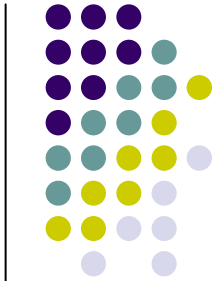
Giardia and Apicomplexa

G. A. Lozano

UNBC

NINE “Protozoan” diseases/parasites



- Ciliphora, *Ichthyophthirius,* Ick
- Sarcomastigophora, *Giardia,* giardiasis
- Apicomplexa: ***Eimeria, Toxoplasma, Sarcocystis, Cryptosporidium***.
- Apicomplexa: Haemoproteous, Leucocytozoon,
- Apicomplexa: Babesia

2.- Sarcomastigophora

- Flagellates and amoebae
- Most “important” flagellates: trypanosomes.
- Trypanosomes are transmitted by vectors, usually insects, with one exception;

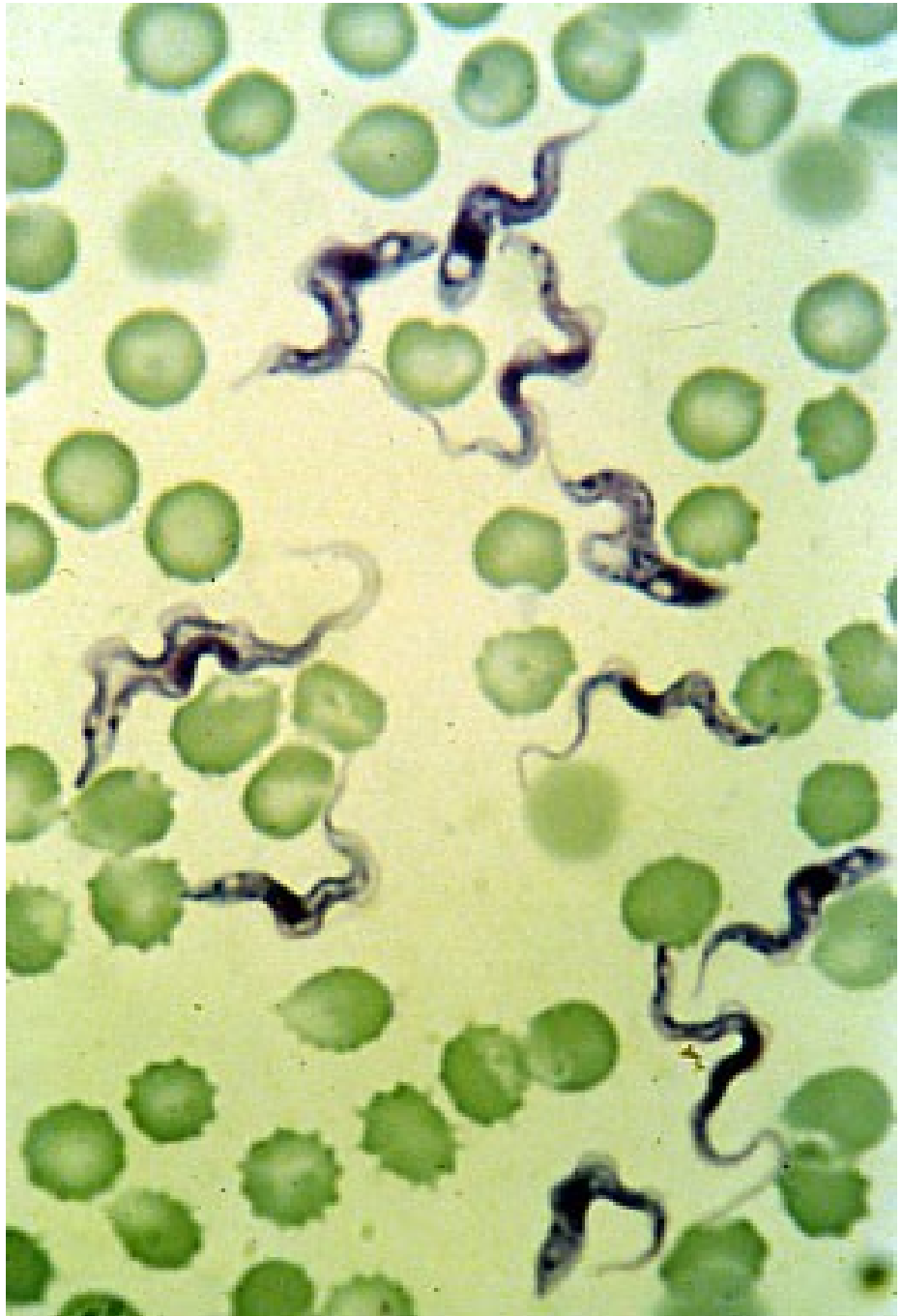
- *Trypanosoma equiperdum*, spread by sex.

