

Coordinated and Synchronous Drenching of Cattle to control Stable Flies

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BACKGROUND

One of the actions from our last RRG meeting was to look into the option of co-ordinating a synchronous drenching of cattle (or any other livestock) in a particular area/shire at select time points during the year with the aim of curtailing stable fly outbreaks that affect livestock.

SUMMARY

Given all the factors listed below and the information provided on the 2 page discussion, on balance and in my opinion, I don't think that there is enough compelling evidence to proceed with this option.

- Stable fly can be exceptionally difficult to control once they have emerged as adult flies because of the brief amount of time they spend on their host as well as their ability to disperse long distances
- There is limited evidence of anthelmintic drugs having a direct and significant impact on blood-feeding stable fly
- No anthelmintic drug is registered in Australia with a claim of any control of stable flies, only against buffalo flies (they blood feed from 20-30X per day compared with stable flies 2-3X/day)
- Although products are registered against many blood-feeding external parasites (eg lice, ticks, mites, screwworm fly and buffalo flies), that does not mean they will definitely work against stable flies
- Antiparasitic drugs given to cattle leave residues in their dung that reduces stable fly larval survival in the dung, but negatively impacts on other dung decomposing insects such as dung beetles)
- Stable fly production from cattle dung is not a major source of stable flies in and around Perth, even though intensive animal industries (cattle feedlots) would benefit from the use of anthelmintics in their production system (which most would be assumed to be doing already).
- A systematic drenching of animals would also increase the risk of developing or exacerbating existing resistance to these drugs. Resistance has developed due to overuse, non-rotation between classes of anthelmintics, under dosing and systematic dosing.

DISCUSSION

USE OF ANTHELMINTICS AGAINST STABLE FLIES

Anthelmintics are drugs that kill both internal and external parasites in a whole range of livestock (cattle, horses, pigs, poultry). They are usually administered by pour-ons, injection into muscle or by oral pastes (equines) or in feed mix (poultry and pig). Many highly effective and selective anthelmintics are available, but such compounds must be used correctly, judiciously, and with consideration of the parasite/host interaction to obtain a favorable clinical response, accomplish good control, and minimize selection for anthelmintic resistance.

Underdosing is likely to result in lowered efficacy and possibly increased pressure for development of resistance. Overdosing may result in toxicity without increasing product efficacy.

Most anthelmintics generally have a wide margin of safety, considerable activity against immature (larval) and mature stages of helminths, and a broad spectrum of activity. Nonetheless, the usefulness of any anthelmintic is limited by the intrinsic efficacy of the drug itself, its mechanism of action, its pharmacokinetic properties, characteristics of the host animal and characteristics of the parasite (eg, its location in the body, susceptibility of the life stage, or susceptibility to the anthelmintic).

There are several classes of anthelmintics including benzimidazoles and probenzimidazoles, salicylanilides and substituted phenols, imidazothiazoles, tetrahydropyrimidines, organophosphates, macrocyclic lactones and, more recently the amino-acetonitrile derivatives, the cyclic octadepsipeptides, and spiroindoles. When adult stable flies were fed blood from ivermectin-treated cattle, mortality increased with length of time they fed on blood and reduced both the number and %hatch of eggs laid.

For male stable flies fed on treated blood for 72 h, the LC_{50} was 37.5ng/ml of blood. The value for female stable flies was outside the range of dosages tested (Miller *et al.* 1986). This is the only published literature on the effects of anthelmintics on blood-feeding by stable flies and suggests that females may not be significantly affected. Most work concentrates on the impact of the drug's residues in cattle dung on fly larval development when excreted after drenching.

