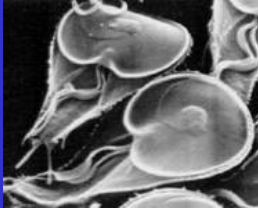


BioMedical Parasitology

Enteric flagellates

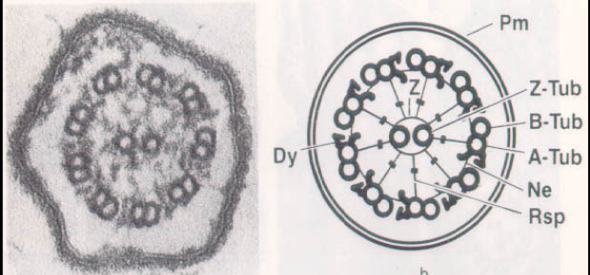


Prof Peter O'Donoghue

1

Flagella (undulipodia)





- extension of cell
- membrane bound
- 2+9 microtubular core



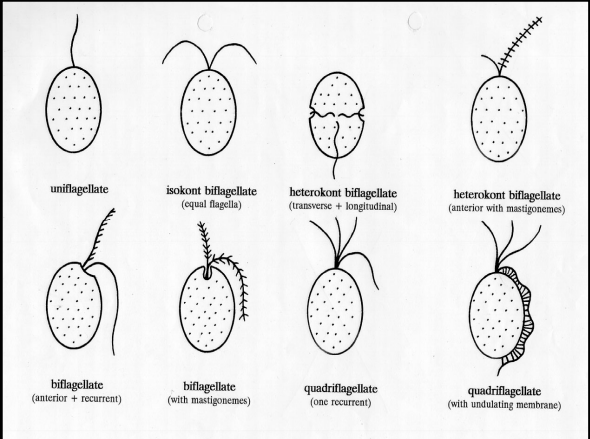
4

PROTOZOA

65,000 species
(31,250 extant + 33,750 extinct)

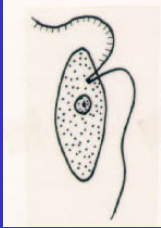
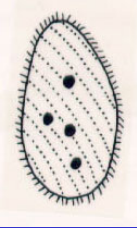

flagellates	amoebae	sporozoa	ciliates
			
6,900 species	11,550 species	5,600 species	7,200 species
5,100 free-living 1,800 parasitic	11,300 free-living 250 parasitic	all parasitic	4,700 free-living 2,500 parasitic

2



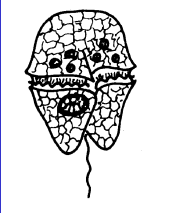
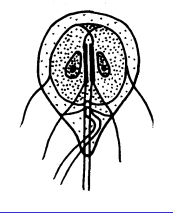
5

SARCOMASTIGOPHORA

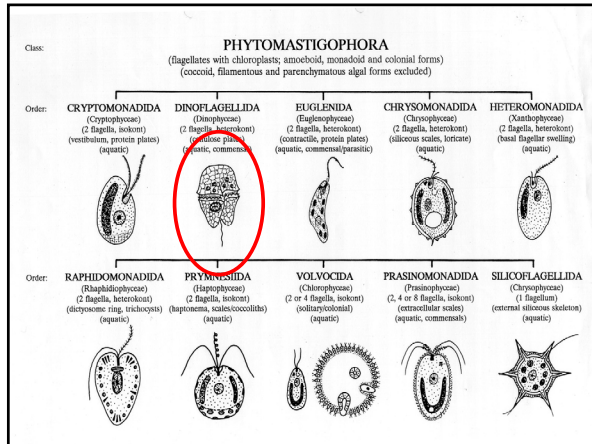
MASTIGOPHORA (flagella)	OPALINATA (flagella)	SARCODINA (pseudopodia)
		

3

FLAGELLATES (2+9)

Phytoflagellates (with chloroplasts)	Zooflagellates (without chloroplasts)
	
(free-living)	(commensals/parasites)

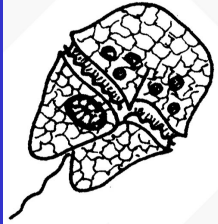
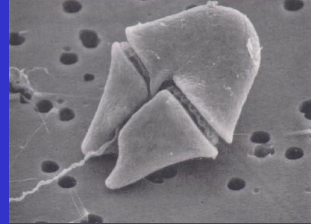
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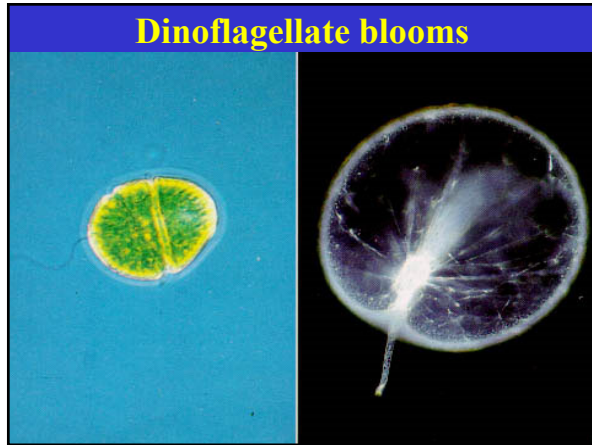
7