2a.- Types of trypanosomes

- *Stercorarian.-* taken up in the blood meal and grow and divide in the hindgut of the insect vector. Final host is infected when the insect defecates as it eats, at the feeding site or by the host scratching.
- E.g., *Trypanosoma cruzi*, Chaga's disease, half a million new infections annually in central and south America.

- S*alivarian* trypanosomes develop in the mid gut of the vector, a fly, and are injected via the salivary glands when it feeds.

- Two species that infect humans: *Trypanosoma brucei* and *T. rhodesiense* - sleeping sickness

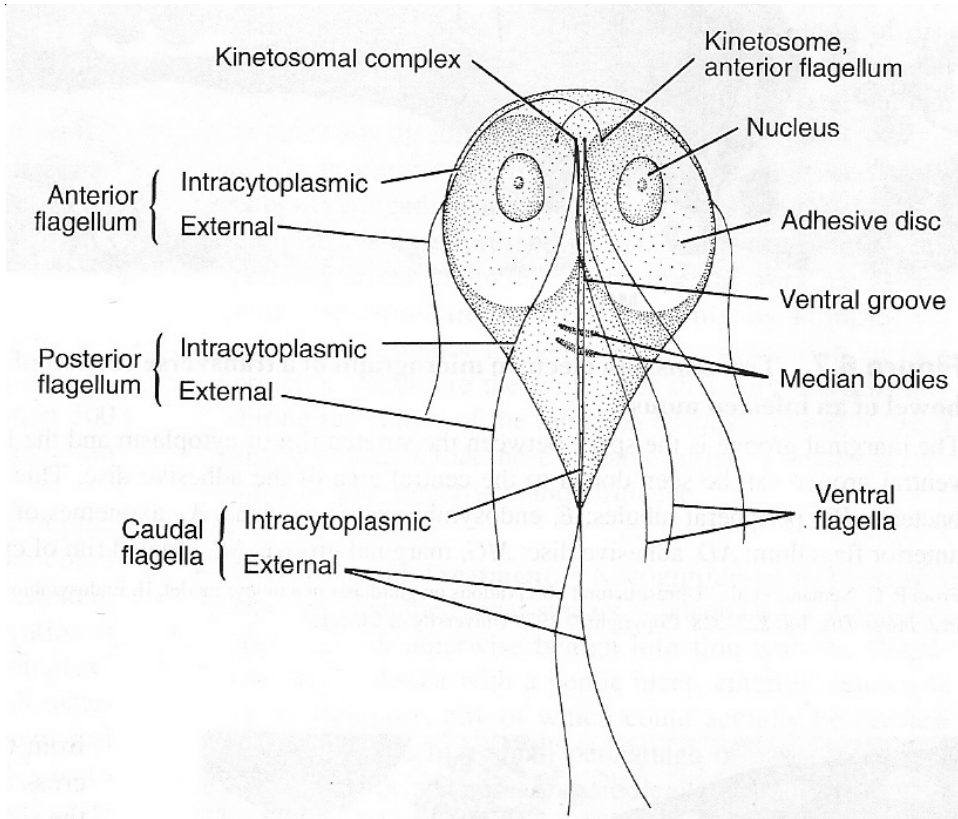


- The trypansomes and their relatives - kinetoplastida - live in blood or tissues.

- The remaining flagellate parasites are mostly intestinal and are transmitted as cysts or other resistant stages that typically contaminate water or food (e.g. Giardia)

2b.- Giardia

- ***Giardia intestinalis*, was discovered in 1681**
- ***G. muris* in mammals, *G. ardeae* and *G. psittaci* in birds**
- **Nuclei, adhesive disks, median bodies and flagella give it its smile.**

