

# Babesia

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# Family: Babesiidae

Organisms of this family are pyriform, round or amoeboid forms occurring in the erythrocytes of the vertebrate host; they multiply by binary fission in the RBCs; their vectors are Ixodidae ticks.

## Genus: *Babesia*

*B. bigemina*; *B. bovis*; *B. divergens*; *B. major* } cattle

*B. motasi*; *B. ovis* } sheep

*B. caballi* ; *B. equi* } equine

*B. canis* ; *B. gibsoni* } dogs

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***Babesia*** parasites can be dividing according to their size into two forms :

- 1- The large forms with an average length more than 3  $\mu$ .
- 2- Small forms which have an average less than 2.5  $\mu$ .

# ***Babesia bigemina***:-

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It is cause a disease called **Texas Cattle Fever, Red Water Fever, Splenetic Fever, Piroplasmosis and Babesiosis.**

**Hosts:** The normal host is **ox** (*Bos taurus*) and some other vertebrates such as **zebu** and **buffaloes.**

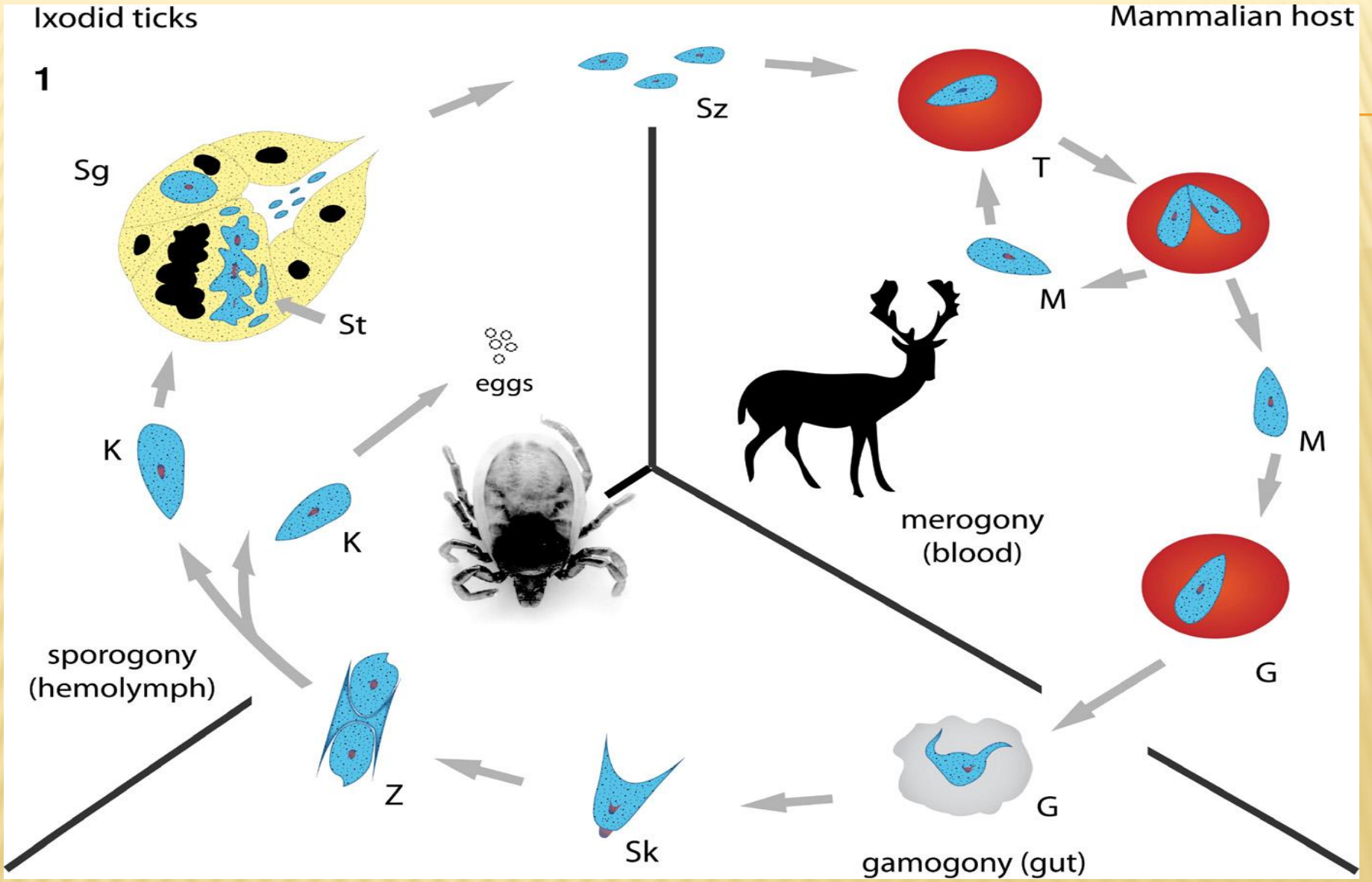
**Vectors:** Ticks belong to the family **Ixodidae** (**Hard ticks**) **such as** *Boophilus annulatus*, *Rhipicephalus evertsi*; *R.bursa* ; *R. appendiculatus* ; *Haemaphysalis punctata.*

## **Morphology:-**

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The parasite inhabit only the **red blood cells (Erythrocytes)** ; as **pear –shape (Pyriform)** and lie in **pairs** forming an **angle** .

The large form (Piroplasm) **4—5  $\mu$   $\times$  2  $\mu$**  ; **round form 2—3  $\mu$**  and **oval or irregular** shape maybe occurs depend on the **developmental stages** of the parasite in the RBCs.



**Life cycle of *Babesia***

# Pathogenesis:-

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The parasites lives and reproduces only in the red blood cells (**RBCs**) of the host **and** consumes some of its contents  
→ break down → **releasing the parasites**  
→ invade other cells → develop **and** divide → **much erythrocytes damage** → up to **75%** of RBCs may be destroyed  
→ **hemoglobinuria (Hb uria)** and consequently **anemia** developed.

## Clinical signs:-

- \*\*In young animals the infection is frequently **symptomless** and associated with a **low parasites density** and the **natural resistance** of the young calf to infection usually **disappears** at **9—12 months** of age.
- \*Incubation period is **1—2 weeks** after exposure to infected ticks.
- \*The disease has tow forms:- **Acute & chronic**



## **In acute cases :**

The most important clinical signs are **rise in body temperature to 106---108 °F**, **anemia** develops, **Hb uria (hemoglobinuria)**, pale mucous membrane, **edema**, profuse diarrhea followed by **constipation**.

