symptoms, including headache, nausea, and vomiting. *Albendazole* is the recommended treatment.

Lyme disease is caused by Ixodes tick bites spreading *Borrelia burgdorferi*. A target-like rash called *erythema chronicum migrans* is associated. Arthralgia, heart block and meningitis (sometimes with bilateral VII nerve palsy) may occur. Treatment is with doxycycline orally or IV ceftriaxone for complicated cases.

Pasteurella multocida is found in the snouts of both dogs and cats. Soft tissue infection results following bites and may progress to tenosynovitis, osteomyelitis or lymphangitis depending on the site of the bite. Drug therapy is with co-amoxiclav.

Pertussis (Whooping cough) is caused by the gram negative bacterium *Bordetella pertussis*. Infection is characterised by paroxysms of coughing. Lymphocytosis is commonly seen. Hemiplegia/hemiparesis is a recognised consequence of severe whooping cough.

Pseudomembranous colitis (*Clostridium difficile*) is rare with aminoglycosides, probably because they have little activity against anaerobic gut flora. Long-term therapy and renal impairment increase the risk of ototoxicity. Neutropenia and aplastic anaemia may be seen. Nephrotoxicity is usually of an ATN/proteinuria type and is usually reversible on withdrawal of the drug.

Psittacosis is caused by *Chlamydia psittaci*. It is spread by all sorts of birds, not just pigeons or parrots. Children are less predisposed than adults to the disease. Treatment is with tetracycline or doxycycline.

Q fever is due to *Coxiella burnetii* and is acquired via animal contact. It is not notifiable, but can occur in outbreaks in farming communities and in abattoirs. Treatment is with prolonged courses of tetracyclines.

Rickettsioses range in severity from diseases that are usually relatively mild (rickettsial pox, cat scratch disease, and African tick-bite fever) to those that can be life-threatening (epidemic typhus, Rocky Mountain spotted fever, and Oroya fever). They are often characterised by rash, an eschar and maculopapular rash.

Schistosoma haematobium infection is associated with eosinophilia. The sexual replication stage may occur in humans or other animal hosts. The asexual stage occurs in snails. Although most of the eggs are laid by the parasite in the bladder (cystitis, granulomas, haematuria), some are deposited in the rectum and a rectal biopsy may yield the diagnosis. The larvae can travel to the lungs and cause pulmonary hypertension.

Hepatomegaly is more typical of **S mansoni** and **S japonicum** rather than haematobium.

Scabies is spread by *Sarcoptes scabiei*. It is spread by contact only. Effective agents are benzyl benzoate, ivermectin and permethrin (Lyclear solution).

Staphylococci and Streptococci:

Benzylpenicillin will cover Streptococci and **flucloxacillin** will cover Staph aureus.

Staphylococcus aureus has the ability to colonise the nasopharynx and/or skin or cause a wide variety of clinical diseases. Its major disease manifestations include: cellulitis

osteomyelitis and septic arthritis

other suppurative infections e.g. intra-abdominal abscesses, perinephric abscesses, empyema or paraspinal abscesses

septicaemia and endocarditis

respiratory disease including pneumonia and empyemas

toxin related disease – toxic shock syndrome, food poisoning, scalded skin syndrome

The presentation of pyrexia, shock, diarrhoea and vomiting, myalgia, desquamating rash and mucous membrane involvement is consistent with **toxic shock syndrome**. It can also present with abnormal liver and renal function, as well as thrombocytopenia. Toxic shock syndrome can be caused by both staphylococcus (tampon related or skin infection) and streptococcus (skin infection).

Streptococcus bovis usually enters the bloodstream via the gastrointestinal tract. Nearly all patients with *S bovis* endocarditis are older than 50 years, and there is also an association with malignancy of the GI tract. Treatment is with penicillin or vancomycin and gentamicin.

Toxoplasmosis causes microcephaly rather than macrocephaly. Choroidoretinitis, cerebral mass, lymphadenopathy and myocarditis also occur. Lymphadenopathy is

earliest typical feature of this parasite which is spread by cats. It typically causes neurological damage and ocular damage. Cysts are found in cat faeces in soil and multiply intracellularly as tachyzoites after spread through the gut, bloodstream and lymphatics.

Treatment is with Pyrimethamine and Sulfadiazine.

Tuberculosis : The BTS guidelines recommend that a six month regimen comprising rifampicin, isoniazid, pyrazinamide, and ethambutol for the initial two months followed by rifampicin and isoniazid for a further four months is a standard treatment for adult respiratory tuberculosis.

Pyridoxine is also given with the therapy. Isoniazid may cause pyridoxine and nicotinic acid deficiency due to its effect on the liver.

Tetanus sometimes known as lockjaw is a disease manifested by uncontrolled spasms, due to the introduction of *Clostridium tetani* toxin into tissues. Skin punctures, contaminated wounds with soil, dust, burns have played a role in the development of the disease. The spores produce a neurotoxin (**tetanospasmin**) which causes severe spasm all over the body which leads to painful muscle contraction and laryngeal spasm which interfere with breathing and muscle tears.

The incubation period is typically between 1-2 weeks. Vaccination with tetanus toxoid has been proved to be effective since its introduction in 1920's. Booster immunization to whom has been injured it is advisable for those who the last immunization received was about 10 years or more. The conventional treatment of severe tetanus which is supportive along with penicillin, is still the most effective treatment.

Typhoid fever: Positive cultures may be obtained from blood, bone marrow, urine, faeces, rose spots and bile.

Whipple's disease typically presents as a gastrointestinal illness caused by the organism *Tropheryma whippei*. The illness is characterized by diarrhea, abdominal cramps, and sometimes frank malabsorption. If gastrointestinal disease is prominent, duodenal biopsy is performed, it often yields evidence of *Tropheryma whippei* by light microscopy, electron microscopy, or PCR, allowing the diagnosis to be substantiated.

Histopathologically, one sees macrophages containing periodic acid-Schiff (PAS)-positive material. The characteristic rod-shaped intracellular organism is seen by electron microscopy.

Current recommendations are for a two-week course of intravenous ceftriaxone, to be followed by one to two years of double-strength oral trimethoprim-sulfamethoxazole.