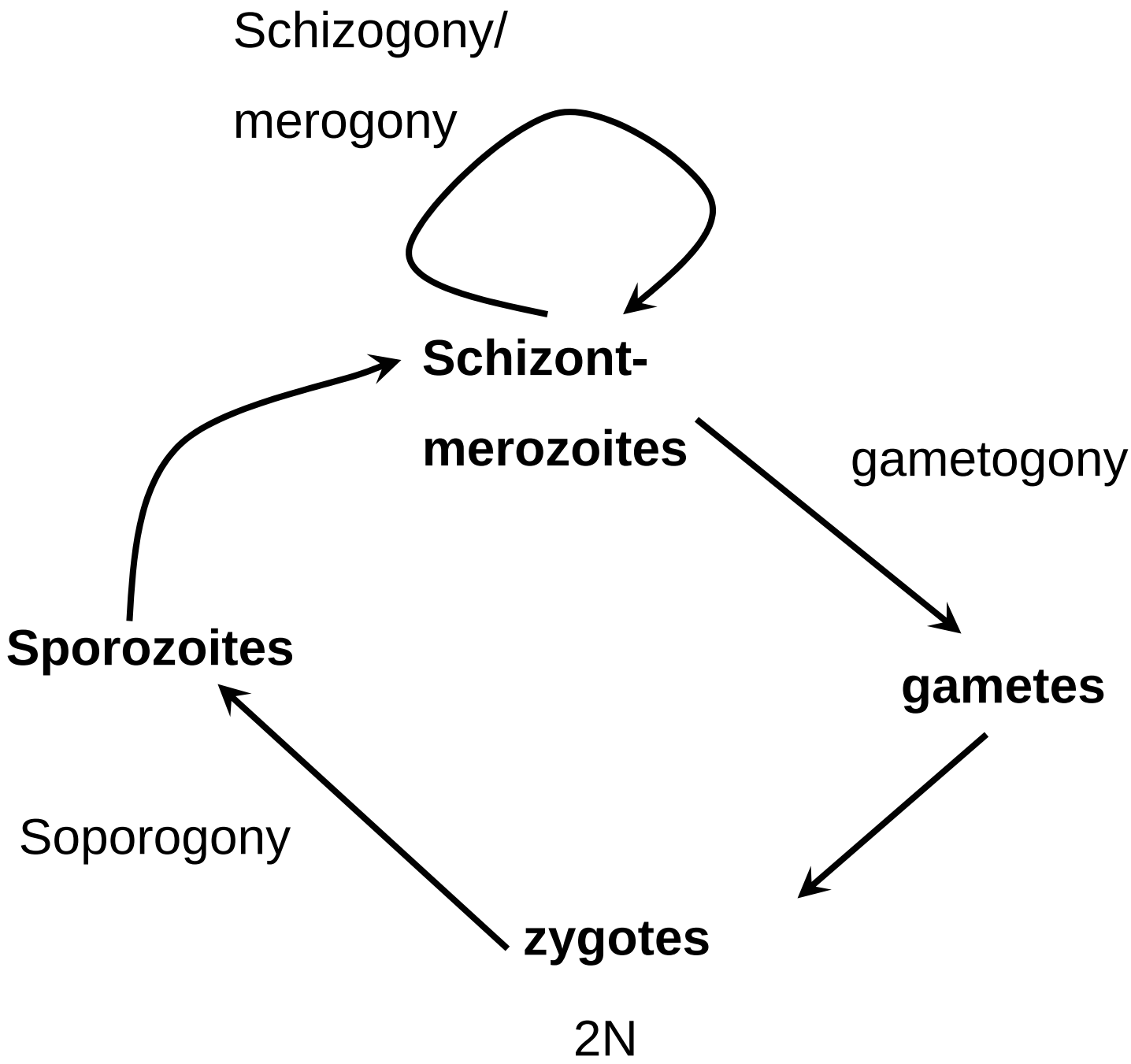


2b.- Giardia

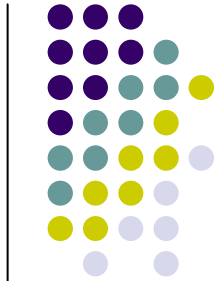
- Common in the small intestine.
- Causes diarrhoea, vomiting and mass loss.
- Divides by binary fission.
- Simple life cycle: encyst in the large intestine, and excyst in the small intestine
- It does not break down host cells, but the dense layer of parasites interferes with absorption.
- Drink clear fresh water while camping!

3.- Phylum Apicomplexa

- **No locomotory organelles (except sexual stages)**
- **Haploid dominant – sexual and vegetative stages.**
- ***Coccidians : cysts, intracellular. Eimeria, Toxoplasma, Sarcocystis, Cryptosporidium***
- ***Haemosporidians: no cysts, blood parasites, arthropod intermediate host. Plasmodium, Haemoproteus, Leucocytozoon.***


Schizogony/
merogony
Schizont-
merozoites
gametogony
Sporozoites
gametes
Soporogony
zygotes
2N

3.- Apicomplexa: *Coccidians*



- **Intestinal parasites in the final hosts, invade epithelial layers, cause discomfort → death**
- **Intestinal and tissue parasites in intermediate hosts (if present)**

