

Acaricide (chemical) resistance in cattle ticks

Introduction

Cattle ticks have the ability to adapt over time so that they, and their offspring, build up resistance to tick treatments. The prolonged or incorrect use of tick chemicals can lead to resistance in ticks. Resistance enables the ticks to tolerate and survive chemical applications. Pesticides that kill mites and ticks are referred to as 'acaricides', which is why this form of resistance is called acaricide (chemical) resistance.

An increase in chemical resistance in cattle ticks could result in current routine tick treatments becoming ineffective, making tick control in the future much more difficult. It is important to preserve the chemicals available by restricting the spread of resistant ticks throughout the Northern Territory. This can be achieved by adhering to movement requirements relating to cattle ticks, the correct use of chemicals and good dip management.

Acaricide chemical groups

A number of chemical groups are available for controlling cattle ticks in Australia. Resistance depends on the chemical group used and its rate of application over time. There have been some cases of acaricide resistance to the Macrocylic Lactone (ML) group in Queensland, which include 'mectin'-based chemicals, such as ivermectin.

Table 1: Chemical groups of acaricides used for controlling cattle ticks and the associated resistant strains

Chemical groups	Resistant strains of cattle ticks (<i>Rhipicephalus [Boophilus] microplus</i>)				
	Biarra Mt Alford	Ulam	Lamington	Parkhurst	Ultimo
Organophosphates (OP)	×	✓	✓	×	×
Synthetic pyrethroids (SP)	✓	✓	×	×	×
Amitraz	✓	×	✓	✓	×
Macrocylic lactone (ML)	✓	✓	✓	✓	✓

Acaricide resistance in Australia and the Territory

Queensland, New South Wales and the Territory all have properties with acaricide resistant cattle ticks. In Queensland, there is a high prevalence of Parkhurst and Ultimo strains of resistant cattle ticks in the central highlands and the southeast corner, while minimal resistance is seen in the northern gulf and western regions.

Resistant cattle tick has not been monitored in Queensland since the 1970s so the extent of resistance is unknown. New South Wales has a high prevalence of Parkhurst and Ultimo resistant cattle ticks in the far north-eastern corner of the state. There is no known acaricide resistance in Western Australia. The other remaining Australian states do not have cattle ticks.

Resistant cattle ticks were first detected in the Territory in 1999, on a property in the Darwin region. The resistant tick was classified as Parkhurst strain. Parkhurst cattle ticks originated at Parkhurst, near Rockhampton, Queensland in 1987. Reports of poor tick kill lead to the suspicion of resistant tick and further investigation confirmed the resistance.

The Parkhurst tick may have been introduced to the Territory when large numbers of export cattle were imported in the late 1990s. It is likely that the cattle tick was not detected during inspection and the treatment applied before movement failed to kill the cattle tick.

Following detection, extensive surveillance was undertaken and 10 properties were classified as infected with Parkhurst tick. Tick control measures commenced on all infected properties to prevent further spread. The Department of Primary Industry and Resources (now the Department of Industry, Tourism and Trade) conducted a survey in 2010 to assess the status of acaricide resistance in the Territory. The surveillance detected an increased number of properties with Parkhurst resistance. This resulted in the declaration of a Parkhurst infected zone (see Figure 1.).

The department monitors the development of acaricide resistance through:

- general tick inspections required for movement to tick free areas
- surveillance on properties bordering the boundary of the Parkhurst infected zone
- investigation of all unauthorised movements of livestock out of the Parkhurst infected zone.

The number of property visits and the cattle inspected by departmental Livestock Biosecurity Officers for the previous 5 years is shown in Table 2.

Table 2: Property visits and tick inspections by Livestock Biosecurity Officers for movement of cattle and buffalo to tick free areas over five years

Year	Total property visits	Total number of cattle inspected
2014-2015	243	112 333
2015-2016	265	73 605
2016-2017	230	85 357
2017-2018	188	58 431
2018-2019	300	87 401

Routine surveillance for resistant ticks in 2018 led to the discovery of the Parkhurst strain of cattle tick on

a property outside of the Parkhurst infected zone. The gazetted Parkhurst infected zone was reviewed and the zone has been extended to include the infected property.

For further information relating to cattle tick zones in the Territory and movement conditions, please refer to the livestock movement conditions section at [Cattle tick control - NT.GOV.AU](https://www.nt.gov.au/industry-tourism-trade/livestock-movement-conditions/)

Implications of acaricide resistance

The development of acaricide-resistant tick populations has significant implications for the Territory. Resistance results in chemicals being ineffective to kill and control cattle ticks, reducing the number of effective chemicals in the market.

For example, if a property is infected by the Parkhurst strain, SP chemicals (such as the Bayticol® spray and dip) are ineffective. The only remaining chemical available for use in a plunge dip is Amitraz. There are no other dip acaricides currently on the market in Australia.

If a property is infected by the Ultimo strain (resistant to SPs, OPs and Amitraz), the only remaining cattle tick treatment option is MLs, which are a pour-on or injectable applications only. Experience has shown that MLs are not as effective as plunge dips and considerably more labour intensive. Additionally, some ML products can take more than 5 days to start killing cattle ticks.

The 'ideal' acaricide is one that:

- has a high level of toxicity towards all stages of the life cycle of cattle ticks
- can be easily administered by a number of methods, such as pour-on, plunge dip, spray dip or injection
- is cost-effective
- is rapidly metabolised and excreted to reduce the level of chemical residue in the animal, which requires long withholding periods and export slaughter intervals.

Factors that influence the development of acaricide resistance

The following factors can increase the likelihood of developing acaricide resistance on a property:

- **Treatment frequency** – the more often ticks are exposed to the chemical, the more likely they will develop resistance to it. Treatment of European cattle in eastern Australia every 3 weeks has resulted in rapid development of acaricide resistance.
- **Under-dosing** risks tick survival, enhancing tolerance/resistance to the chemical.
- **Persistent use of one chemical group for tick control.** This is generally not an issue in the Territory because of infrequent and low use of acaricides for controlling cattle ticks.

Reducing the risk of acaricide resistance

Basic management and biosecurity principles can reduce the chances of acaricide resistance developing or being imported on to a property.

- Always use the recommended strength in dips as printed on the chemical label by the manufacturer.
- If using a plunge dip, always re-dip stirrer cattle. A factsheet detailing maintenance and testing requirements of a plunge dip is available at [Cattle tick control - NT.GOV.AU](https://www.nt.gov.au/industry-tourism-trade/livestock-movement-conditions/)

- Never under-dose animals during treatment with pour-on or injectable applications. Treat the mob at the rate of the heaviest animal to reduce the chance of under-dosing.
- Strictly observe the Territory tick zones and related movement requirements to avoid spreading chemical resistant ticks.
- Import only tick-free livestock on to your property. If this is unavoidable, treat livestock on arrival and only turn out tick-free cattle on to the paddock.

How to report poor tick kill

If you suspect poor tick kill, notify your local livestock biosecurity officer for investigation and testing.

Darwin	Telephone: 08 8999 2034
Katherine	Telephone: 08 8973 9767
Tennant Creek	Telephone: 08 8962 4458
Alice Springs	Telephone: 08 8951 8125