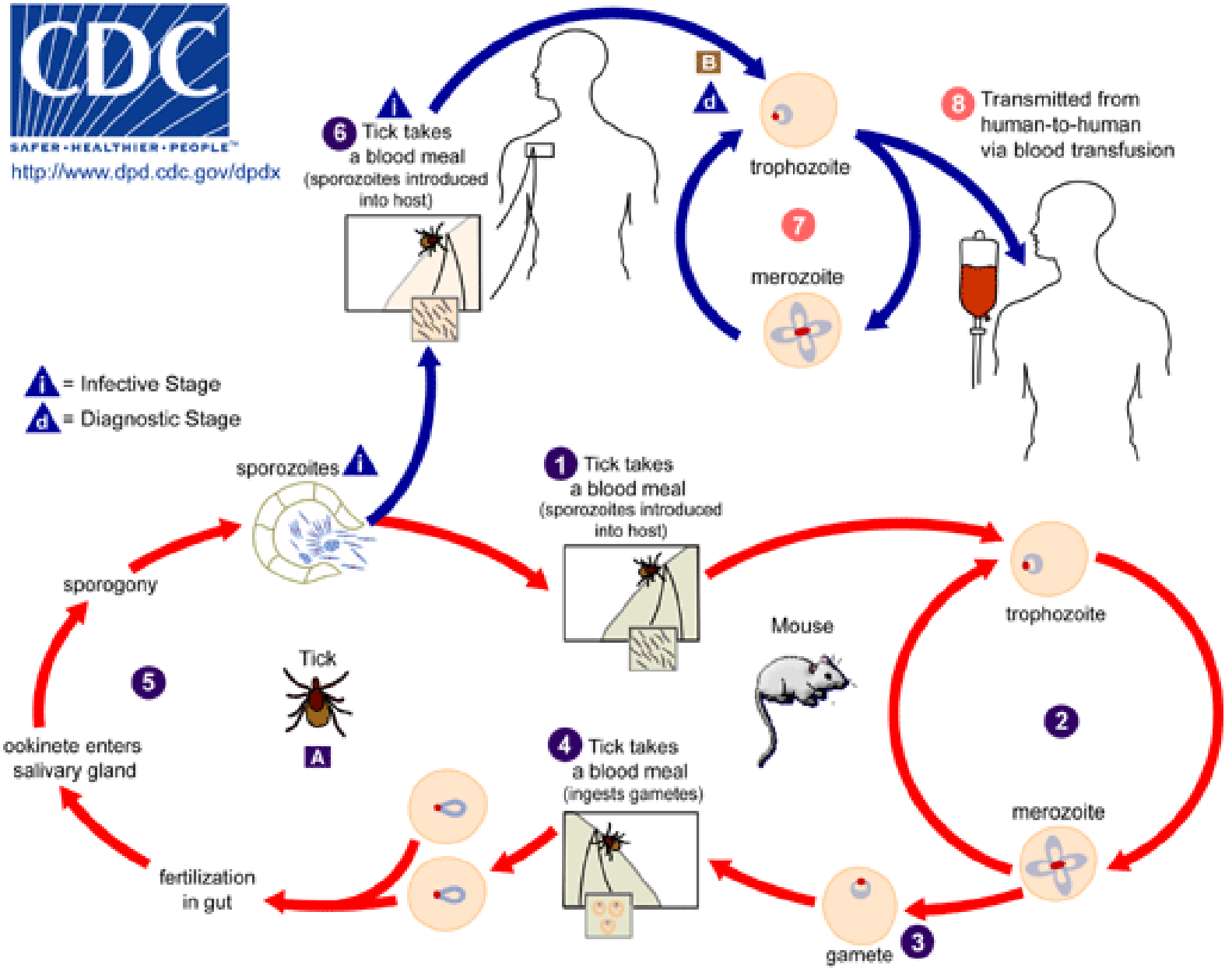
PROTOZOA Summary table

Intestinal Amoeba	Entamoeba histolytica E. dispar, E. coli, Endolimax nana, Iodameoba butschlii Blastocystis hominis
Non intestinal Amoeba	Naegleria fowleri Acanthomoeba spp. E. gingivalis
Intestinal Flagellates	Giardia lamblia Chilomastix mesnili, Dientamoeba fragilis Trichomonas hominis
Non intestinal Flagellates	Trichomonas vaginalis, Trichomonas tenax
Intestinal Coccidia Intestinal Microsporidia	Cryptosporidium parvum Cyclospora cayetanensis, Isospora belli, Sarcocystis hominis, Enterocytozoon bieneusi, Encephalitozoon intestinalis
Non intestinal Coccidia & Microsporidia	Toxoplasma gondii
Intestinal Ciliates	Balantidium coli
Blood & tissue Sporozoa	Plasmodium spp., Leishmania spp., Trypanosoma spp., Babesia spp. TODAY !

BABESIOSIS

- **Agent: *Babesia* spp. Phyl. Apicomplexa, F. Babesiidae**
- **Parasite of domestic & wild animals**
- **Human cases due to *Babesia divergens, B. microti* complex, *B. bovis***
- **Zoonosis acquired by tick bite (human is a dead-end host)**

Babesia spp. Cycle



Babesiosis Cycle in humans

- **Humans enter the cycle when bitten by infected ticks.**
- **During a blood meal, a *Babesia*-infected tick introduces sporozoites into the human host .**
- **Sporozoites enter erythrocytes and undergo asexual replication (budding) .**
- **The multiplication of the blood stage parasites is responsible for the clinical manifestations of the disease.**
- **Can be transmitted by blood transfusion or transplacental/perinatal**

Babesia spp
merozoites and tetrad

Babesiosis Epidemiology

- More than 100 species reported
