

Acaricide (Chemical) Resistance in Cattle Ticks

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INTRODUCTION

Like all living things, cattle ticks have the ability to overcome adversity in order to survive. They can adapt genetically over time so that they and their offspring build up resistance to the normal tick treatments used. This is known as tick acaricide (chemical) resistance. The prolonged or incorrect use of tick chemicals can lead to resistance in ticks, enabling the ticks to tolerate and survive chemical applications.

An increase in the level of chemical resistance to cattle ticks in the NT could lead to the current routine tick treatments becoming useless, making tick control in the future much more difficult. Therefore it is important to preserve the chemicals available by restricting the spread of resistant ticks throughout the NT. This can be achieved by observing the tick control zone system in the NT and by the correct use of chemicals and good dip management.

ACARICIDE CHEMICAL GROUPS

A number of chemical groups are used for controlling ticks in Australia. Resistance depends on the chemical group used and its rate of application over time.

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 microplus</i>)				
	Biarra Mt Alford	Ulam	Lamington	Parkhurst	Ultimo
Organophosphates (OP)	X			X	X
Synthetic pyrethroids (SP)			X	X	X
Amitraz		X			X
Macrocyclic lactone (ML)					

There have been some cases of acaricide resistance to the ML group in Queensland, which include 'mectin'-based chemicals, such as ivermectin.

ACARICIDE RESISTANCE IN AUSTRALIA AND THE NORTHERN TERRITORY (NT)

The central highlands and the south east corner of Queensland have a high prevalence of Parkhurst and Ultimo strains of resistant cattle ticks. There is minimal resistance in the northern gulf and western regions of Queensland. 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 on a property in the Darwin region in Northern Territory in 1999. The resistant tick was classified as Parkhurst strain. Parkhurst cattle ticks originated at Parkhurst near Rockhampton,

Qld in 1987. Reports of poor tick kill lead to the suspicion of resistant tick and a subsequent 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 and the cattle tick was not detected during inspection or effectively killed during treatment prior to movement. Following detection, extensive surveillance was undertaken and a total of ten properties were classified to be infected with Parkhurst tick. Tick control measures commenced on all infected properties to prevent further spread. The Department of Primary Industry and Fisheries conducted a survey in 2010 to evaluate the current status of acaricide resistance in the NT. The surveillance detected an increased number of properties with Parkhurst resistance. This resulted in the declaration of a Parkhurst Infected Zone (see Figure 1.). Two properties, which had been previously infected by the Parkhurst strain were identified to be infected with the Ultimo strain. This may have been introduced on imported cattle or developed through frequent or understrength Amitraz application.

The department constantly 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 and also 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 five years is shown in Table 2.

Table 2. Property visits and tick inspections by Livestock Biosecurity Officers for movement to tick free areas in the last five financial years

Year	Total Property Visits	Total Number of Cattle Inspected
2007-2008	113	41 158
2008-2009	127	64 265
2009-2010	276	141 133
2010-2011	543	225 343
2011-2012	472	190 605

- They have a clean inspection and an inspector authorises movement to a plunge dip outside the Parkhurst Infected Zone, within 24 hours of the clean inspection for the purpose of the supervised treatment under the supervision of an inspector and moved within 24 hours of the supervised treatment.

Goats, sheep, camels and alpacas

Clean inspection:

- inspected by an inspector; and
- declared by the inspector to be free of visible ticks or free of ticks containing body fluids.

Supervised treatment:

- the livestock are treated under supervision and with the approval of an inspector, in a certified solution.

Goats, sheep, camels and alpacas must have a clean inspection followed by supervised treatment with Amitraz and the animals must be moved from the property within 24 hours after the clean inspection and supervised treatment.

Horses

There are currently no movement restrictions between the Parkhurst Infected Zone and the Cattle Tick Infected Zone. However, movement restrictions apply for all horses from the Infected Zone into or through the Control Zone or Free Zone.

Clean inspection:

- inspected by an inspector; and
- supervised treatment with Bayticol®.

For property to property movements of all livestock within the Parkhurst Infected Zone Area there are no movement restrictions. Movement restrictions apply to properties with Ultimo classified status.

IMPLICATIONS OF ACARICIDE RESISTANCE

The development of acaricide-resistant tick populations has significant implications for the infected property and the NT. The development of acaricide resistance results in the chemical being ineffective to kill and control cattle ticks. This reduces the number of available effective acaricides 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), then the only remaining cattle tick treatment option are MLs, which are a pour-on or injectable applications only. Experience has shown that MLs are not as effective as plunge dips and some ML products can take up to five 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.



Figure 2. Cattle ticks on the brisket of a Brahman cross animal

Factors that Influence the development of acaricide resistance

- 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 three 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. It is generally not an issue in the NT because of infrequent and low use of acaricides for controlling cattle ticks.

REDUCING RISK OF ACARICIDE RESISTANCE

Some basic management and biosecurity principles can be used to reduce the chances of acaricide resistance developing or being imported on to your property, such as:

- Always use the recommended strength in dips as printed on the chemical label by the manufacturer.
- If using a plunge dip, always re-dip your stirrer cattle.
- Never under-dose animals during treatment with pour-on or injectable applications. Treat the mob at the rate of the heaviest animal, reducing the chance of under-dosing.
- Strictly observe the NT 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.
- If you suspect poor tick kill, notify your local Livestock Biosecurity Officer for investigation and testing.



Figure 3. Jumping into the plunge dip

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