

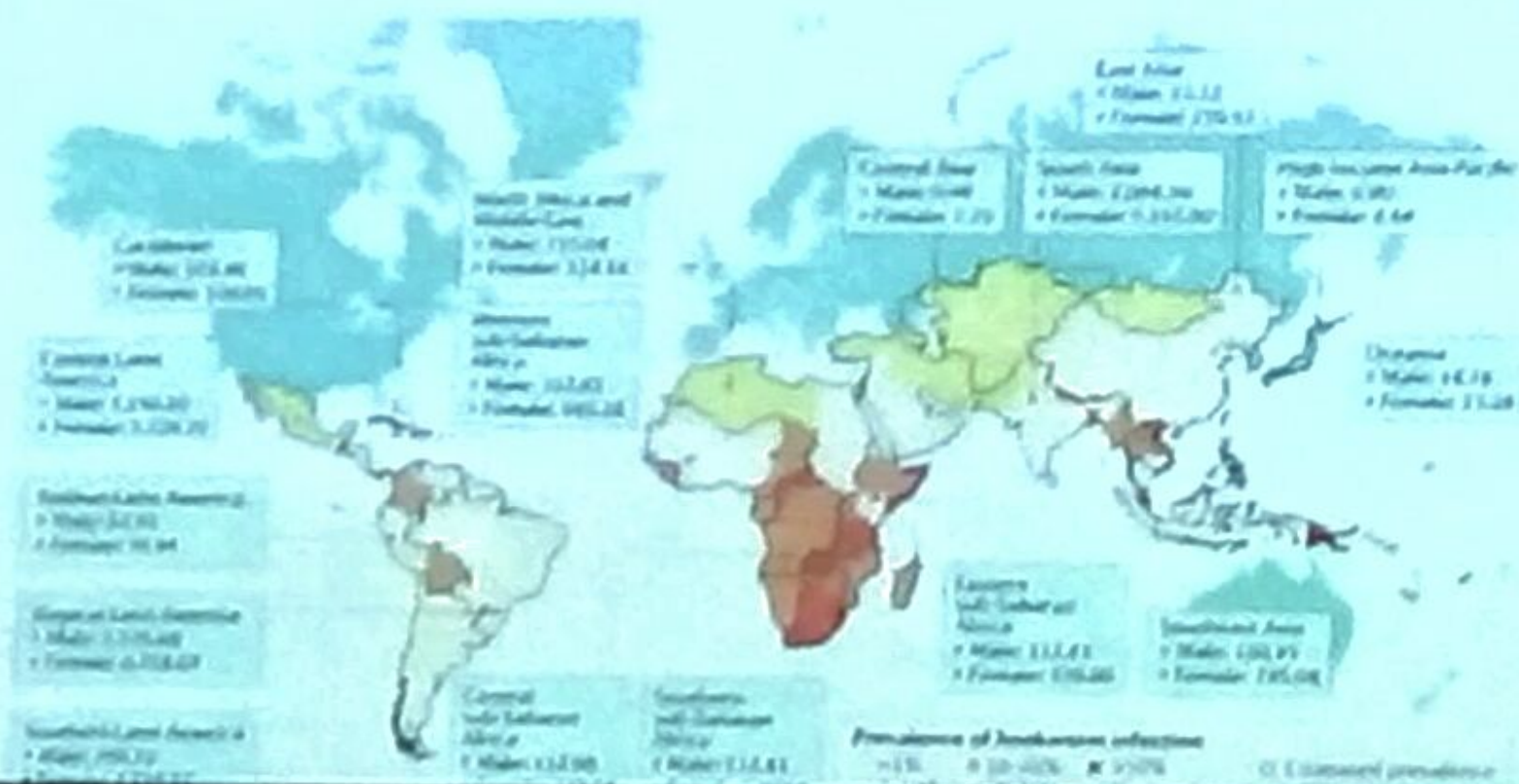
HELMINTHOLOGY

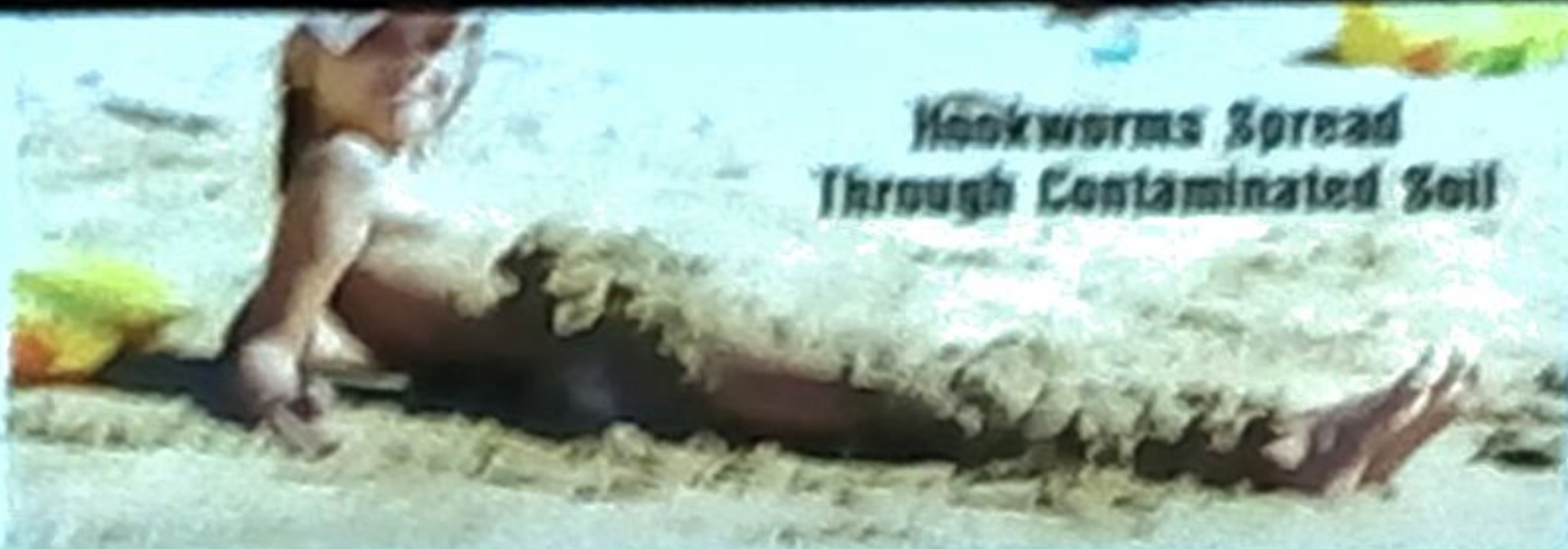
PHYLUM NEMATODA

Kariuki Njaanake

Hookworms (*Ancylostoma duodenale* & *Necator americanus*)

Epidemiology



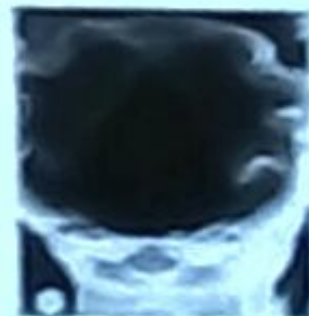
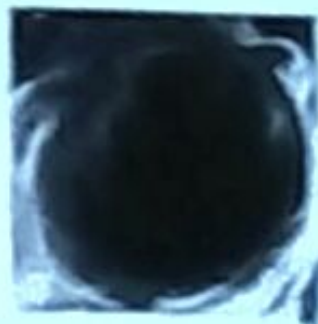


