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CHEMICAL RESISTANCE in *cattle ticks:*

Why it is increasing and what farmers can do about it

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Ticks cause major economic losses for farmers worldwide. This is mainly due to the diseases they transmit, which have a large impact, but productivity is also directly affected by the blood-feeding of these parasites. For example, each engorging female blue tick can lead to a loss of as much as 1 gram of body mass per animal per day. Although this sounds small, a single animal in some areas may carry more than 1,000 female ticks at a time, meaning as much as 1 kilogram of body mass can be lost per animal per day.

In South Africa, blue ticks have a major impact. Two blue tick species currently occur in the country: the Asian blue tick (*Rhipicephalus microplus*) and the African blue tick (*Rhipicephalus decoloratus*). Both can cause redwater, but the Asian blue tick can transmit both Asiatic and African redwater, whereas the African blue tick can transmit only African redwater. Asiatic redwater is particularly serious, as cattle become very sick (and in most cases die) in areas where they have not been previously exposed to the pathogen.

Ticks and tick-borne diseases are commonly managed by applying chemical products (known as acaricides) that kill ticks before they can cause disease. But the major problem is that ticks on some farms have become much more difficult to kill than in the past. Recent studies show that this can be attributed to ticks, especially blue ticks, becoming increasingly resistant to the chemical products that farmers have been using for many years. This means the acaricides we rely on are becoming less effective.

Asiatic blue tick - *Rhipicephalus microplus*
Source: Jade Hastings

How do ticks develop resistance?

Acaricide resistance is an inherited change in a tick population's susceptibility to a chemical. It is observed when an acaricide repeatedly fails to control ticks adequately, even when applied exactly according to instructions and at the recommended dose.

When cattle are treated with an acaricide, the ticks on the animals are exposed to the active ingredient (for example, cypermethrin). Those that are susceptible die, while those that are resistant survive. This means selection favours ticks carrying the resistance gene(s), which are then passed on to the next generation. Initially, only a small proportion of ticks in the field carry these resistance gene(s), because many ticks occur in the free-living phase and are not exposed to treatments. Over time, as more treatments occur, the balance shifts. Eventually, most ticks in the field will carry the resistance gene(s), resulting in less effective tick control.

The brown ear tick - *Rhipicephalus appendiculatus*
Source: Alec Evans

Resistance is difficult to prevent completely, but the rate at which it develops can be slowed. The speed of development depends mainly on:

1) How often an acaricide is applied, and
2) The chemical class (e.g., synthetic pyrethroid or organophosphate) of the acaricide used.

The more frequently the same product is used, the more ticks are exposed to that active ingredient and the faster resistance develops. Chemical class matters because it determines how resistance genes are passed on, which influences the speed of resistance development.

Why does it develop faster in blue ticks?

Blue ticks are known as one-host ticks because their entire parasitic life cycle - larva, nymph, and adult - occurs on a single animal. The cycle begins when a free-living larva climbs onto a cow and starts feeding. It feeds for 5 to 9 days before moulting into a nymph. The nymph then feeds for another 5 to 9 days before moulting into an adult. Female ticks mate on the host, feed for 7 to 9 days until fully engorged, and then drop off into the environment to lay 2 000 to 2 500 eggs. These eggs hatch after 3 to 6 weeks into larvae, starting the cycle again. The full life cycle takes about two months, meaning several generations occur each year.

Multi-host ticks, such as the brown ear tick (*Rhipicephalus appendiculatus*), the bont-legged tick (*Hyalomma truncatum*), and the South African bont tick (*Amblyomma hebraeum*), complete their different parasitic stages on different hosts and generally complete only one life cycle per year.

Resistance typically develops faster in one-host ticks because most parasitic stages and multiple generations are exposed to the same acaricide

Bont-legged tick - *Hyalomma truncatum*
Source - Luther van der Mescht

in a short period. In contrast, multi-host ticks develop resistance more slowly because only one stage and usually only one generation are exposed to a given treatment. Additionally, multi-host ticks generally have a much larger proportion of their population in the free-living stage at any time, meaning fewer individuals are exposed to treatments.

Rhipicephalus tick cluster on cow
Source: Luther van der Mescht

What can farmers do to slow the problem?

Sustainable tick management requires an integrated programme that promotes the responsible use of acaricides, prevents misuse, and is applied alongside good production and grazing management to ensure effective long-term control. Management practices should be adapted to each farm's specific environmental, production, economic, social, cultural, and individual context.

Key considerations include:

1) Biosecurity

When animals are moved between camps on the same farm or between farms, biosecurity measures must be in place to prevent ticks from moving with them. When animals arrive from another farm, they must be treated in quarantine with an acaricide not recently used on the farm of origin. These animals should remain in quarantine for at least 30 days to prevent ticks arriving with them from dropping into the field.

2) Good nutrition

Nutrition plays a crucial role in increasing cattle resistance and resilience against ticks and other parasites. A strong immune system requires good nutritional status. High-quality grazing and strategic feed supplementation with energy and protein help strengthen immunity against ticks.

3) Smart grazing management

Grazing management is one of the most important non-chemical strategies for managing ticks. It involves resting or rotating camps for periods long enough to break the tick life cycle by ensuring free-living stages die off. The required rest period depends on the environment and can be shorter in hot, dry seasons or areas with little vegetation, as these conditions are unfavourable for tick survival.

4) Targeted use of acaricides

In addition to good biosecurity, nutrition and grazing strategies, best practices in acaricide application must be used. Four general approaches exist:

- Suppression

A zero-tolerance strategy where treatments occur at short intervals, typically no more than 21 days apart. This requires long-term commitment and relies on the consistent availability of effective acaricides with minimal resistance. Continuous resistance monitoring is essential.

- Opportunistic

Acaricides are applied when cattle are already in the handling facility for other routine management tasks. This is more effective in areas with low to medium tick loads. It also works better when the acaricide provides long residual protection and treatments coincide with periods of higher tick abundance on animals.

- Strategic

Designed mainly for blue ticks, especially in subtropical regions with well-defined tick seasons. This involves intensive treatment at the beginning of the period when free-living larvae are most abundant. Treatment intervals should not exceed the product's protection period. This method is effective when applied long enough to ensure most free-living larvae are killed.

- Selective

An economic threshold of engorged female ticks per animal is determined for a farm to decide when treatment is necessary. The threshold depends on factors such as environment, season, production system, tick species, and disease risk. The disadvantage is that a farm-specific study is required to determine the threshold before this approach can be implemented.

The road ahead

Tick resistance is not something we can completely prevent, but we can slow it down. It requires a combination of good grazing management, nutrition, biosecurity, and especially the smart use of acaricides. An integrated approach is key to preventing these tiny parasites from becoming a major threat.