Paralytic shellfish poisoning

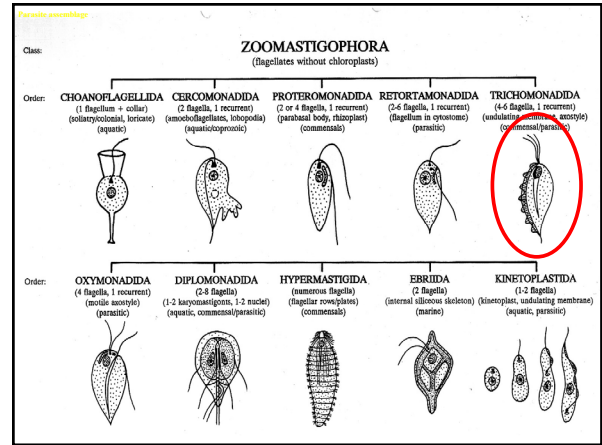
- dinoflagellate blooms (e.g. *Gymnodinium*)
- plankton taken up by filter-feeding shellfish
- minute traces of toxin sequestered in flesh
- toxin acts on nervous system of mammals

10



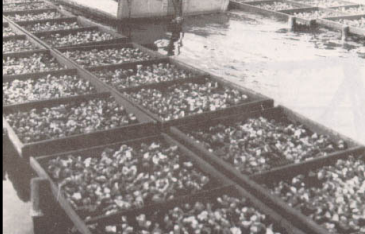

8



11

Oysters

- culture: shell beds, sticks, trays, bags, longlines
- sedentary bivalve - filter feeder
- feed on planktonic algae (incl. dinoflagellate)

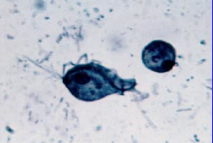




9

Trichomoniasis

Parasitic problem

- venereal disease
- medical impact: wrongly dismissed as benign chronic sequelae
- veterinary impact: bovine infertility abortifacient

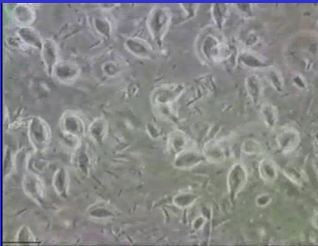



12

Parasite morphology

Trichomonas spp.

- protozoan parasite
- zooflagellate
- trophozoite stage only
- 2-20 μm
- micro-aerotolerant
- amitochondriate
- hydrogenosomes
- 3+ anterior flagella plus recurrent flagellum and undulating membrane




13

Parasite pathogenesis

T. vaginalis in humans

- infections in males
 - in urethra (sometimes prostate)
 - often asymptomatic
- infections in females
 - in vagina (likes acidic environment)
 - may cause vaginitis (mucopurulent discharge)
 - endometritis (inflammation)
 - preterm labour, low birth weight
 - cervical neoplasia?
 - \uparrow transmission of VD (incl. HIV)
- virulence factors
 - growth rate, cell adhesion, proteinases, haemolysis, phagocytosis, cytotoxicity



16


Parasite biodiversity

Trichomonas spp.

- parasitic (commensal?) in wide range of vertebrates (mammals, birds, reptiles, amphibia, fish)
- worldwide (esp. tropical and temperate regions)
- 170 million people per year (notably in third world)

Three species in humans

- *Trichomonas vaginalis* vagina/urethra
- *Trichomonas intestinalis* intestines
- *Trichomonas buccalis* mouth



One species in cattle


- *Tritrichomonas foetus* urogenital tract

14

Parasite diagnosis

Diagnostic tests

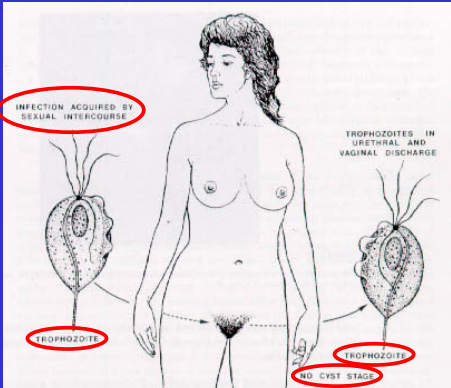
- parasite detection: swabs/smears (insensitive) culture (axenic, InPouch)
- indirect indication: enzyme immunoassays (for Ag) fluorescent staining DNA detection tampon/PCR tests