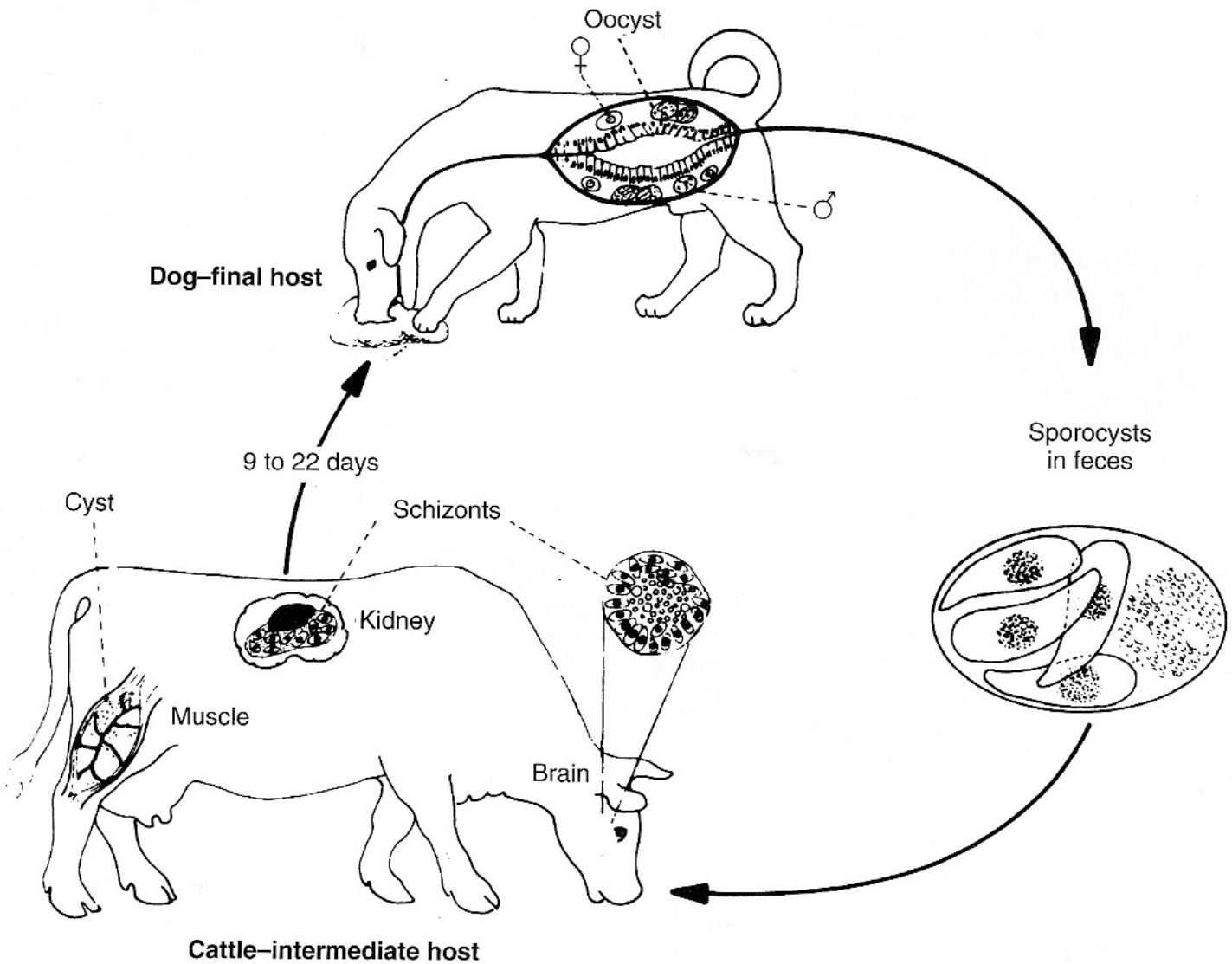
- **Eimeria.- Avian and domestic mammals (dog, cattle, sheep, pig, rabbit).**

- **Toxoplasma. – final hosts: cats. Intermediate, various birds and mammals (including humans).**

- **Cryptosporidium.- all vertebrates (single host)**

- **Sarcocystis - herbivorous intermediate host and carnivore final host (e.g. canids)**