- Worldwide, but little is known about the prevalence of *Babesia* spp. in malaria-endemic countries, where misidentification as *Plasmodium* probably occurs
- Ecology and bionomics of vector define patterns of risk for humans

Babesiosis

Vector

Babesiosis Pathology

- Mostly asymptomatic
- Manifestations of disease include fever, chills, sweating, myalgia, fatigue, hepatosplenomegaly
- Haemolytic anaemia, jaundice
- Haemoglobinuria
- Acute renal failure due to tubular necrosis
- Thrombocytopenia
- Substantial damage to erythrocytes membrane (protrusions & perforation)
- Pathology more severe in splenectomized and immuno-suppressed people
- Fulminant cases for *B. divergens* and more severe but gradual onset for *B. microti*

Babesiosis Clinical features

B.bovis/B.divergens **:**

- **Incubation period : 1-4 w**
- **Fever, prostration, myalgia, jaundice, anaemia, haemoglobinuria**
- **Nausea, vomiting, diarrhoea may occur**
- **Sometimes: hepatomegaly, pulmonary oedema, renal failure**
- **Fulminant so may not be diagnosed up to death**
- **Diagnosis may be confused with *P. falciparum* malaria in blood films**
- **Also misdiagnosed with leptospirosis/ viral hepatitis**

Babesiosis — Clinical features

B.microti **:**

- **Most infections are sub-clinical**
- **Incubation period: 1-3 w for tick transmission**
  6-9 w for transfusion cases
- **Gradual onset with anorexia, fatigue, fever, sweating, rigors, myalgia**
- **Sometimes splenomegaly, hepatomegaly**
- **Complications: respiratory distress syndrome, intravascular coagulation, congestive heart failure, renal failure**
- **Severe anaemia**

