

MMed and DCH Lectures

Weekly by Zoom

Prof Trevor Duke

MMed and DCH Lectures

Neglected tropical diseases in children

Monday 31st August 2020

Prof Trevor Duke

WHO list of NTDs

- Buruli ulcer
- Chagas disease
- Dengue and Chikungunya
- Dracunculiasis (guinea-worm disease)
- Echinococcosis
- Foodborne trematodiasis
- Human African trypanosomiasis (sleeping sickness)
- Leishmaniasis
- Leprosy (Hansen's disease)
- Lymphatic filariasis
- Mycetoma, chromoblastomycosis and other deep mycoses
- Onchocerciasis (river blindness)
- Rabies
- Scabies and other ectoparasites
- Schistosomiasis
- Soil-transmitted helminthiasis
- Snakebite envenoming
- Taeniasis/Cysticercosis
- Trachoma
- Yaws (Endemic treponematoses)

Buruli ulcer

- Mycobacterium (*M. ulcerans*) infection of skin, soft tissue and bones
- Painless nodules on arm or leg (calves and ankles 70%), then patch of firm, raised skin >2cm across ("plaque")
- 4 weeks, affected skin sloughs off, leaving a large painless ulcer, with white-yellow base
- Toxin (myolactone)
- Contaminated soil and stagnant water
- Possums and mosquitoes involved in spreading the bacteria