Sarcocystis life cycle



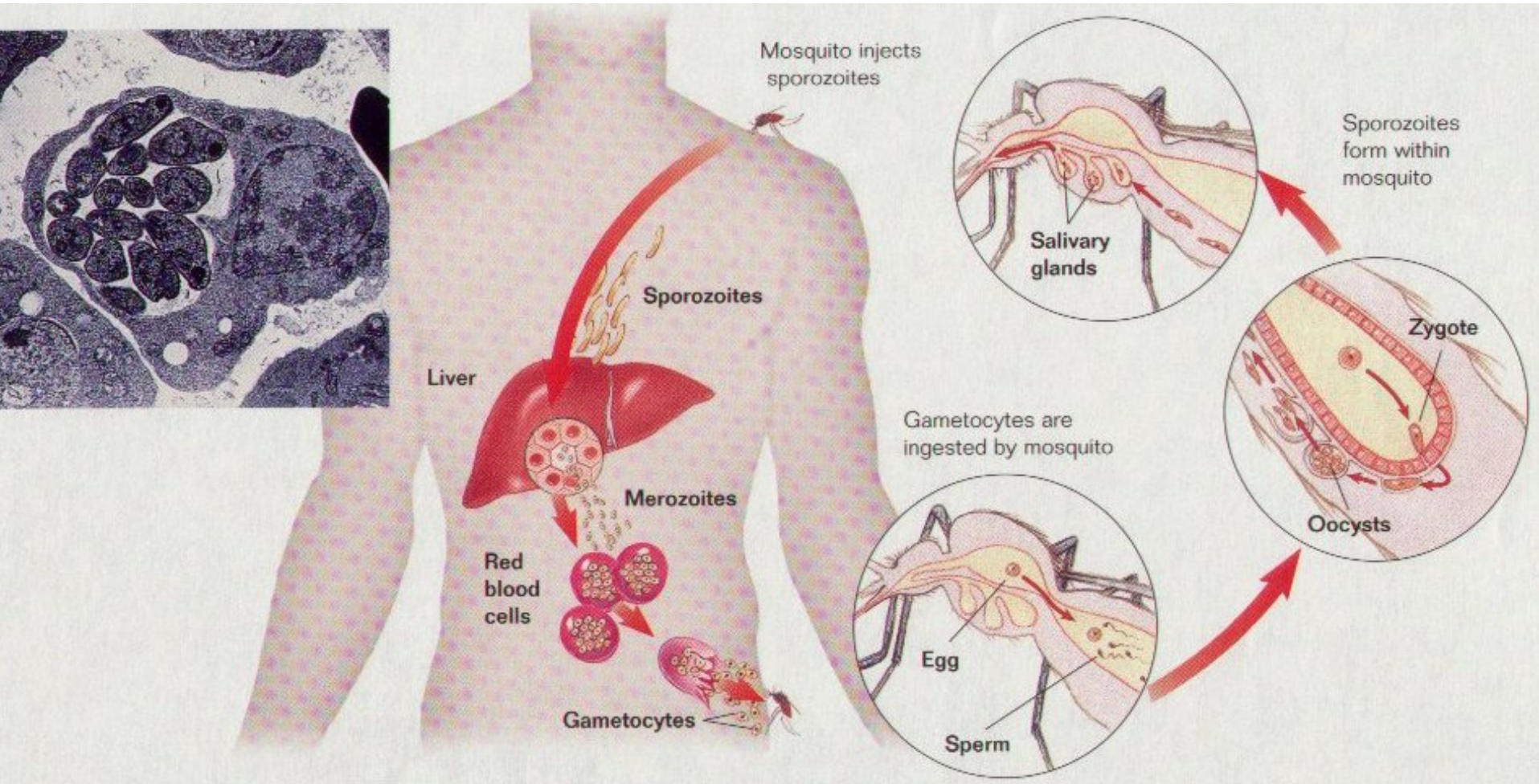
Invade the entire body

4. Apicomplexa: *Haemosporidians*

- ***No cysts***
- ***Sporozoites → merozoites (in several tissues – liver- and BCs)***
- ***Gametogony in BCs***
- ***Syngamy inside the insect vector***
- ***arthropod intermediate host (mosquito, sandfly)***