17

Parasite life-cycle

Life-cycle



15

Parasite management

Management

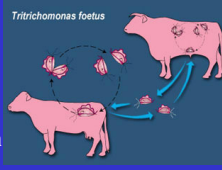
- treatment metronidazole, tinidazole (pro-drug, toxic nitro radicals)
- prevention break venereal cycle (abstinence, condoms, douches) (not currently notifiable)
- control education, public awareness (problem of asymptomatic carriers) intervention (screening, treatment) cull infected livestock

18

Parasite pathogenesis

T. foetus in cattle

- cause of abortion in pregnant cows
 - irritates endometrium
 - intra-uterine death/abortion
 - resorption/mummification
- subsequent infertility
 - uterus hostile to implantation
 - stock culled from herd
- asymptomatic carrier bulls
 - screen AI donors
 - contaminated cryopreserved sperm




Trichostrongylus axei

19

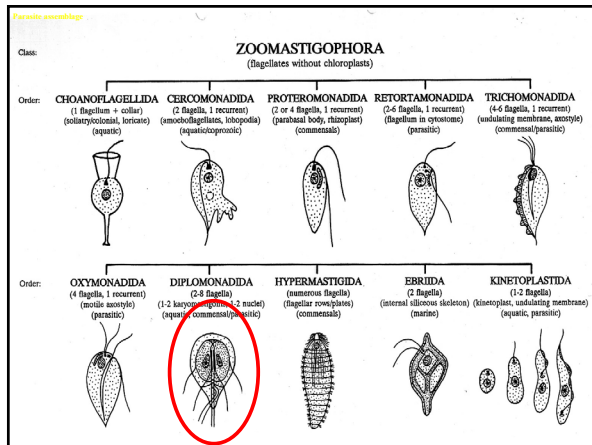
Parasite morphology

Giardia spp.

- protistan parasite
- flagellate (12-15 µm long)
- bilateral symmetry
- diplomonad (with 2 nuclei)
- 8 flagella (4 pairs)
- ventral sucking disc
- small resistant cysts (with 4 nuclei)



22



20

GIARDIASIS

- travellers diarrhoea (esp. E. Europe)
- backpackers malady (esp. Rocky Mts)
- regional variants (Dehli belly, Bali blitz, etc.)
- porcelain polka, trots, runs, etc.
- beaver fever

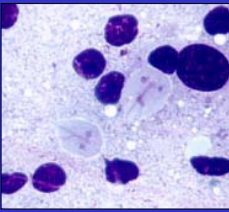
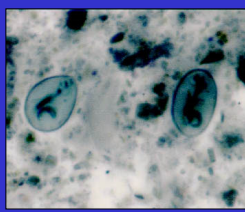
names suggestive of human & animal sources

23

Parasite problem

Giardiasis

- intestinal infections
- diarrhoeal disease, malabsorption, failure-to-thrive
- environmental contamination

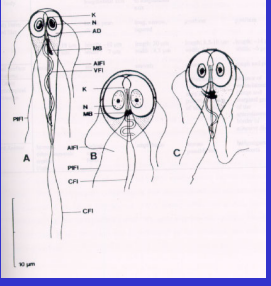



21

Parasite biodiversity

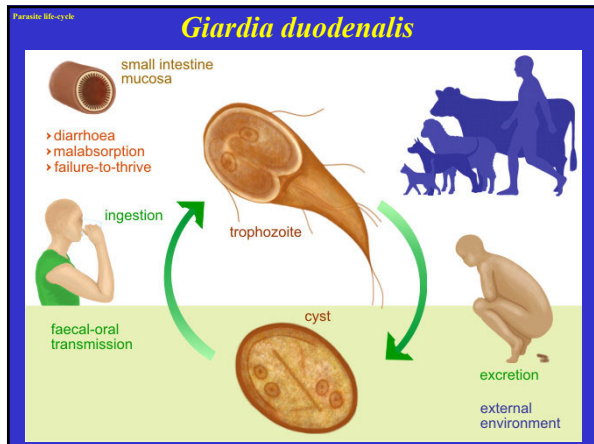
Giardia spp.