**\*\*Mortality rate** may be exceeded **75%** in some cases and **death occur** between **4---**  
**8 days after the onset of the clinical signs.**

## **In chronic cases :-**

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- \*\*Extend over several weeks ---with irregular course---intermittent temperature rise at times reaching 104—105 °F.**
- \*\*Animal become thin and emaciated ,but is usually no marked hemoglobinuria--- finally the animal recovers.**

## Post mortem:-

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**Subcutaneous** and **intramuscular edema** with **icterus** ,fat is **yellow** and **gelatinous** and the **blood thin** and watery , **urine** in the urinary bladder is frequently **red or dark brown** .

**Spleen soft and enlarge** , **liver** is pale and **yellowish** and **enlarge** , **gall bladder** is **distended** with **thick dark bile**.

# Diagnosis:-

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1-Clinical signs (Hb uria)

2-**Blood smears** (thin and thick----**Giemsa** stain)

3-**Serological tests** (CFT, ELISA, IFAT-----etc,)

4-PCR.

# **Control:-**

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- 1-Tick control measures ----regular dipping of cattle.**
- 2- Immunization by infection and treatment method (mild strain).**
- 3- Treatment of infected animals.**
- 4- Test and slaughter of infected animals.**

## ***Babesia caballi***:-

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It is cause a disease called **Equine piroplasmosis**.

**\*\*Distributed** in south Europe, Asia and Africa.

**\*\*Hosts:** horse, donkey, mule.

**\*\*Vectors:** *Dermacentor marginatus*, *D. reticulatus*,  
*D. silvarum*; *Hyalomma excavatum*,  
*H. dromedarii* ; *Rhipicephalus bursa* **and**  
*Rh. Sanguineus*.

## **\*\*Morphology:-**

It is a **large species** resembling to *B. bigemina* ; occurs in **pairs** as **pyriform 2.5—4 μ**, and **round or oval forms ( 1.5 ---3 μ)** may also occur.

## **\*\*Clinical signs:-**

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The course may be **acute** or **chronic**, mild or severe.

**\*\*Persistent fever** , **anemia** with icterus are common occur , **hemoglobinuria is rare** .

**\*In acute cases** death may occur from **1—4** weeks after the **onset of clinical signs**.

**\*Disturbances of the central nervous system**

→ result in posterior paralysis or incoordination , restlessness, nervousness **and walking in circles** may be seen.



## **\*\*Diagnosis:-**

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**1-Clinical signs (anemia)**

**2- History of area and presence of tick vector.**

**3-Blood smears.**

**4-Serological tests (CFT, PHA ----- etc.)**

**5-PCR.**

## *Babesia canis* :-

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It is cause **Canine babesiosis** or **Canine Piroplasmosis** or **Malignant Jaundice** .

It is a **highly pathogenic** parasite of dogs. Several species of **canids** (domestic and wild) are natural host **and** It is also infects a number of other **carnivores**.

### **\*\*Morphology:**

The **shape** of the parasite is **variable**; It is a quite **large pyriform** as large as **5 $\mu$**  and the **round** ones are about **3 $\mu$**  in **diameter**.

## **\*\*Vector:**

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Some species of **Ixodidae** are the vectors  
and the **principle vector** is

***Rhipicephalus sanguineus*** (**Brown dog tick**)  
and transmitted through the **transstadial**  
and **transovarian** transmissions.

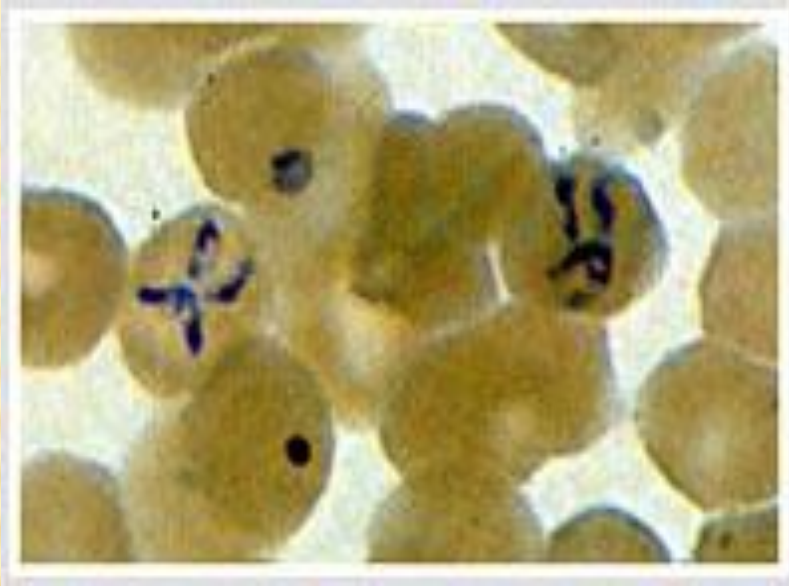
## **\*\*Clinical signs:**

**Young animals (Puppies) show less severe clinical effects than older .**

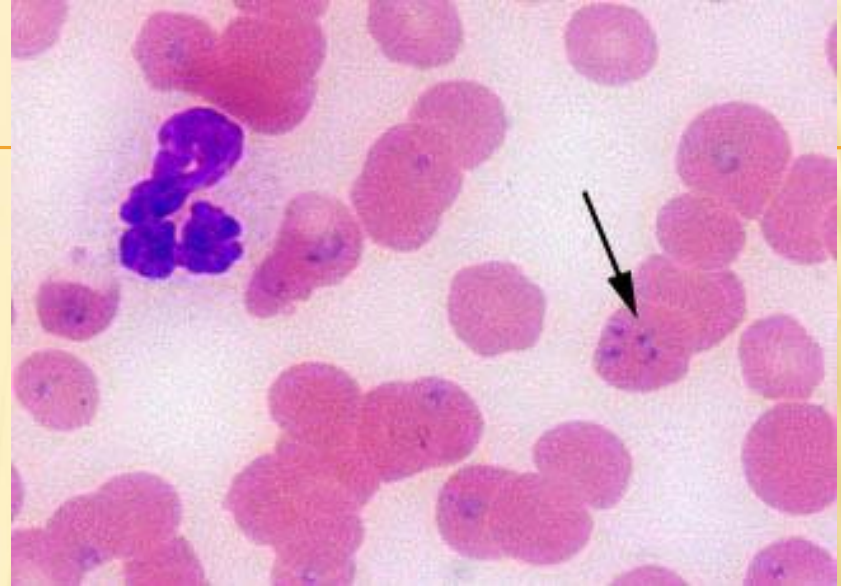
**\*\*Incubation period 10-----21 days.**