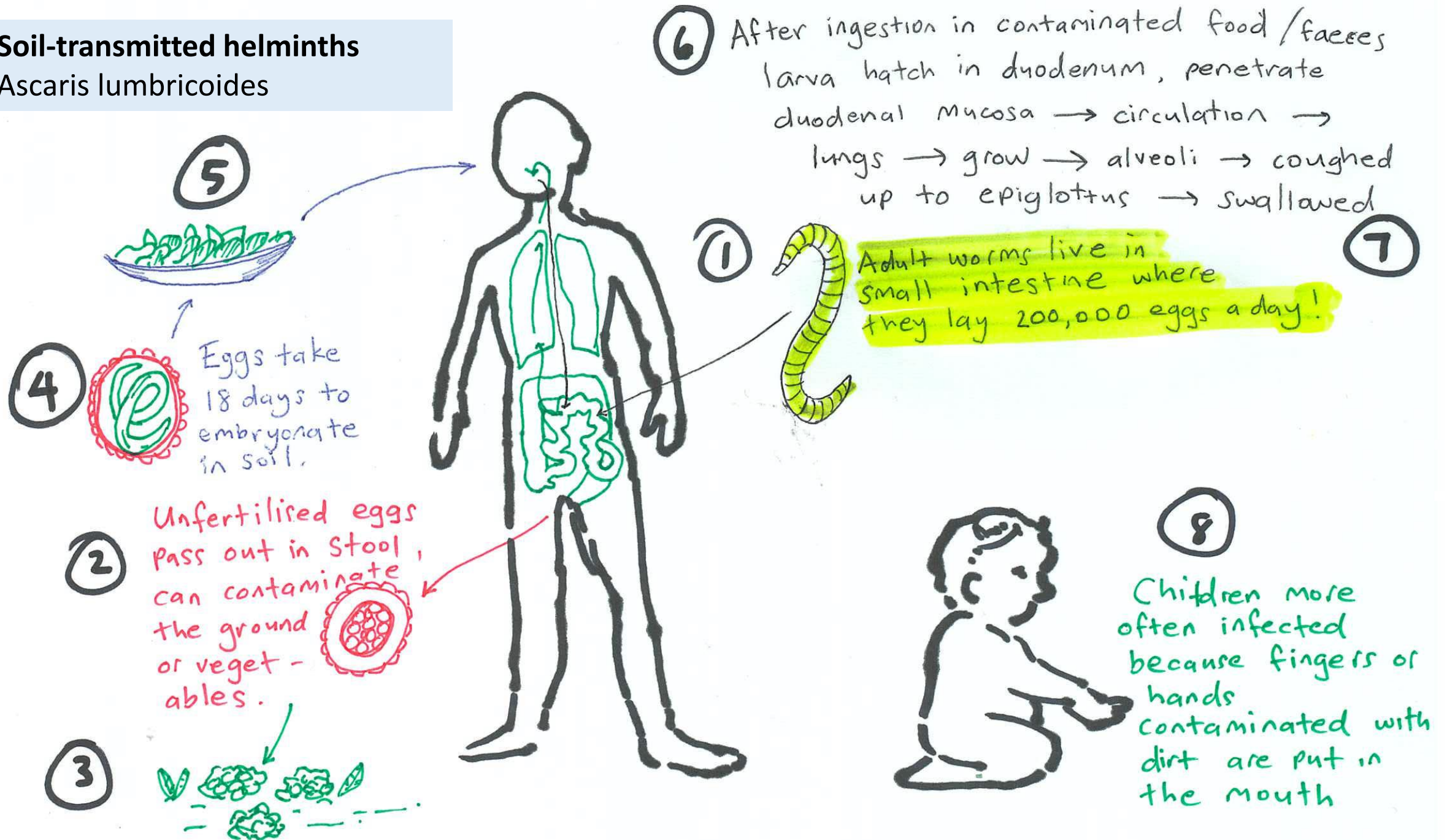
Diagnosis and treatment

- 1988 - 46 cases in East Sepik Province, mostly children <10 years.
- Clinical
 - Differential diagnosis – Staph ulcer, Diphtheria, fungal
- Acid fast bacilli by microscopy from swab of ulcer (Z-N staining)
- Rifampicin + clarithromycin – 8 weeks
- Options ciprofloxacin, ethambutol, azithromycin

Igo JD, Murthy DP. Mycobacterium ulcerans infections in Papua New Guinea. Am J Trop Med Hygiene. 1988; 38; 391-392

Soil-transmitted helminths

Ascaris lumbricoides



Ascaris lumbricoides

- Large round worm (15-30cm long), migratory
- Mechanical obstruction of small bowel, intussusception
- Appendicitis
- Obstruction of bile duct (jaundice, cholangitis) and pancreatic duct (pancreatitis)
- Laryngeal obstruction
- Lungs - eosinophilic pneumonia, wheeze, “Loffler's syndrome”
type-1 hypersensitivity reaction (IgE mediated)
- **Malnutrition, pot-belly, oedema**

Ascaris lumbricoides

- Risk factors
 - Eggs in soil contaminated by faeces, “night soil” on gardens
 - Young children most commonly affected
 - Fruits and vegetables not properly cooked, washed or peeled
- Eggs in stool
- Eosinophilia
- Treatment
 - Albendazole – broad-spectrum anthelmintic, active against hookworm and Strongyloides (and Tricuris to a lesser extent)
 - Mebendazole



Hookworm – necator americanus

- 59-83% of child population infected in PNG
- Mostly *Necator americanus* (*Ankylostoma duodenale* not found in PNG)
- Skin penetration of larvae (500 microns long with a pointed tail that can penetrate skin of the feet) → travel through subcutaneous venules and lymphatics → right heart → pulmonary capillaries → alveoli → airways → trachea → pharynx → swallowed → small intestine.

Shield JM. A comparative study of intestinal helminths in pre-school-age urban and rural children in Morobe province, Papua New Guinea. PNG Medical Journal 2013; 56; 14-31

Hookworm – clinical manifestations

- Mature hookworm can extract 0.05ml blood per day (necator), ankylostoma (0.2ml)
- Anaemia
- Poor growth
- Hypoalbuminaemia
- Abdominal pain, diarrhoea
- Impaired intellectual, and cognitive development
- Vitamin A deficiency
- Diagnosis
 - Clinical
 - Ova in stools