Hookworms Spread Through Contaminated Soil

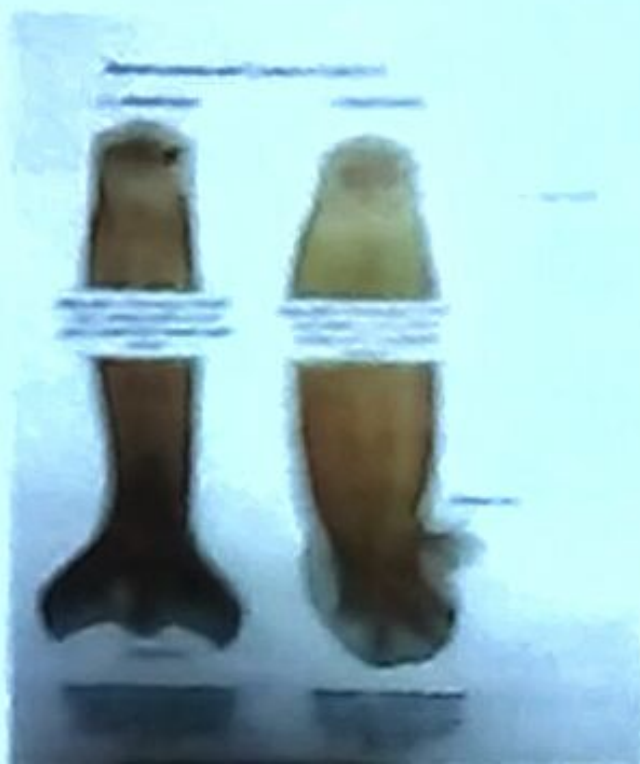
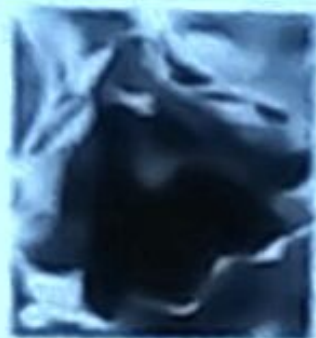
- *Transmission mainly depends on the presence of suitable environmental conditions (23 and 30 °C)*
- *Sturdy, well-aerated soils are also required (course clay or sandy soils)*