**\*\* In acute cases----- anemia , sometimes Hb uria , weak, lethargic , fever (102—105 ° F), central nervous system may involve, depression ,anorexia , disinclination to move ,pale mucous membrane and jaundice develops, feces are markedly yellow ---bilirubin in urine-----death of the animals.**

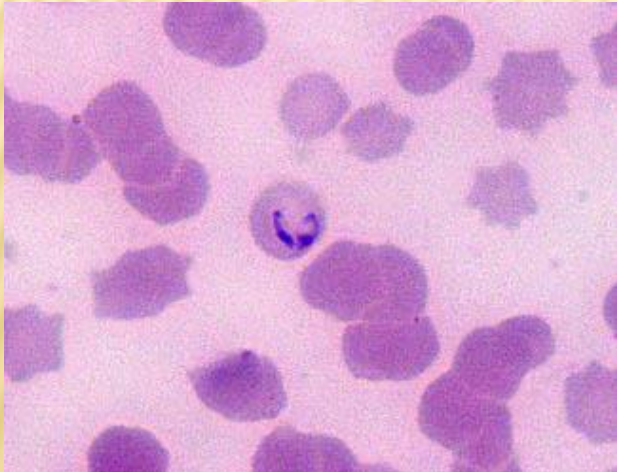
**\*\* In chronic cases --- extreme emaciation, irregular temperature, capricious appetite and loss of condition.**



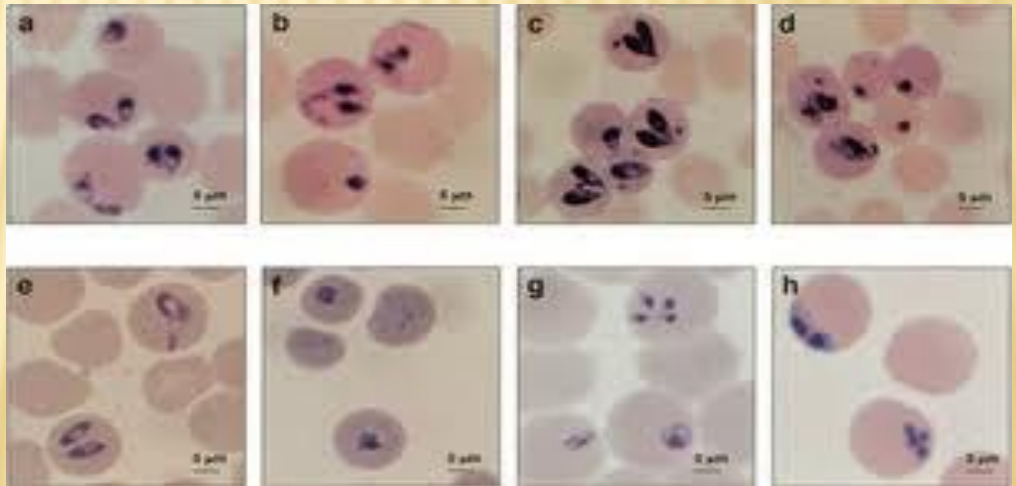
***Babesia parasite***



***Babesia equi* "Maltese cross."**



***Babesia caballi***



***Babesia parasite***

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***Theileria***

# Family: Theileriidae

Members of this family are **round, ovoid, rod –like** or **irregular** forms; found in **lymphocytes**, and **erythrocytes**.

**\*\*Transmitted by Ixodidae ticks.**

**\*\*They are occurring in cattle, sheep, and goats causing a disease called Theileriosis.**

**\*\**T.parva* (more pathogenic); *T.annulata* (pathogenic); *T.mutans* (mild) }----cattle.**

**\*\**T.ovis* (mild); *T.hirci* (*T.lestoquardi*) -(more pathogenic) } ---sheep **and** goats.**

## ***Theileria annulata***:-

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The organism produces a highly fatal disease of **cattle** called **Tropical Theileriosis**, and transmitted by ticks of the genus ***Hyalomma***: {***H. detritum***, ***H. dromedarii***, ***H. excavatum***, ***H. turanicum***, ***H. marginatum***, ***H. scupense*** and ***H. anatolicum***}.



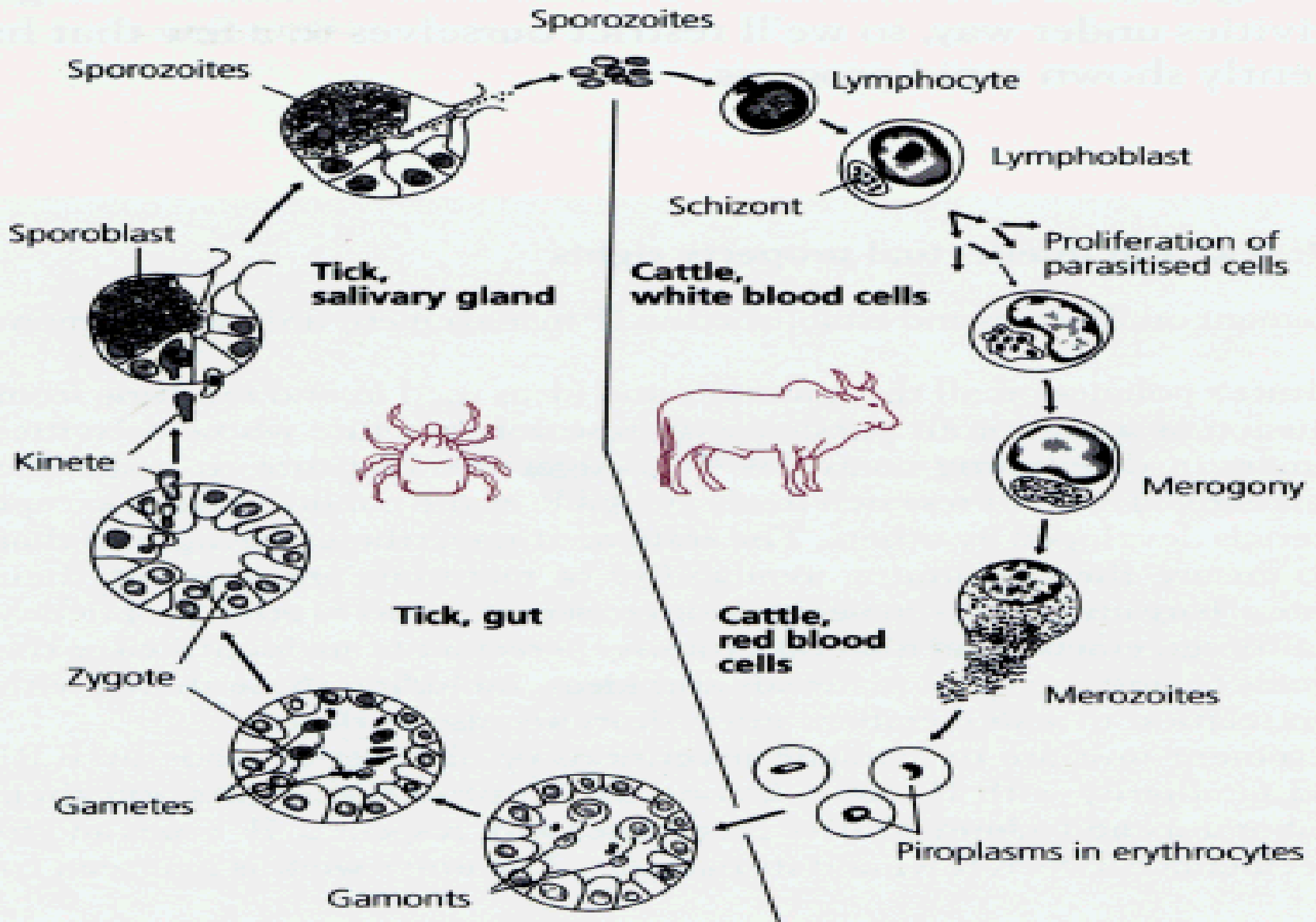
**\*\*Hosts:** Bovine, zebu, water buffaloes.