Hookworm treatment

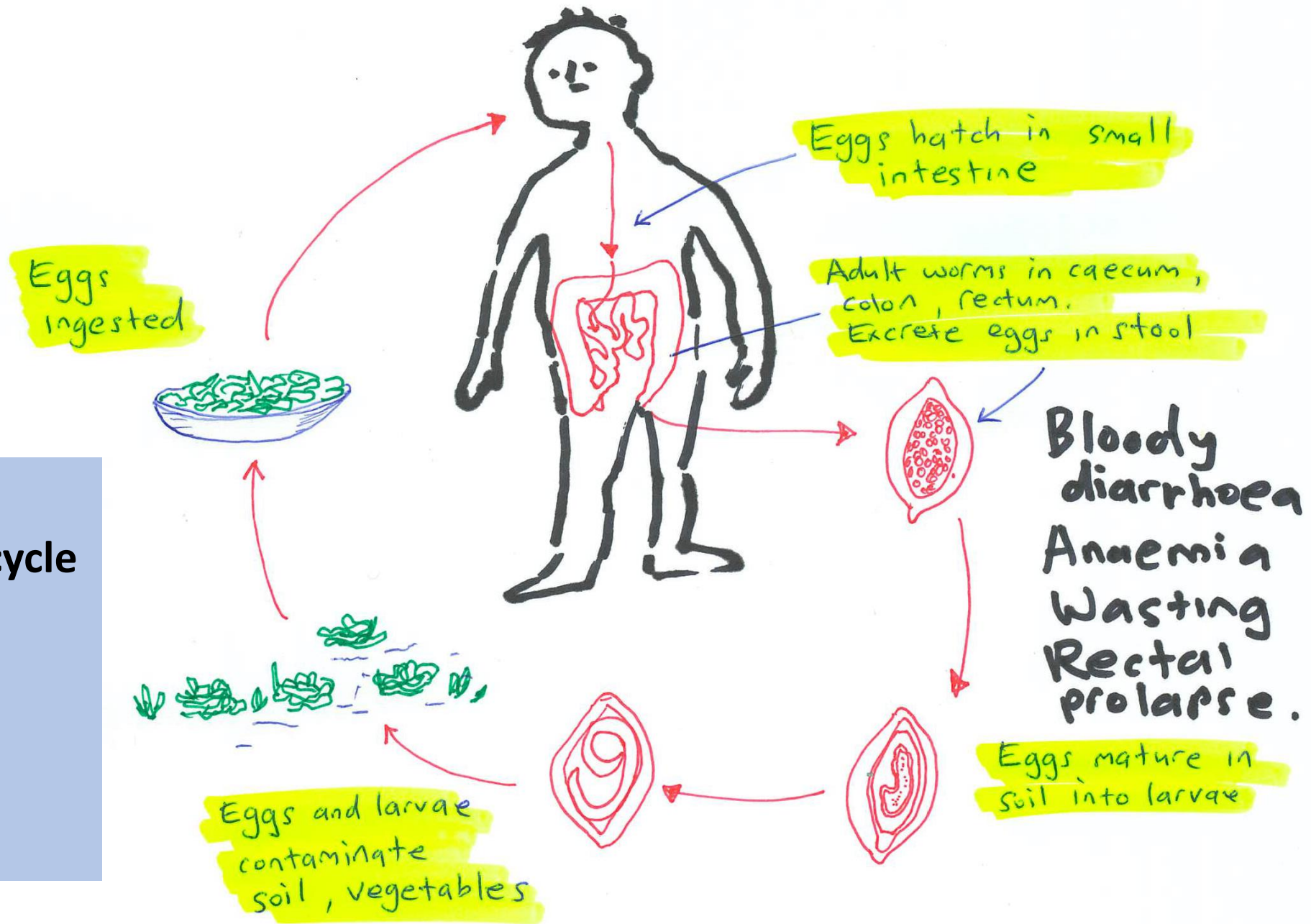
- Replace iron – ferrous sulphate
- Ascorbic acid (vitamin C) to increase iron absorption
- Albendazole
- Mebendazole – broad spectrum anti-helminth (hookworm, Ascaris, Tricuris).
- Footwear (not flip-flops)



Whip worm (*Trichuris trichiura*)

- Adult worms in large bowel (caecum, colon, rectum) – rectal prolapse
- Dysentery (but no fever)
- Iron deficiency anaemia
- Wasting
- Eosinophilia
- Diagnosis
 - Eggs of direct faecal smear
 - Rectal prolapse
- Mebendazole ideal 100mg BD x 3 days
- Albendazole 400mg adult x 3 days - q50%+ cure

Whip worm
Trichuris life cycle
No cutaneous
migration or
blood or lung
phases, all GI



Strongyloides

- *Strongyloides stercoralis*
 - 27% of PNG children positive (81% under 1 year of age)
- In addition to the extrinsic life-cycle in soil, Strongyloides can complete a life cycle inside the intestine (larva re-enter intestinal mucosa or through perianal skin – “autoinfection”).
- Especially if immune compromised (HIV). WW II veterans.