Babesiosis Diagnosis

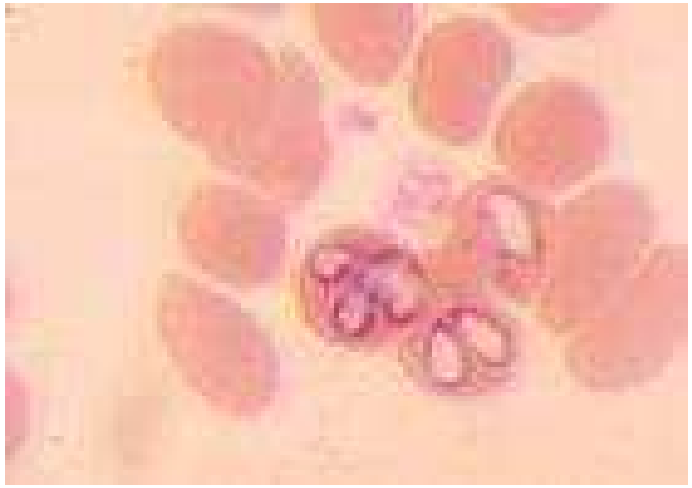
- **Parasites in blood films:**

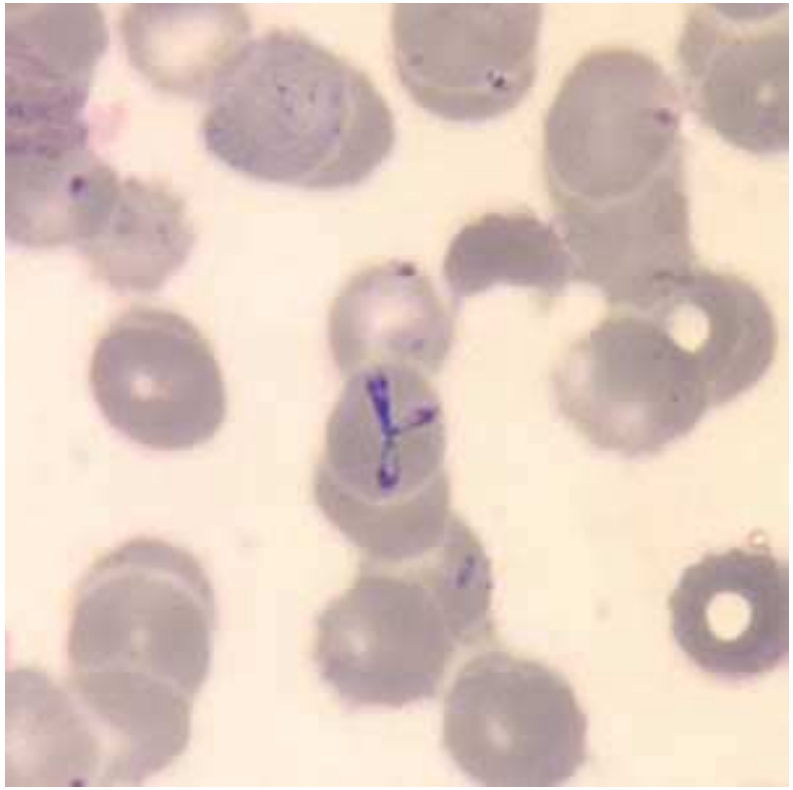
B. microti	*B. divergens*	*B. bovis*
2 x 1.5 µm	0.4 x 1.5 µm	2.4 x 1.5 µm
Several forms seen	Pleomorphic: pear-shaped, oval, round	Pleomorphic: pear-shaped, oval, round
Up to 10% RBC infected		

- **PCR (for *B. microti*) & sero-diagnosis (indirect fluorescent Ab test) for *B. microti* & *B. Bovis***
- **ELISA for *B. microti***
- **The distinction with *P. falciparum* is difficult : no pigment developed in Babesia infection but young *P. falciparum* have no pigment ! Babesia do not have schizonts and are smaller**

Thin blood smear stained with Giemsa

Intra-erythrocytic vacuolated forms





Tetrad (division form)

Babesiosis Management

B. bovis & B. divergens :

- If untreated, death occurs in splenectomized people
- Pentamidine + co-trimoxazole
- Imidocarb (veterinary drug) was used with success
- Massive blood transfusion was used + intravenous clindamycin & quinine

B. microti:

- Mostly spontaneous cure
- Oral quinine (650mg every 8h) + clindamycin (300- 600mg every 6h) for 7-10 days
- Atovaquone + azithromycin are effective and have less side effects
- Whole blood transfusion for severely ill

Babesiosis Prevention

- **Avoid tick bites**
- **Repellent, clothing**
- **Remove ticks quickly**
- **Health education**
- **Screening of blood donations**

Well done!

For today!