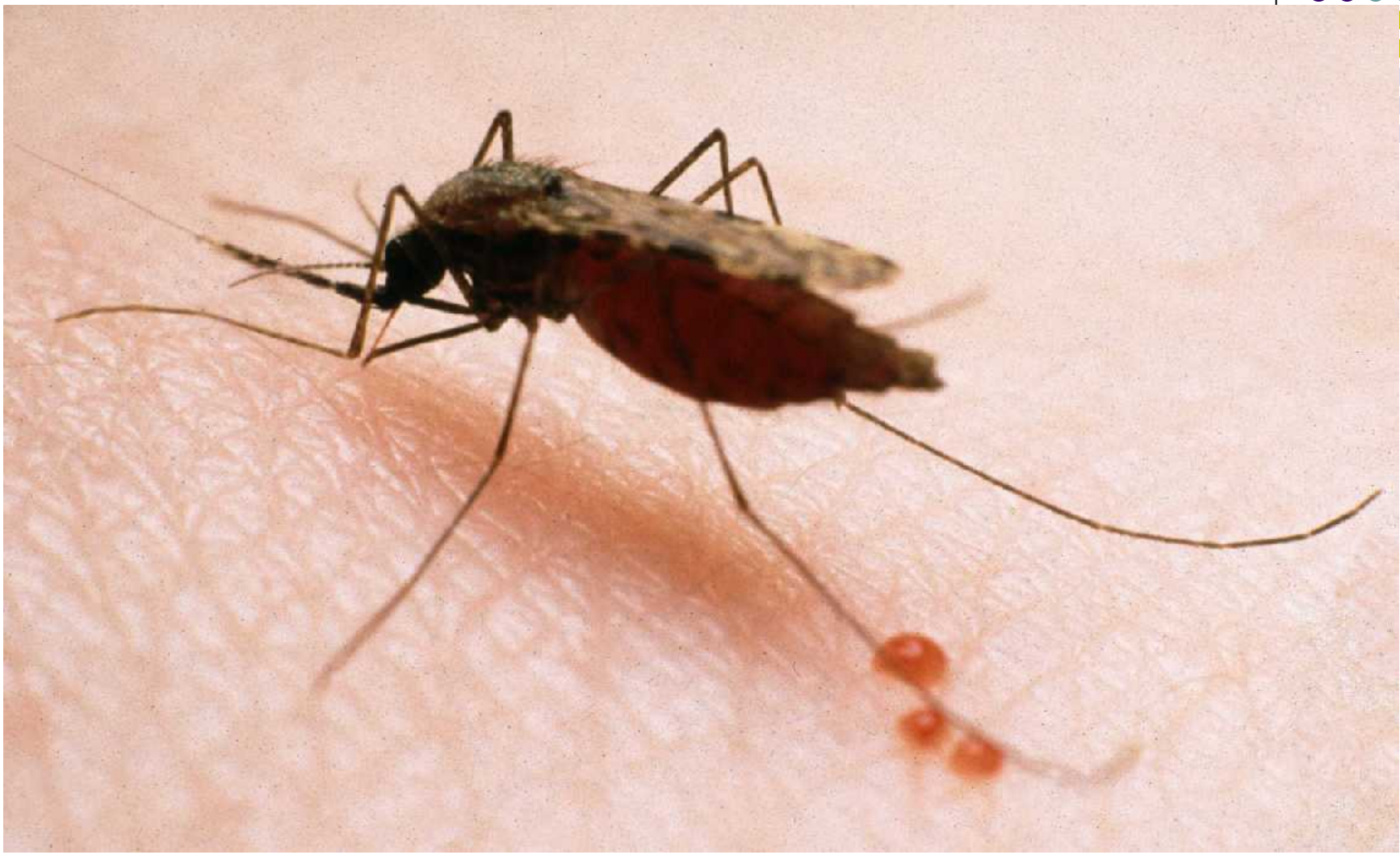
- ***Plasmodium, Haemoproteus, Leucocytozoon***

Plasmodium –life cycle



Plasmodium in humans, just to make a point

- Huge problem in humans, perhaps ½ billion cases.
- First mentioned in 3500 B.C.
- Now kills about 1 million people yearly.
- 4 species affect humans *P. falciparum, malariae, ovale* and *vivax.*
- MOST species affect birds.
- Others affect rodents, primates, and reptiles.



Avian Malaria

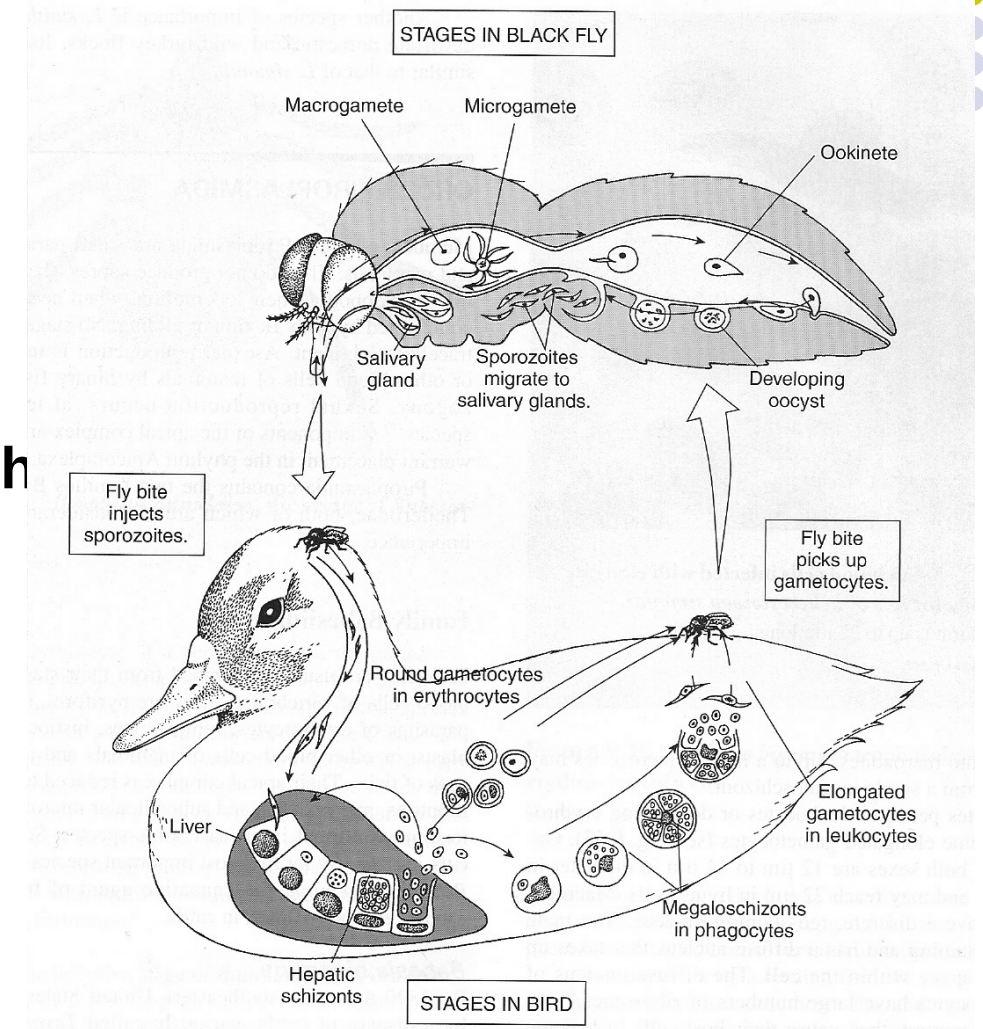
- Huge problem in Hawaii where the disease was introduced in the early 1900s.
- Some birds have gone extinct, others are in decline
- Birds have ‘escaped” malaria by moving to higher altitudes.