- *Proper hygiene and sanitation*

General Morphology

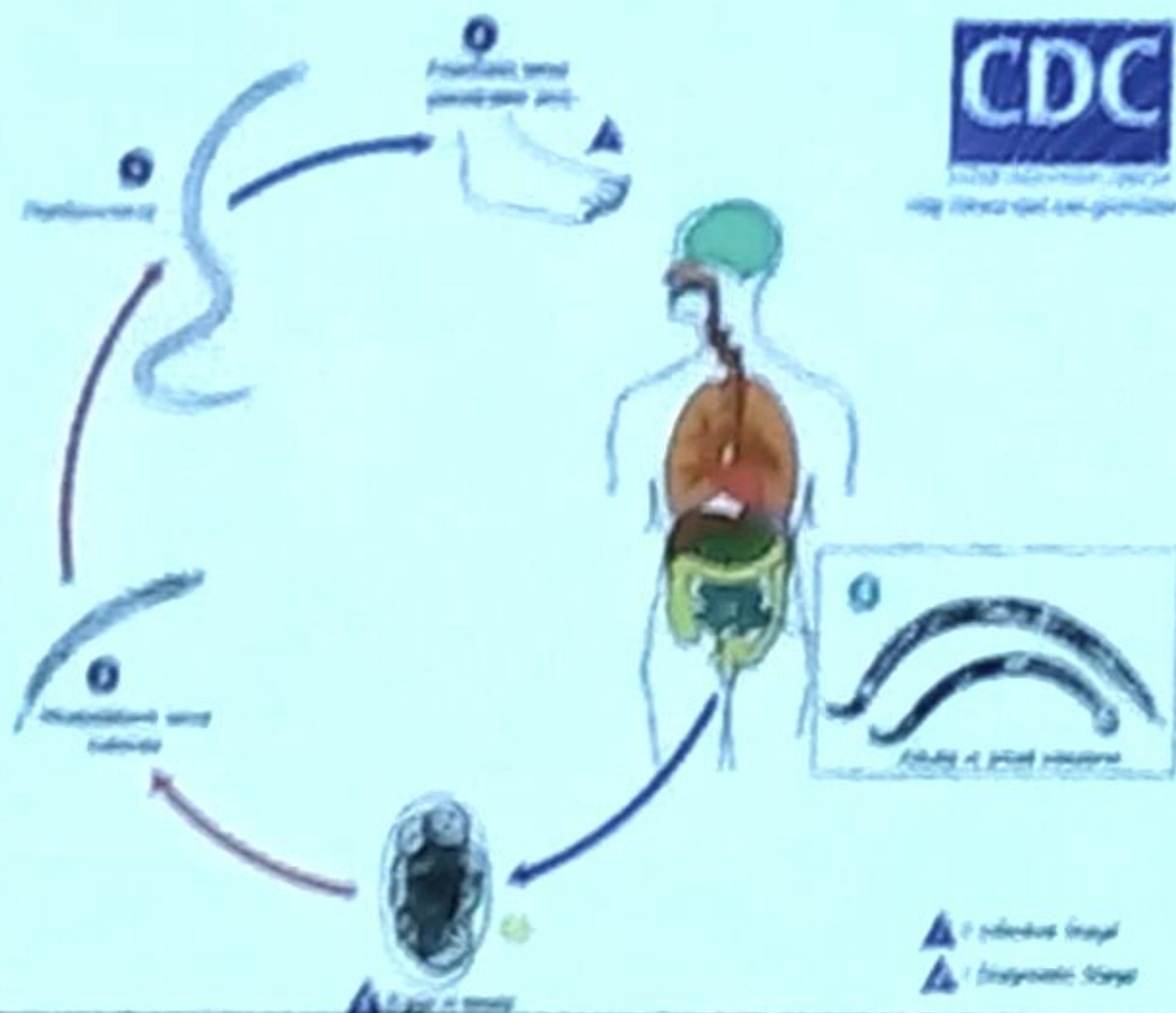
- Stout with the anterior end curved dorsad
- Buccal cavity large and heavily sclerotised
- Armed with teeth (*A. duodenale*), or cutting plates (*N. americanus*)
- Oesophagus stout and has a swollen anterior bulb (i.e. club-shaped)