**\*\*Morphology:**

The piroplasm forms in the red blood cells are **round, oval or ring (0.5–1.5 μ), rod, comma (1.6 μ) or *Anaplasma* like form (0.5μ)**

**and**

**Schizonts** in the lymphocytes (**Macroschizonts and Microschizonts**).



**Life cycle of *Theileria*.**

## **\*\*Clinical signs:-**

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The disease may be **acute; sub acute** or **chronic** forms.

**\*\*The acute form** occurs in **all breeds** and **all ages** of cattle, zebu and buffaloes.

**\*\*Rise in body temperature (104- 107°F)** , depression, **Lacrimation** , nasal discharge, **swelling of superficial lymph nodes**, emaciation and hemoglobinuria (**Hb uria**) **may occurs in severe cases.**

## **\*\*Post mortem:-**

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**Enlargement of spleen and liver , infarction in kidneys , edematous lungs , swollen lymph nodes , icterus of mucous membrane with petechial hemorrhage ;**

**\*\*Abomasum and small intestine swollen and show characteristic ulcers (2-----12 mm) in diameter surrounded by a zone of inflammation.**

**\*\*Some cases show cutaneous lesions (nodules).**

## **\*\*Diagnosis:-**

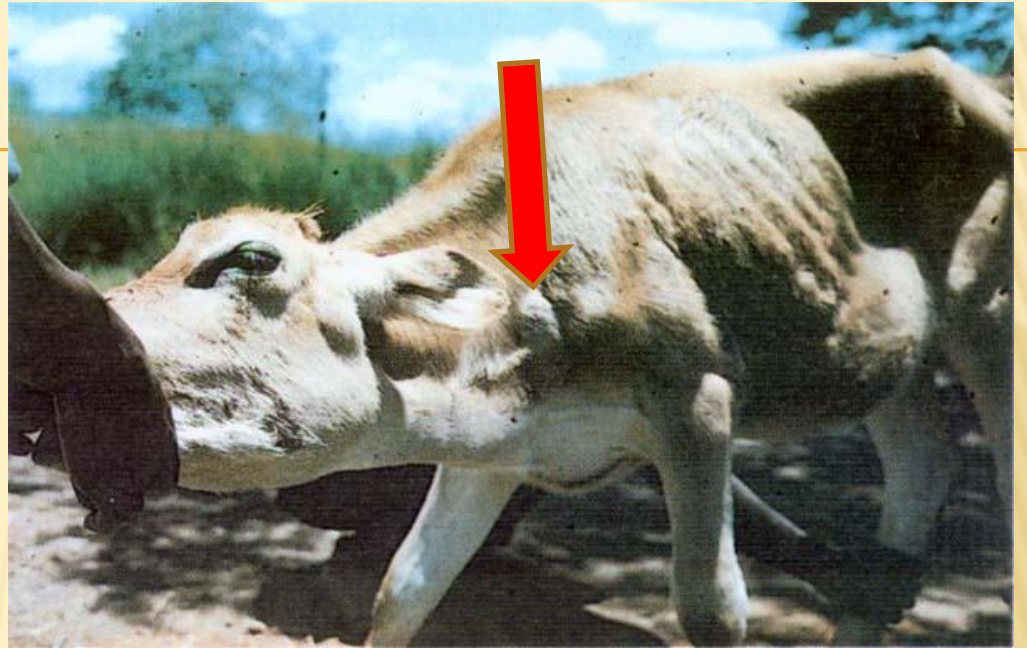
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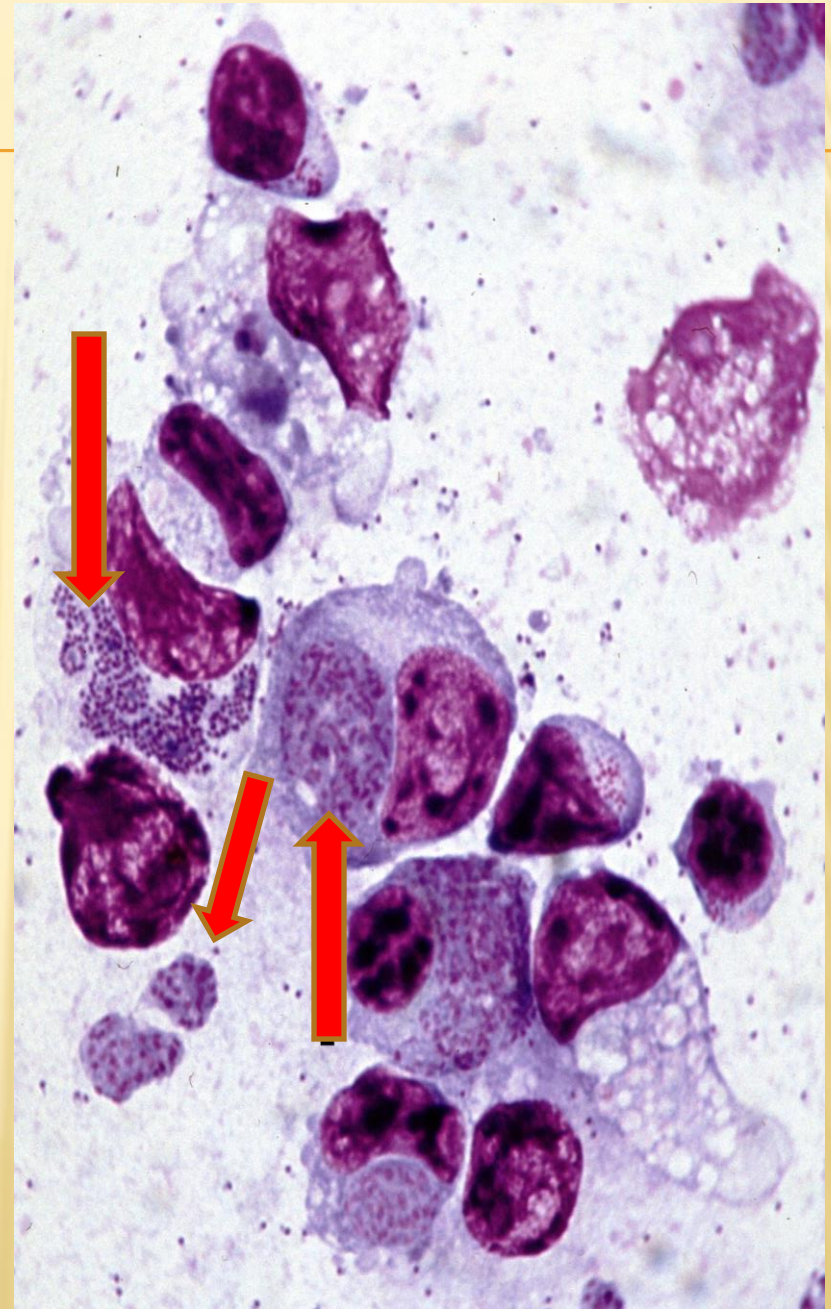
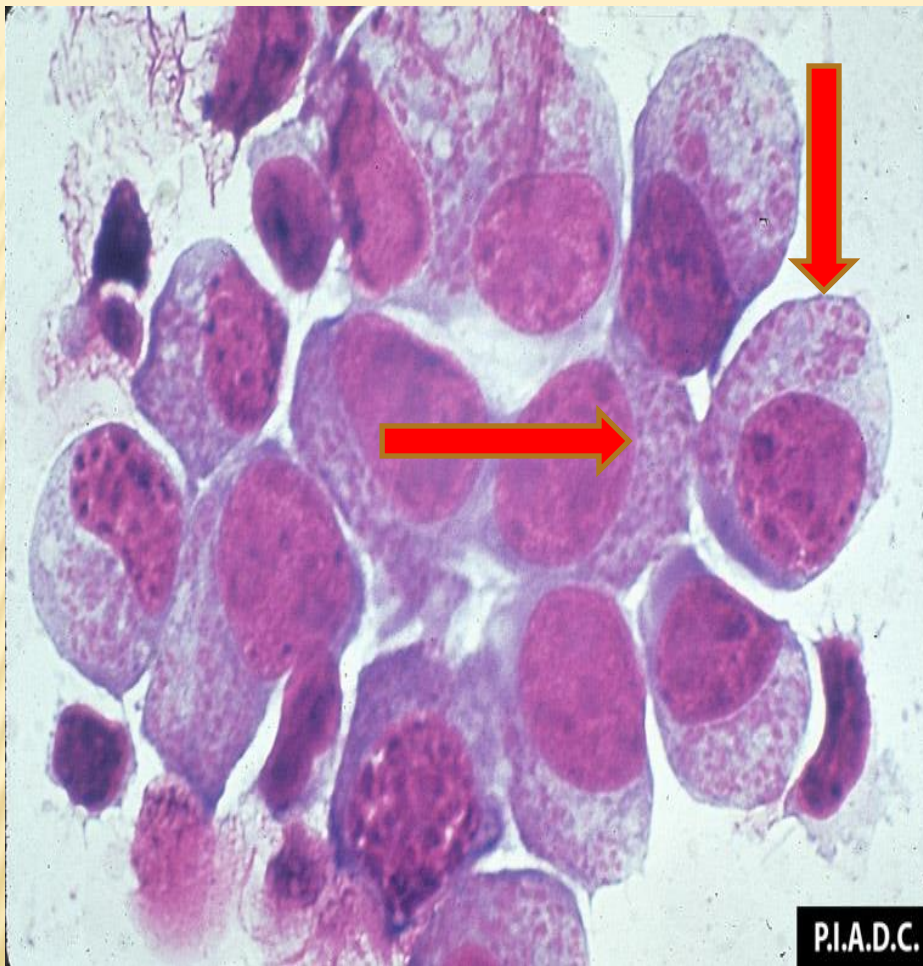
- 1 – History of disease and clinical signs.**
- 2 – Blood smears (parasite in RBCs).**
- 3 – Lymph smears (Superficial lymph nodes).**
- 4 – Serological tests (IFAT, ELISA----etc.).**
- 5 – PCR (Polymerase chain reaction).**