- over 40 species described but three species groups
- host specificity contested



- G. agilis (gracilis)*
amphibia, birds, reptiles
- G. muris (ardae)*
rodents, birds, reptiles
- G. duodenalis (intestinalis, lamblia)*
mammals, birds, reptiles

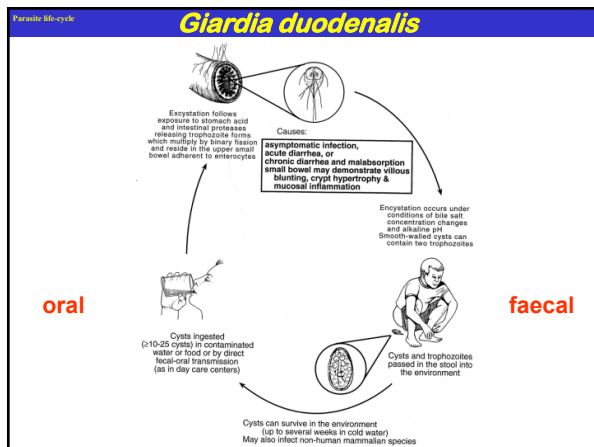
24



25



28



26

Parasite diagnosis

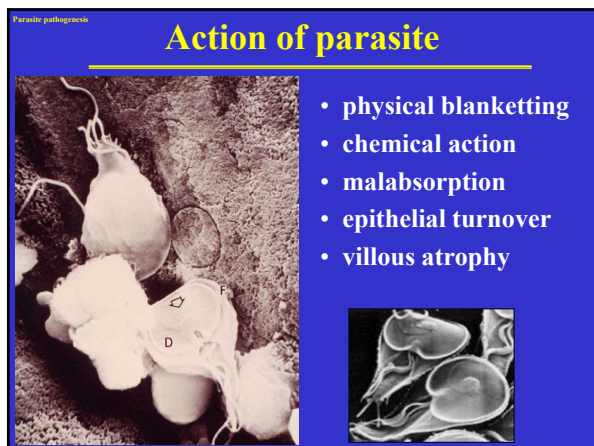
Diagnosis

- symptomatology (nonspecific watery diarrhoea)
- parasite detection (sporadic excretion, endoscopy)
- indirect indication (antigen/antibody/DNA tests)
- clinical/environmental samples

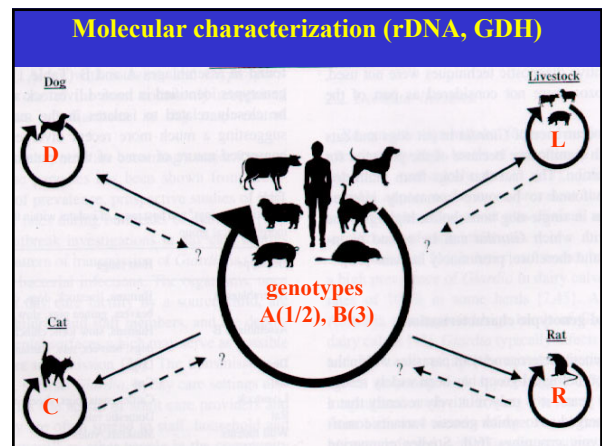
Need to characterize isolates:

- genotype (partial gene sequences)
- phenotype (virulence, infectivity, specificity)

29



27



30

Parasite management

Treatment

Giardia

metronidazole	+
tinidazole	+
furazolidone	+
paromomycin	+
benzimidazole carbamate	+

but emerging drug resistance

31

IMPLICATIONS

Birds possible source of mammal infection


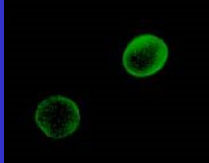
- may contaminate water (wetlands, reservoirs, dams) (roofs feeding rainwater tanks)
- may infect livestock (shared pasture, cattle egrets, heron, ibis)
- may transcend geographic barriers (flight, migration)

34

Parasite management

Control

- break faecal-oral transmission cycle
- good sanitation (effluent treatment, disposal, use)
- disinfection (chemical/energy sources)
- good hygiene (education to modify behaviours)
- water treatment (filtration, chlorination)

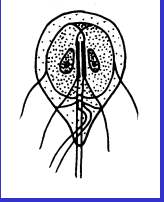



32

Future requirements

Need more studies to characterize:


- environmental isolates (from water, effluents, biosolids)
- clinical isolates (from humans) (from livestock) (from pets) (from wildlife)



35

POLLY

- *G. duodenalis* morphotype (ex. sulphur-crested cockatoo)
- infective to mice, lambs, kittens, calves (crossed bird-mammal barrier)
- extremely vigorous (petechiation) (novel pathogenicity)
- suppresses immune response (novel immunology)



33

Review

- zooflagellates like anaerobic environments
- several parasitic in intestinal/urogenital tract
- *Trichomonas* (swimmers with fins)
 - trophozoites irritate vaginal mucosa
 - no cysts formed, venereal transmission
- *Giardia* (suckers with two nuclei)
 - trophozoites carpet intestinal mucosa
 - cyst formed, faecal-oral transmission

36