- Rare Hawaiian bird dies of malaria

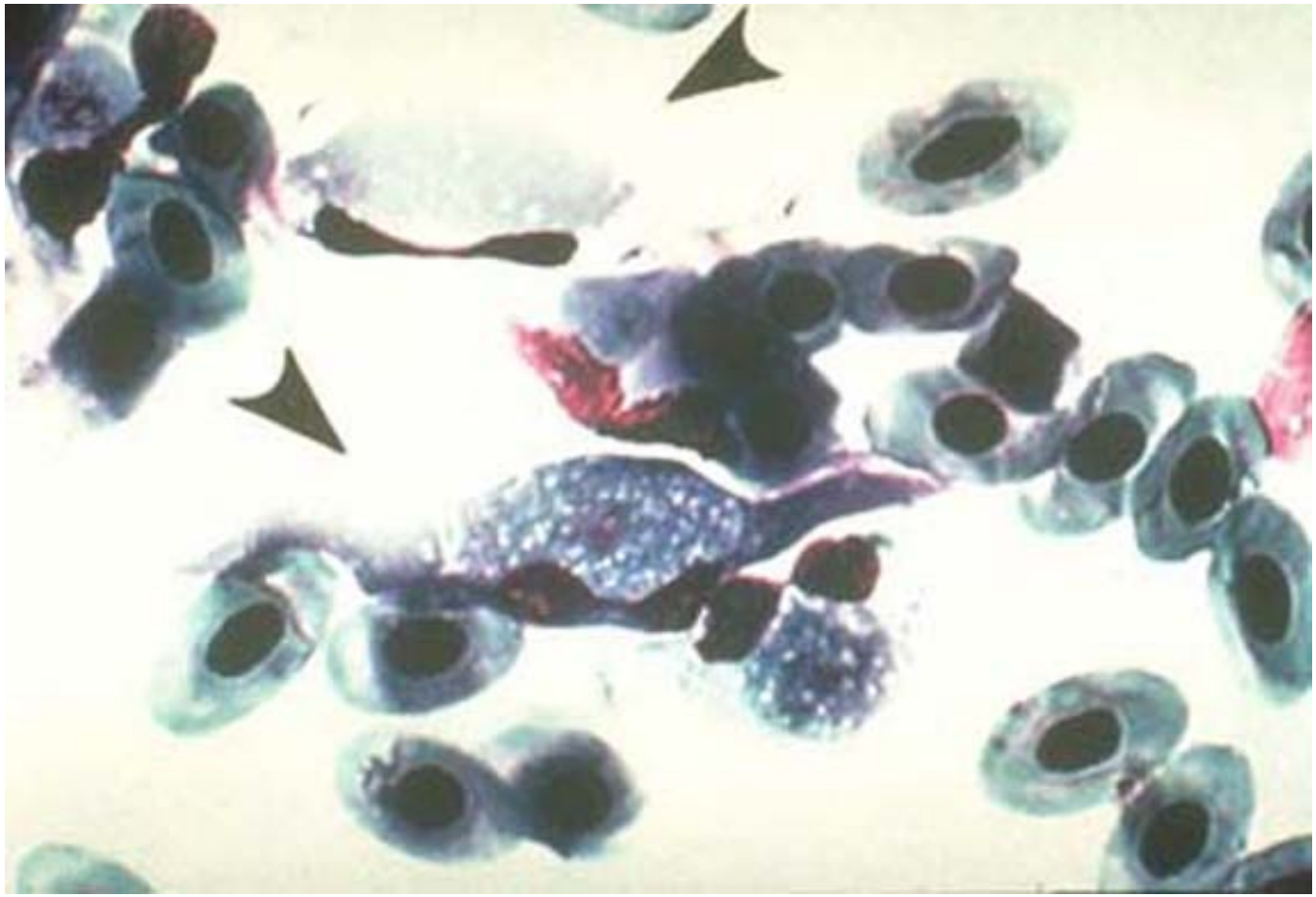
Leucocytozoon, Haemoproteus,

- ***Leucocytozoon***
  - **Birds (waterfowl)**
  - **Black flies**
  - **Effects : none to death**
  - **Sub-lethal: anemia lethargy**

- ***Haemoproteus***
  - **Reptiles and birds (pigeons)**
  - **Louse flies**
  - ***Effects, none to anemia***

