TICK RESISTANCE TO ACARICIDES

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INTRODUCTION

- Chemical tick control is currently the most practical method of controlling ticks in Kenya.

- Almost all ticks are found on the bodies of cattle. Thus, cattle are the best methods of collecting ticks to either a dip, spray race or a crush where they can be killed by soaking the animals with a chemical – acaricide.
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 – pour-on, plunge dip, spray dip or injection

- Is **cost-effective**

- Is **rapidly metabolized and excreted** to reduce the level of chemical residue in the animal
Acaricides use TRENDS in Kenya

- Classify products in the market:

- Arsenicals (Sodium arsenate): First to be used in 1912 when the first dips were constructed in Kenya. Use up to 1949. Very Toxic & persistent in the environment

- Organochlorines (OCs), Benzene Hexachloride, BHC: Used From 1949 very toxic with Bio-accumulation in body fats and secretion in milk. Environmental residues
Carbamates: (Sevin) Introduced in 1959. Not much used.

Organophosphates (OPs) group I: Introduced in the 1970s. (Delnav, Bacdip).


**Developed resistance to a lot of them, esp. Blue tick**


**Confirmed resistance by Blue tick in some parts of the country**
• Synthetic Pyrethroids (SPs): (Dominex, Ectomin etc). Low mammalian toxicity & persistence, with high levels of toxicity to insects enable them to be used at very low doses.
  • Used in Kenya since 1995 for tsetse control.
  • DVS gazetted SPs for the purpose of Tick/tsetse control in 2003 (Legal Notice No. 212 of 5th Dec. 2003) under cattle cleansing act.

• Combination Acaricides: DVS approval for Registration of Combination acaricides (2011?)
  1. DuoDip (2013) First Combination to be registered

• Triple Combinations
TICK RESISTANCE TO ACARICIDES

- Resistance is usually first recognized as a failure to eliminate tick burdens from cattle after frequent, correctly applied acaricide treatments.

- The first case of resistance to arsenic in Kenya was reported in B. decoloratus ticks in 1953. In 1954 resistance by the same ticks to BHC was reported. In 1962 resistance to Toxaphene by B. decolororus was confirmed and in 1976 the use of toxaphene was prohibited because of resistance to it by R. appendiculatus.

- We have not properly mapped our resistance incidences.

- In the last couple of years however, there have been increased claims from parts of Rift valley and Central provinces of the appearance of resistance to Amitraz and SP acaricides.
Resistance involves some or all of the following factors:

- Frequency of resistance gene: Natural genetic adaptation to overcome adversity in order to survive. In most cases, it is likely that genes that confer resistance are already present at very low levels in the tick population before the introduction of a new acaricide. *Target site mutations are most common resistance mechanisms.* *Metabolic mechanisms*

- Treatment intervals: The more often ticks are exposed to the chemical, the more likely they will develop resistance to it (Selection pressure)

- Acaricide concentrations: Incorrect use. Under-dosing enhances tolerance & eventual resistance
Persistent use of one chemical group for tick control: President Museveni (June 2013)… “I have been using decatix for the last 15 years to spray my cows and it had been working. However in the recent past the acaricide was no longer effective in eliminating ticks from my herd and I only learnt a few months ago that my prolonged use of decatix has instead enabled the ticks to build resistance.” …” While we Africans are known for conservation, this love does not extend to conservation of disease! These diseases impoverish our people and must be addressed.”

Existing tick control policies

Resistance different from tolerance
Resistance is most widespread and diverse in the one-host cattle tick *Rhipicephalus (B) microplus/decoloratus*

It is much slower to develop in the two- and three-host ticks where longer generation times, less acaricidal exposure of the immature stages and presence of alternative hosts helps reduce selection pressure.
PRACTICAL OPTIONS TO COUNTER RESISTANCE

- More judicious use of acaricides (including rotating between acaricide classes. Acaricide Combinations.doc)
- Reduce intensity of acaricide use (One host ticks vs multiple host ticks): Reduces the selection pressure to a minimum while still achieving control with tactics designed to increase the useful life of a pesticide and decrease the interval of time required for a pest to become susceptible once more to a given pesticide
- New generation acaricides (including mixtures): New acaricides are extremely expensive to develop. Acaricide Combinations.doc
- Biological Controls - Fungi
- ECF vaccination
- Integrated Pest Management (IPM): Exploit the biology of the tick
OTHER OPTIONS

- Preserving refugia of untreated populations. More practical in places where livestock movement is effectively controlled.
- Tick-resistant cattle.
- Tick vaccines (A vaccine against *Rhip. (B) microplus* is registered in Australia.)

NB:

- Resistance mgmt in a free-market economy will almost inevitably involve implementation of strategies after resistance has emerged, and therefore has to operate in a crisis situation.
- The paradox is that once resistance has emerged, most of the best options for managing it are no longer effective.
Thank you!