## **\*\*Control:-**

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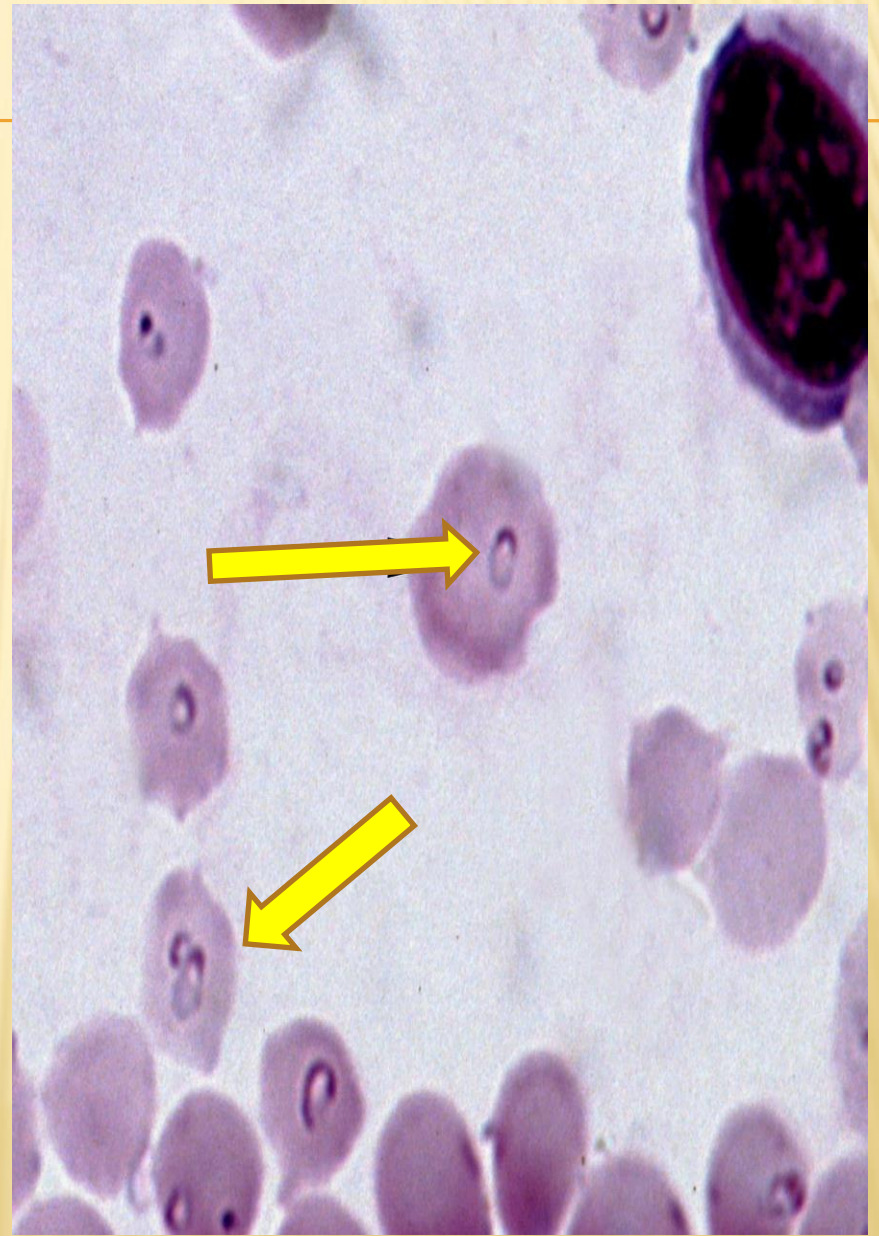
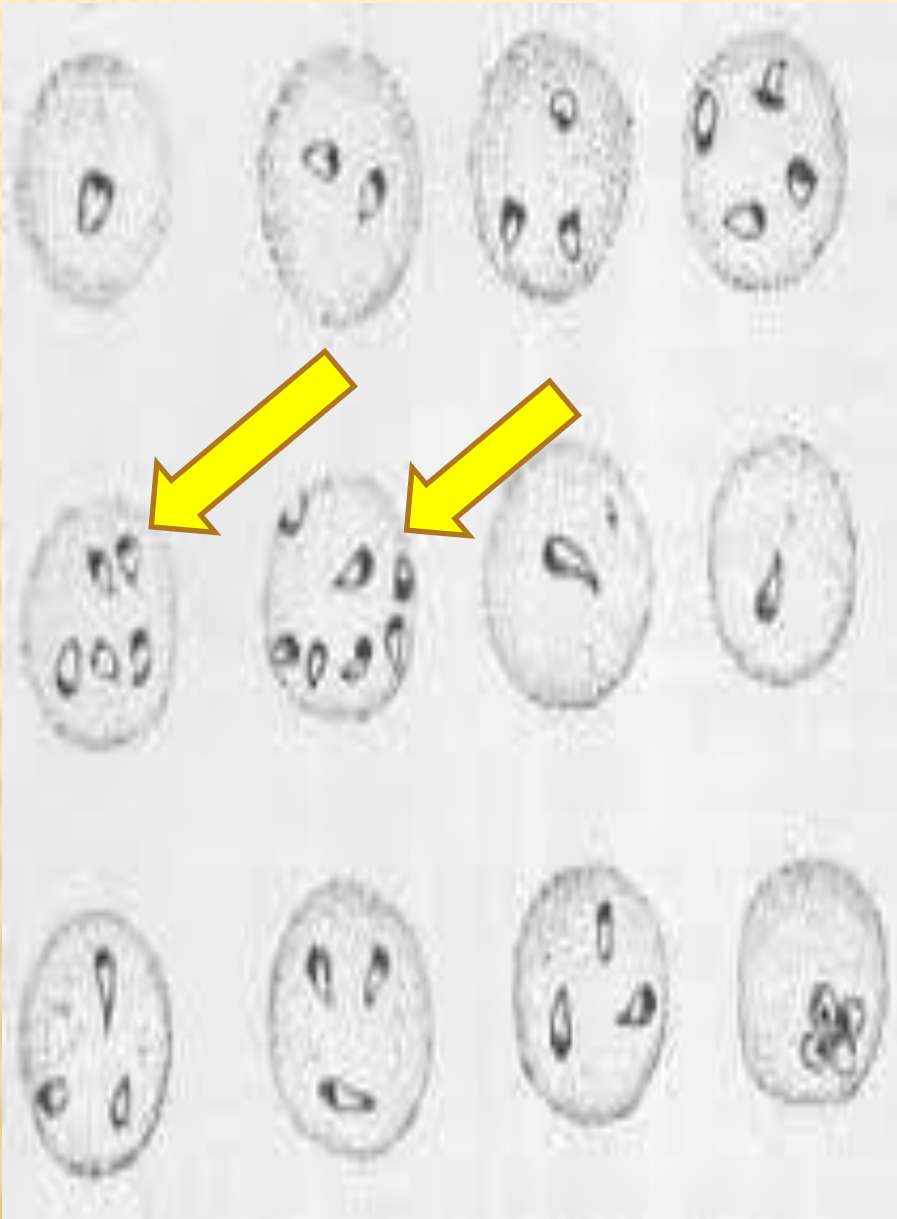
- 1 – Treatment of the infected animals.**
- 2 – Tick control measures .**
- 3 – Test and slaughter of infected animals.**
- 4 – Vaccination of animals by using tissue culture attenuated parasite (**Macroschizonts**).**