Strongyloides

- *Strongyloides fuelleborni kellyi* – swollen belly syndrome (Kanabea in Gulf Province, and Madang)
- Can be vertically transmitted (mother → baby trans-placental or breast milk) – accounts for young infants infected

Vince JD, Ashford RW, Gratten MJ, Bana-Koiri J. Strongyloides species infestation in young infants of Papua New Guinea: association with generalized oedema. PNG Med J 1979;22:120-127

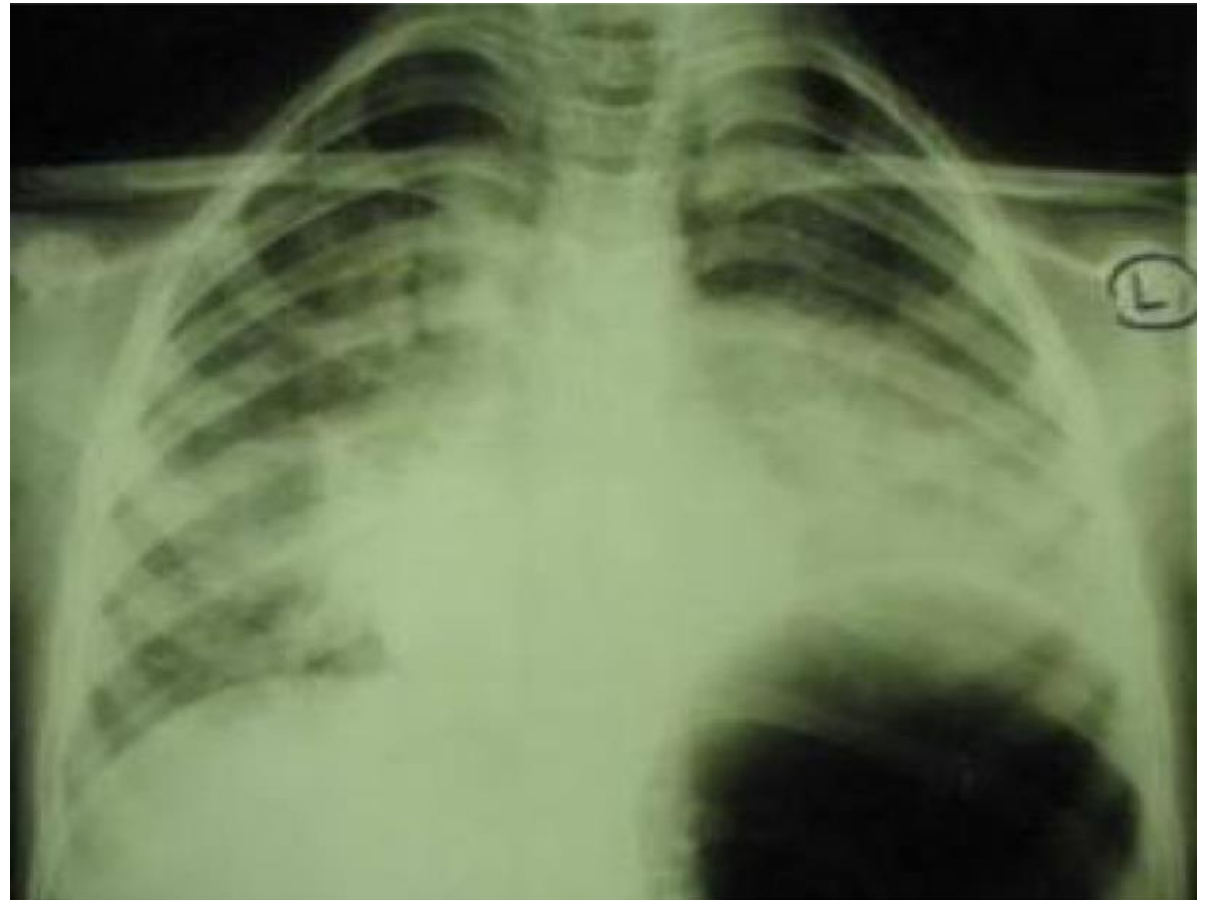


Strongyloides

- Most *Strongyloides stercoralis* infections trivial, unless immune compromised
- Itchy eruption migrating lesions in skin “larva currens”
- Cough and wheeze
- Abdominal pain, diarrhoea, steatorrhoea (malabsorption)
- Weight loss