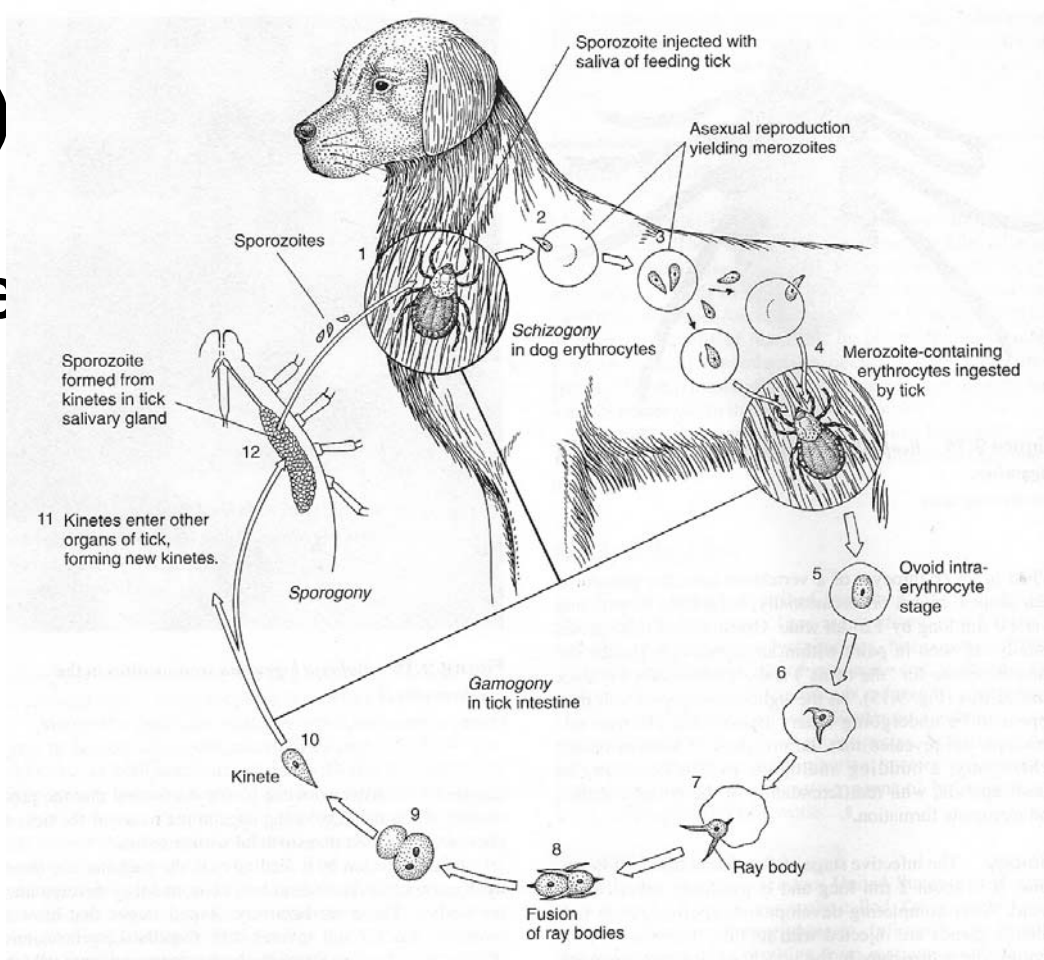


Leucocytozoon



5.- Apicomplexa: *Babesia*

- **Deer, cattle, caribou, horses, carnivores (dogs, cats, raccoons) skunk, and rodents.**
- **A few birds and reptile**
- **Intermediate hosts: ticks.**
- **Obligate intraerythrocytic**
- **Pathology: anemia, tissue damage due to blockage.**



NEXT→ Flatworms