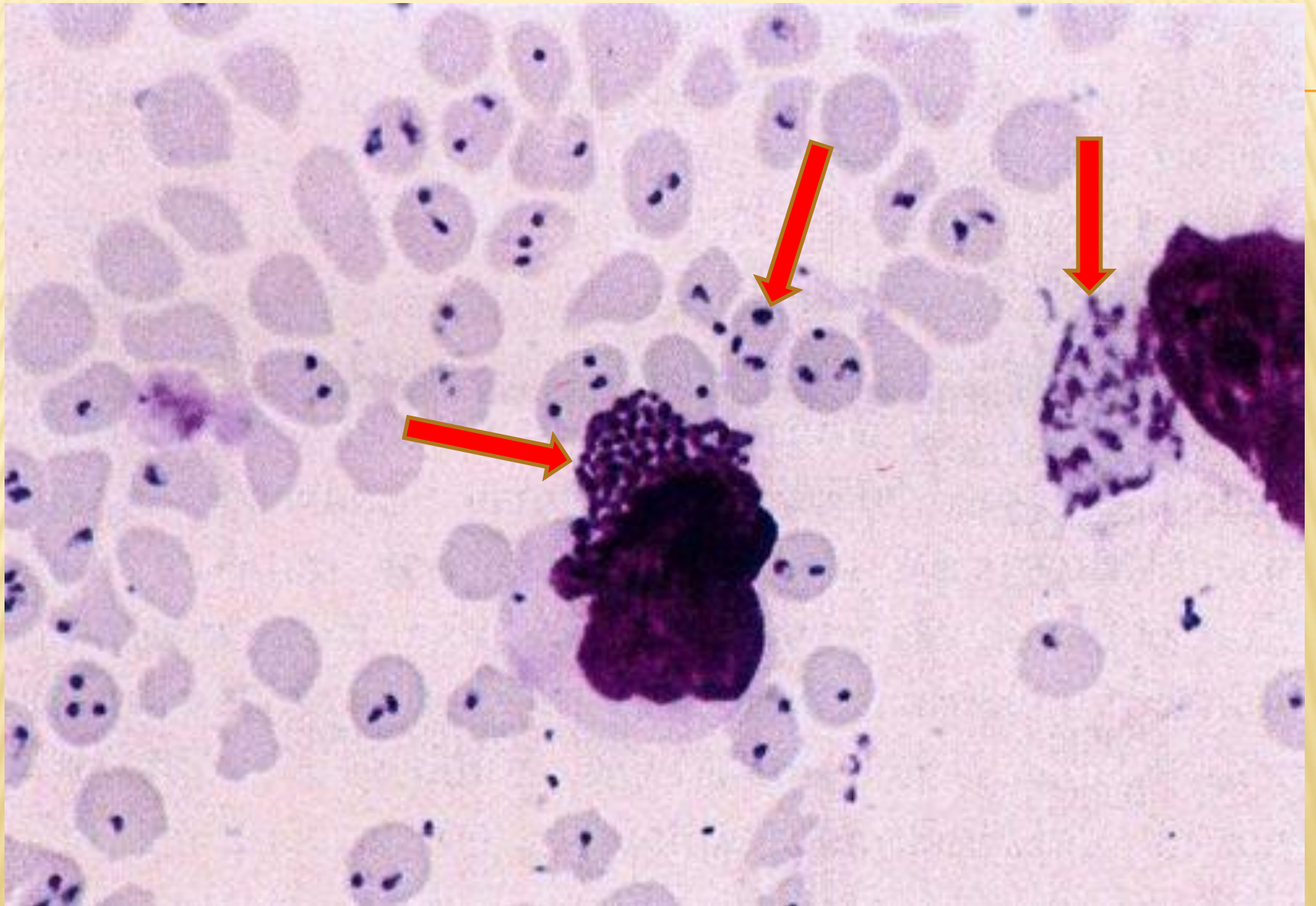




**Bovine lymphoblasts** contain intracytoplasmic *Theileria* schizonts.







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# *Anaplasma*

# Genus: *Anaplasma*

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*Anaplasma* appears as **small spherical bodies**, **red to dark in color** inside the **red blood cells (RBCs)** of cattle, deer, sheep, goats **and** other animals **and** causes a disease called **Anaplasmosis**.

**\*\*They are about 0.2 ---0.5  $\mu$  in diameter , binary fission multiplication and multiple invasion of a the cell may occur.**

**\*\*Species of parasite are *A. marginale* , *A. centrale* and *A. ovis*.**

## *A. marginale*:-

- \*\*This organism is **widely distributed** throughout the **tropical** and **sub tropical areas** of the world-  
---- Africa, Middle east, southern Europe, Far East **and** USA.
- \*\*It is transmitted by **19 species of 7 genera of ticks** such as *Argas*, *Boophilus*, *Dermacentor*, *Hyalomma*, *Ixodes*, *ornithodoros* and *Rhipicephalus*; **also by** biting flies, **stable flies**, deer flies **and** mosquitoes.
- \*\***Mechanical transmission** by major or minor operations (**dehorning** ; **castration**); also by **vaccination** and **blood sampling** -----etc.

## **\*\*Life cycle:-**

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**Organisms are invade and multiply in red blood cells.**

**Initial bodies enter mature erythrocytes by penetration ----reproduction by binary fission (two daughter organisms are formed)**  
**→2→4 → 8- → 16→ 32 → etc.**

## **\*\*Clinical signs:-**

**Anaplasmosis** is a disease of **adult cattle** and clinical infections **do not occur** until **18 months** of age.

**\*\*Younger animals** exhibit little detectable reaction.

**\*\*In mature cows incubation period between 15-36 days (average 26 days) .**

**\*\*In acute cases:-** Increase in the body temperature, anorexia and **severe anemia** (**30---48 %** of RBCs infected); **mortality rate in susceptible imported cattle** may be high (**80 %**), but in enzootic area may be **10 %**.

**\*\*In chronic cases** --- **severe anemia** --- recovery is low **and** the animal become more susceptible to other pathogens.