- Male worms - copulatory bursa
- Lateral lobes joined by a small dorsal lobe
- Lobes supported by fleshy rays
- Usually, there are simple similar needle-like slender spicules



The life cycle of Hookworms



a) Cutaneous phase

- During larval penetration, lasts 1 – 2 wks;
- More common in *N. americanus*
- Urticaria, ground itch (ancylostome dermatitis)
- Exacerbated by pyrogenic bacteria in the larvae



b) Pulmonary phase

- Larvae break through the blood vessels in to the alveoli
- Bronchitis & bronchopneumonia
- Marked eosinophilia
- Haemorrhage, which is serious in massive infection
- Symptoms like severe dry cough and pneumonitis

c) *Intestinal phase*

- Adult worms in the intestines.
- Worms repeatedly cut intestinal mucosa
- Secrete anticoagulants
- Anaemia
 - Worms feed on blood (*A. duodenale* - 0.26 ml; *N. americanus* - 0.03 ml)
 - Loss of iron - hypochromic microcytic anaemia
 - Loss of vitamin B₁₂ and folic acid deficiency - macrocytic anaemia
 - Dimorphic anaemia
 - Severity Depends on number and species of hookworms



- Nephritic syndromes – proteinuria & loss of plasma proteins

Clinical manifestations

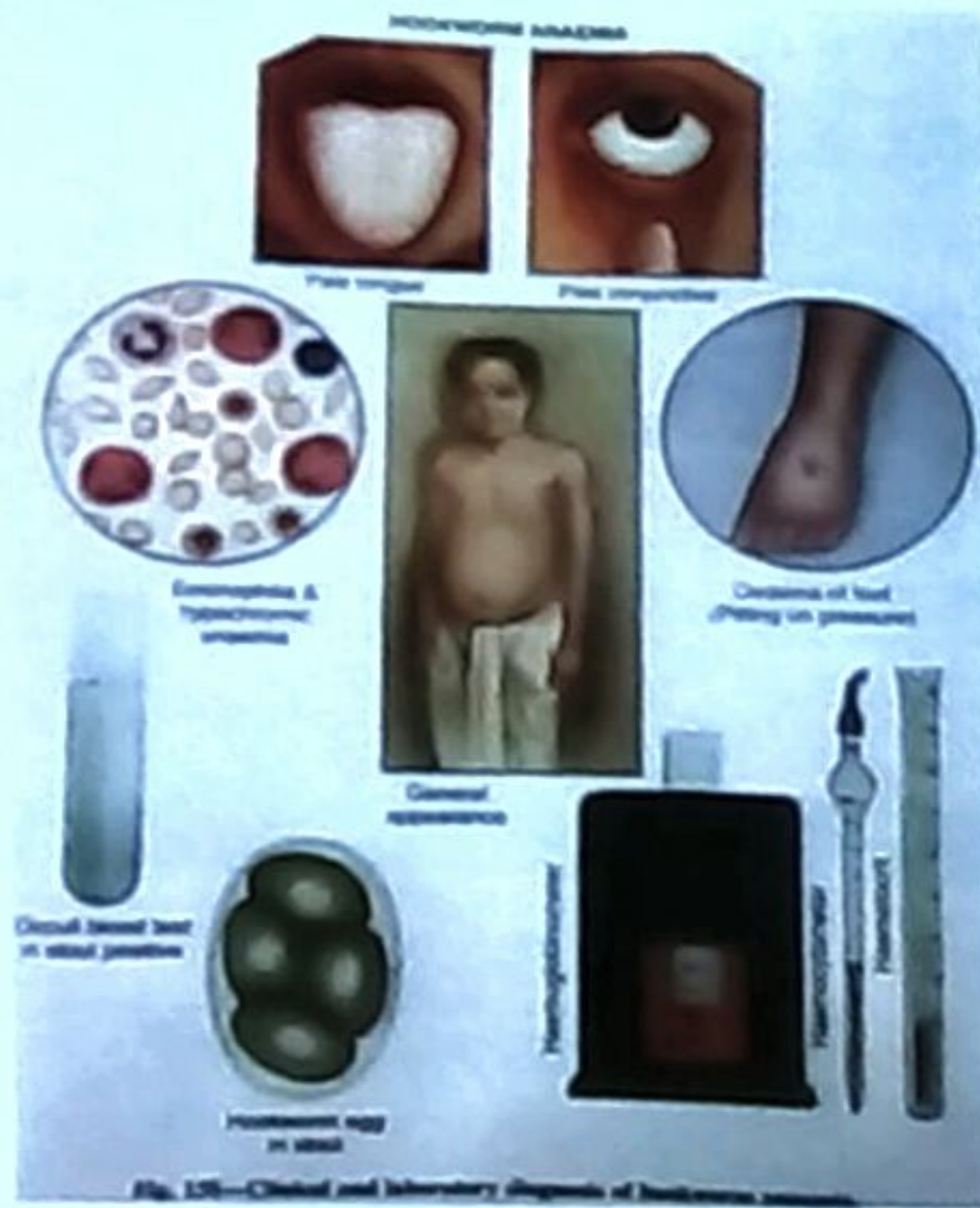
i) Gastrointestinal manifestations

- Intermittent abdominal pains
- Epigastric tenderness (duodenal ulcers)
- Constipation
- Anorexia
- Blood-flecked faeces