Strongyloides: hyperinfection syndrome

- Diarrhoea
- Paralytic ileus
- Gram negative septicaemia
- Serous effusions
- Bacterial peritonitis
- Cough, wheeze, dyspnea, haemoptysis
- Encephalitis (larva in brain)



Strongyloides – diagnoses and treatment

- Clinical, eosinophilia, fat malabsorption
- Stool microscopy for motile larvae or eggs
- Stool culture – grow larvae
- Treatment
 - Albendazole 400mg (adult) x 3 doses



Albendazole

- Benzimidazoles: 1960s plant fungicides and then veterinary anthelmintics
- Thiabendazole first human drug, then mebendazole, flubendazole, albendazole, triclabendazole
- Mechanism of anti-helminth action:
 - Metabolic disruption of parasite at different sites, most of sites of energy production
 - Kills the adult stages of gut-dwelling helminths, kills or sterilises eggs, and kills larvae

Albendazole

- Highly effective broad-spectrum antihelminthic drug
- Many helminths (hookworm, Ascaris) are treated with a single dose
- Recommended dose for *Strongyloides stercoralis* infection is 400 mg daily for 3 days
- Less effective against Trichuris – mebendazole better

Tinidazole and metronidazole

- 5-nitroimidazoles
- **Anti-protozoal**
 - Gastrointestinal: Giardia, Entamoeba histolytica
 - Reproductive system: Trichomonas, gardenerella
- Antibiotic – *only anaerobes* (e.g. *Bacteroides fragilis*)
- No effect on helminths

Yaws (Endemic treponematoses)



Courtesy of Oriol Mitjà, MD.

Yaws (Endemic treponematoses)

- *Trepanema pallidum* subspecies *pertenue*
- Endemic in PNG and Pacific Islands
- TPHA / RPR positive in 19% of children in Western province
- 5% have evidence of yaws bony lesions



Papilloma of
primary yaws

Marks M. Epidemiology of yaws in the Solomon Islands and the impact of a trachoma control programme
London School of Hygiene & Tropical Medicine; 2016.

Yaws (Endemic treponematoses)



Tertiary yaws (bone,
subcutaneous nodule)



Courtesy of Oriol Mitjà, MD.

Yaws (Endemic treponematoses)

- Spread by direct contact
- Ulcers contain large numbers of organisms
- Incubation period 2-8 weeks
- Differential diagnosis:
 - *Mycobacterium ulcerans*
 - Tropical ulcers: infected scratch, trauma, insect bite: *Fusobacterium* spp; *Bacillus fusiformis*; *Treponema vincenti*; *Escherichia coli*; Enterococcus: tetracycline + metronidazole
 - Leprosy
 - Syphilis
- Swab – spirochetes visible on dark field microscopy – rarely done
- TPHA – stays positive for life
- VDRL and RPR (non-Trepanemal antigens) becomes negative with successful treatment

Yaws (Endemic treponematoses)

- Treatment
 - Azithromycin single dose: 30 mg/kg (max 2g); as effective as intramuscular benzathine benzylpenicillin
 - Benzathine penicillin
- Community control
 - <5% treat immediate family
 - 5-19% treat all children in village and any adults with clinical disease
 - 20% + treat all the community

Poverty and NTDs – a cycle

- Poverty – poor housing, sanitation, water supplies, poor food preparation, no footwear
 - Infections – iron deficiency, anaemia, cognitive impairment, poor school performance, micronutrient deficiency, wasting, poor development→
 - Poverty
-
- MDA – Albendazole, ivermectin
 - Public health policies, housing, sanitation, water supplies
 - Economic development, education