THEILERIOSIS TODAY

A NATIONAL CRISIS

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THEILERIOSIS TODAY

• What is theileriosis?
• What is happening?
• Why is it happening?
• What can be done about it?
WHAT IS THEILERIOSIS

• What is theileriosis?
  – Definition
  – Distribution
  – Variants
  – Life cycle
  – Clinical signs
  – Post-mortem findings
  – Diagnosis

• How is it transmitted?
Theileriosis: Definition

• “A disease of animals caused by protozoa of the genus *Theileria*”

• Various species carried by various ticks cause heavy economic losses in cattle, sheep, goats and wildlife in Africa, southern Europe, Middle East, Asia and Australasia

• In Zimbabwe, specifically “a disease of cattle caused by *Theileria parva*”
Theileria Parva: Distribution
Theileria parva: Variants

- Three distinct epidemiological variants of disease caused by *T. parva*.

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>TRANSMISSION</th>
<th>SEASONALITY</th>
<th>MORTALITY</th>
<th>SPREAD</th>
</tr>
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<tbody>
<tr>
<td>East Coast fever</td>
<td>Cattle - cattle</td>
<td>Non-seasonal</td>
<td>High</td>
<td>Rapid</td>
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<td>Zimbabwe theileriosis</td>
<td>Cattle - cattle</td>
<td>Rainy season</td>
<td>Low</td>
<td>Slow</td>
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<td>Corridor disease</td>
<td>Buffalo - cattle</td>
<td>Non-seasonal</td>
<td>High</td>
<td>Self-limiting</td>
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Theileria parva: Variants

- East Coast fever + Corridor disease
- Corridor disease
- Zimbabwe theileriosis + Corridor disease
Theileria parva: History in Zimbabwe

• 1901/2 East Coast fever introduced
• 1934 Corridor disease recognized
• 1936 Zimbabwe theileriosis (January disease) recognized
• 1954 East Coast fever eradicated, Corridor disease and Zimbabwe theileriosis persist
Theileria parva: Life Cycle

Transformation
*Theileria parva*: Clinical signs

- Breathlessness
- Swollen lymph nodes
- Temperature
- Poor appetite
- Low milk production
Theileria parva: Clinical signs
Theileria parva: Post-mortem findings
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Theileria parva: Diagnosis

• Based on the detection of schizonts in blood, lymph node and spleen smears, in conjunction with history, clinical signs and post-mortem findings
Theileria parva: Diagnosis
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Theileria parva: Diagnosis

- Based on the detection of schizonts in blood, lymph node and spleen smears, in conjunction with history, clinical signs and post-mortem findings
- Piroplasms are non-specific
- Differentiation from other Theileria species is based on serological and molecular techniques
Theileriosis in Zimbabwe

What Is Happening
Theileriosis Confirmed At Central Veterinary Laboratory 2010-2019
Theileriosis In 2018

![Bar graph showing the number of affected farmers and total cattle deaths in 2018.](image-url)
Districts With Theileriosis 2010-2019

Number of Districts

- 2010: 1
- 2012: Data missing
- 2013: Data missing
- 2014: Data missing
- 2015: Data missing
- 2016: Data missing
- 2017: Data missing
- 2018: Data missing
- 2019: Data missing
Districts With Theileriosis 2019
Seasonal Incidence Of Theileriosis
*Theileria parva* is primarily a parasite of ticks.
The Brown Ear Tick
*Rhipicephalus appendiculatus*

- The main vector of *Theileria parva*
- Three host tick
- Preferred hosts are cattle and large wild ungulates
- Adults feed preferentially on the ears
- Immatures feed on the head and neck
The Brown Ear Tick
The Brown Ear Tick
Life Cycle

Larvae

Nymphs

Adults

unfed adults

engorged nymphs

Host III

Host II

unfed nymphs

unfed larvae

eggs

engorged females

Host I

unfed nymphs

engorged larvae

Host II

engorged nymphs
The Brown Ear Tick
Transmission of *Theileria*
The Brown Ear Tick
Seasonality in Southern Africa

- **Diapause**: October - December
- **No ticks**: January - March
- **Nymphs**: April - June
- **Larvae**: July - September
- **Adults**: January - March
East Coast Fever
Seasonality in Zimbabwe

- Adults: January - March
- Nymphs: July - September
- Larvae: April - June
- No ticks: October - December
- Diapause
Zimbabwe Theileriosis Seasonality

- **Adults**: January - March
- **Larvae**: April - June
- **Nymphs**: July - September
- **Diapause**: October - December

No ticks October - December
Theileriosis in Zimbabwe
Change in Seasonality

- **Adults**: January - March
- **Larvae**: April - June
- **Nymphs**: July - September
- **No ticks**: October - December
- **Diapause**: October - December
What Is Happening?