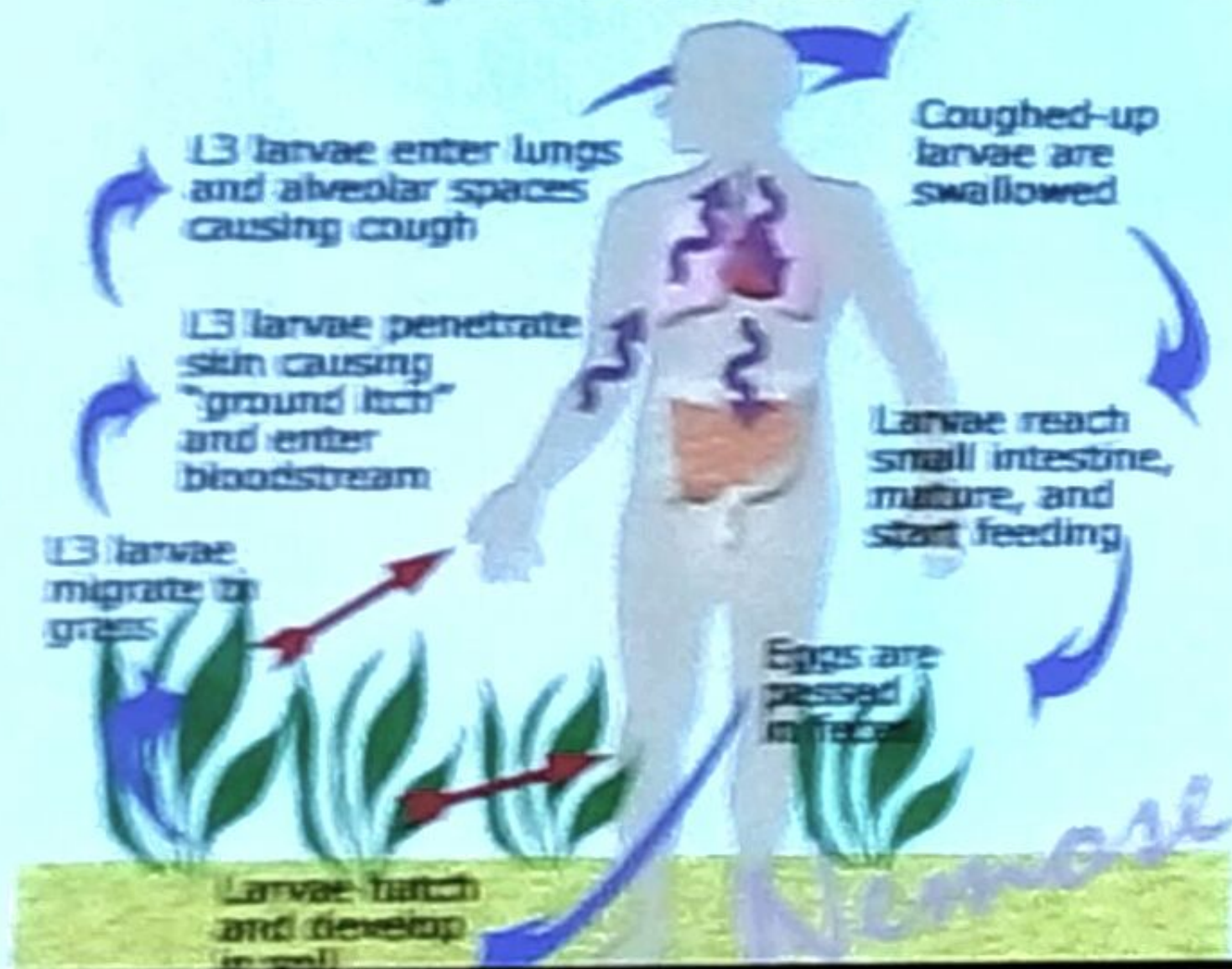
ii) Effects of anaemia

- Pallor – eyes, lips & tongue
- Light yellow and dry skin
- Dry hair

- Oedema (usually facial but may be generalised)
- Puffy face & swollen eye lids
- Potbellies due to ascites
- Koilonychia
- Stunted growth and general malaise
- Acute mental distress
- Mental dullness
- Delayed puberty
- Heavy infections - heart failure



Life cycle of hookworms



Diagnosis

i. Indirect (Clinical) diagnosis

- Blood haemogram – anaemias (hypochromic, macrocytic or dimorphic)

ii. Direct method:

Stool examination

(a) macroscopic (adult worms)

(b) microscopic (eggs)

(c) larval worm



Treatment:

a) Expulsion of adult worm

- Albendazole
- Mebendazole
- Thiabendazole
- Pyrantel pamoate

b) Larvae

- Thiabendazole (migratory or dormant larvae)
- Levamisole (less effective against *N. Americanus*)

c) Treatment of anaemia

- Iron supplements
Folic acid & vit B₁₂ in some cases

Control

- a) Treatment
- b) Proper sewage disposal
- c) Disinfection of faeces or soil
- d) Personal protection
- e) Vaccine?