## **\*\*Diagnosis:-**

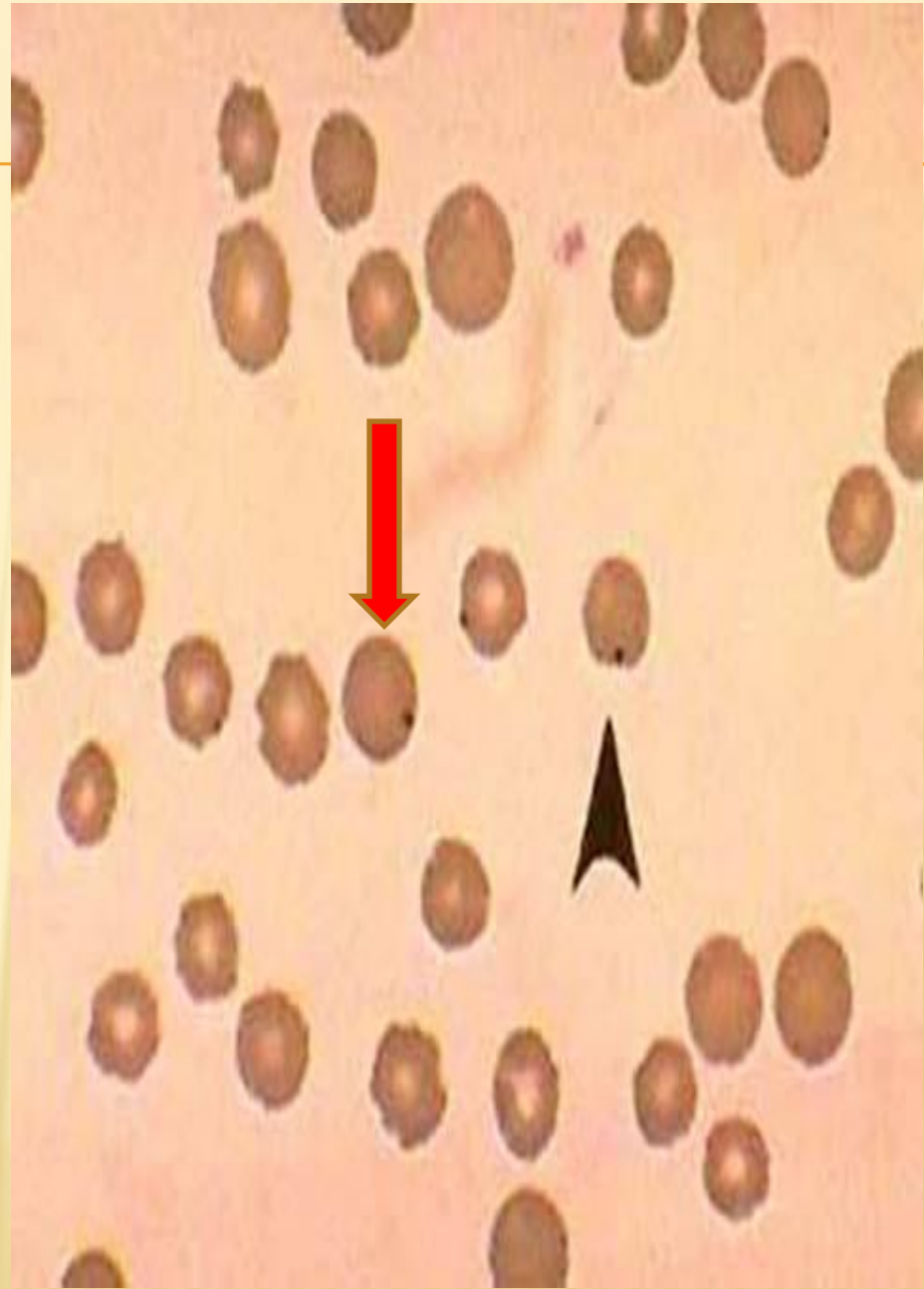
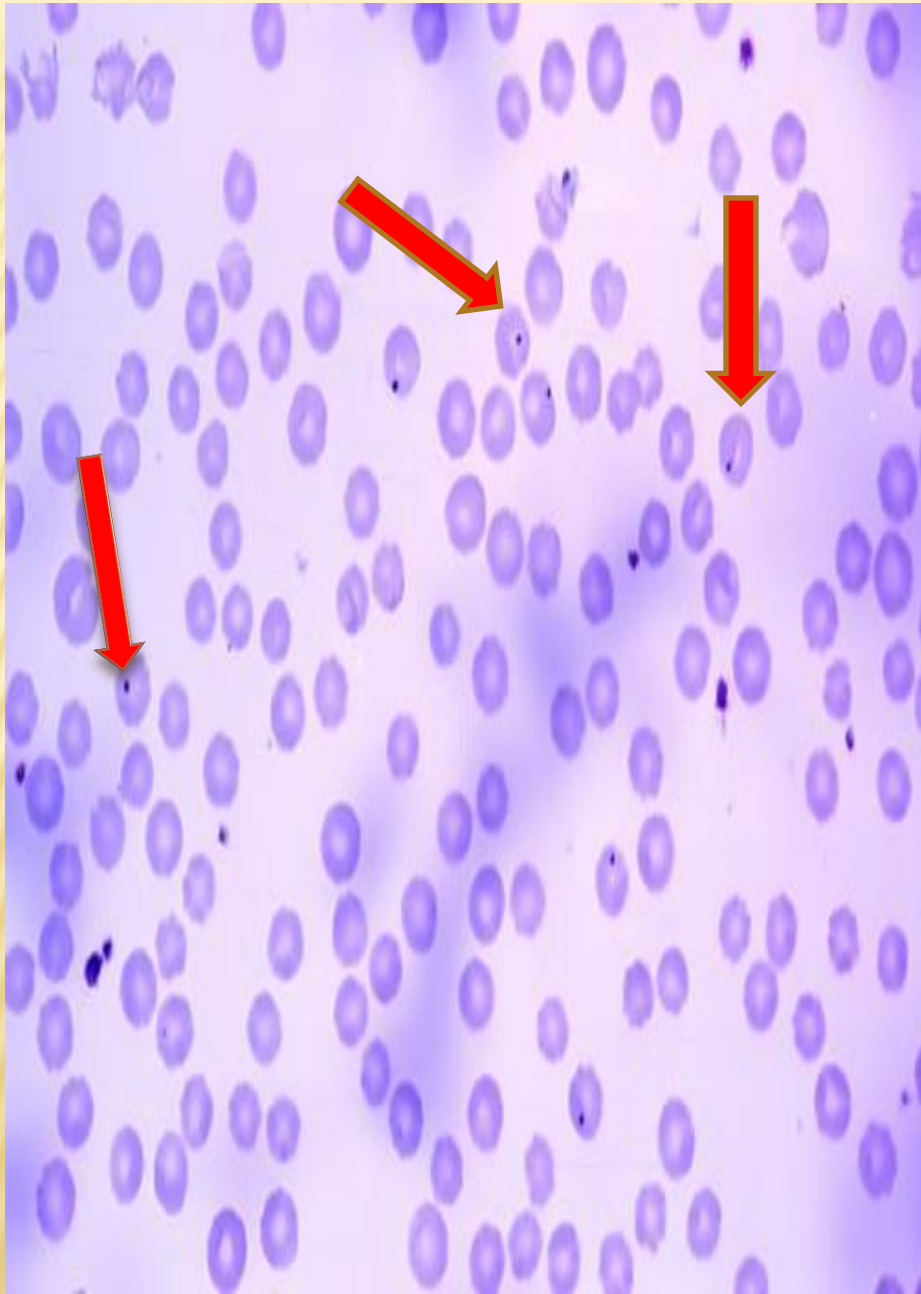
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- 1 – **Blood smears** --- (Thick and thin).
- 2- Serological tests (**IFAT, ELISA—etc.**).
- 3-PCR.

## **\*\*Control:-**

- 1 – **Treatment** of infected animals.
- 2 – **Control of vectors** (**Ticks, flies, and mosquitoes**).
- 3 – **Test and slaughter** of infected animals.
- 4-**Vaccination** with mild strain (*A. centrale*).







**Thanks For Listening**