- *Theileria parva* is changing from seasonal to non-seasonal, with rapid spread and high mortality.

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1930’s        today
Why Is It Happening?

• Change in cattle?
• Change in the *Theileria*?
• Change in the tick?
Change In The *Theileria*

- Has the *Theileria* that was present in Zimbabwe for 80 years suddenly changed its character?
- Has an East African type of *Theileria* been reintroduced?
Change In The Tick?

• Has the Brown Ear Tick increased in numbers to overwhelm the seasonal effect? Are nymphs so numerous that they can transmit fatal disease?

• Has the Brown Ear Tick changed its character? Can nymphs now transmit *T. parva* more efficiently than before?

• Has another species of tick become involved in transmission?
Lowveld Brown Ear Tick

- Brown Ear Tick (*Rhipicephalus appendiculatus*) was identified in 1901
- Lowveld Brown Ear Tick (*Rhipicephalus zambeziensis*) was not identified until 1981
- Differences
  - Adults almost identical – feed on ears
  - Lowveld Tick larvae and nymphs more easily differentiated – feed on legs
  - Lowveld Tick more tolerant of dry conditions
  - Lowveld Tick nymphs efficient vectors of *T. parva*
Distribution of Lowveld Brown Ear Tick in Zimbabwe

1982

2014
Lowveld Brown Ear Tick: Distribution In Zimbabwe

• Why has the distribution changed?
  – Failure of dipping
  – Lack of movement control
  – Climate change?
Lowveld Brown Ear Tick: Transmission of Theileriosis

- The Lowveld Brown Ear Tick is known to be a major vector of East Coast fever, especially in winter, in the Southern Province of Zambia.
- It is likely that it is the tick responsible for transmission of theileriosis in Zimbabwe in winter.
- Transmission throughout the year favours the appearance of strains of *Theileria parva* that are more virulent, spread more easily and cause higher mortality.
What Can Be Done To Control Theileriosis?

National level

• National control/eradication programme
  – Intensive dipping
  – Movement control
  – Quarantine of infected properties
  – Destocking
What Can Be Done To Control Theileriosis?

Farm level

- Effective fencing (double along public roads/vulnerable boundaries)
- Effective dipping, throughout the year
- Prevention of introduction of tick-infested or *Theileria*-infected cattle (including vaccinated animals)
- Prevention of introduction of tick-infested hay
- Surveillance – disease and ticks (NB legs)
- Early treatment of clinical cases
What Can Be Done To Control Theileriosis?

Immunization

- Live parasites in blood and spleen - ineffective
- Molecular vaccine – no vaccine yet developed
- Cell culture vaccine – not effective with *Theileria parva*

Infection and treatment

- Block treatment with tetracyclines – unreliable
- NB Infection and treatment and block treatment create carriers
Infection and Treatment

• Bulk up selected isolate of *Theileria* in cattle, infect ticks, prepare deep-frozen stabilate, establish safe/effective dose, and inoculate simultaneously with long-acting tetracycline

• Shortcomings
  – Immunization is generally most effective with a local isolate
  – Immunized cattle are likely to be carriers
  – Logistical difficulties
  – Expense – up to USD7/head (2019)
Immunization In Zimbabwe

• A local isolate, Boleni, was developed and tested in the mid-1990’s by an FAO project.
• It proved to be effective against all isolates tested, except those originating from buffalo.
• It could be administered without tetracycline coverage.
• No vaccine available since 2005.
Conclusions

• Theileriosis has re-emerged as a serious constraint to cattle production
• The major reason may be the reintroduction of the Lowveld Brown Ear Tick to the highveld
• There is little prospect of an effective national control programme
• Cattle owners must accept responsibility for control in their herds
• Immunization may play a role in control programmes