Preventive treatment of cattle with avermectin insecticides (eprinomectin, abamectin, ivermectin, and doramectin) reduces the viability of stable fly larvae developing into adult flies in manure by >84% (Macedo *et al.* 2005). A significant inhibitory effect on the development of stable fly larvae can also be achieved by treating cattle dung with insect growth regulators pyriproxyfen and buprofezin (Liu *et al.* 2012) and novaluron (Lohmeyer & Pound 2012). Daily oral dosages of 5 µg/kg of ivermectin kill all face flies, approximately 60% of the stable flies, and 90% of the house flies in the manure. Cattle dosed at 20 µg/kg per day resulted in >90% mortality of stable fly larvae in the manure. Additionally, daily subcutaneous injections at 5 µg/kg per day prevented horn fly development in the manure, but injections of 10 mg/kg per day did not control stable fly larvae (Miller *et al.* 1981).

Residues from cattle treated with veterinary anthelmintics are excreted into the dung in concentrations that may be toxic to functionally important dung-colonizing insects. In the dung, these residues cause a range of well-studied lethal and sub-lethal effects, the magnitudes of which vary with the compound used, mode of administration and concentration, and the insect species in question. Particular concern has been associated with the use of macrocyclic lactones in this context (Wall & Beynon 2011). Faecally excreted

ivermectin inhibits the development of dung-dwelling flies for up to 30 days after treatment. The decomposition of dung pats from recently treated cattle is delayed significantly when compared with untreated controls due to the adverse effects on the primary dipteran decomposing fauna (Madsen *et al.* 1990). The residues in dung from cattle treated topically with endectocides, doramectin, eprinomectin and ivermectin suppressed stable fly up to 5wks post-treatment, whereas moxidectin residues did not suppress stable fly (Floate *et al.* 2001).

There are no anti-parasitic or anthelmintic based products available in WA (or Australia for that matter) with a registration claim on controlling stable flies. Most products are registered for sucking lice, mites, ticks and screwworm fly larvae, but not specifically for stable fly or buffalo fly control. Of the ≈200 anthelmintic products registered, there are 26 ivermectin-based, 2 eprinomectin, 2 doramectin and 4 moxidectin products with claims for control of buffalo fly (*Haematobia irritans exigua*) (see Table 1 for examples). Only 1 of the nearly 200 abamectin based products has a registration claim for control of buffalo fly, but the withholding period for meat and milk and the export slaughter interval are huge.

Anthelmintic resistance is becoming a major worldwide constraint on livestock production. Development of varying degrees of resistance among different species of gastrointestinal nematodes has been reported for all the major groups of anthelmintic drugs. Frequent usage of the same group of anthelmintic; use of anthelmintics in sub-optimal doses, prophylactic mass treatment of animals and frequent and continuous use of a single drug have contributed to the widespread development of anthelmintic resistance in helminths. The extent of this problem including multidrug resistance is likely to increase (Shalaby 2013).

Table 1. Registered anthelmintic products against buffalo fly on cattle in WA.

PRODUCT	ACTIVE	WHP	ESI
SEQUEL COMBINATION POUR-ON FOR CATTLE	10mg/mL abamectin	56	70
CATTLEMAX POUR-ON FOR BEEF & DAIRY CATTLE	5g/L ivermectin	28	28
BOVIMEC POUR-ON FOR BEEF AND DAIRY CATTLEBF	5g/L ivermectin	0	28
ZEROMEK POUR-ON FOR CATTLE	10g/L ivermectin	42	42
CATTLE PRO POUR-ON FOR BEEF & DAIRY CATTLE	5g/L ivermectin	28	28
TOROMAX POUR-ON FOR BEEF & DAIRY CATTLE	5g/L ivermectin	28	28
TOP END MECTIN FOR CATTLE	10g/L ivermectin	42	42
STOCKRITE IVERMECTIN POUR-ON FOR CATTLE	5g/L ivermectin	28	28
BIOMECTIN POUR-ON FOR CATTLE	10g/L ivermectin	42	42
IVOMEK EPRINEX POUR-ON FOR BEEF & DAIRY CATTLE	5g/L eprinomectin	0	0
EPRICARE POUR-ON FOR BEEF & DAIRY CATTLE	5g/L eprinomectin	0	0
DECTOMAX POUR-ON	5mg/mL doramectin	42	42
TARGOT POUR-ON ENDECTOCIDE	5mg/mL doramectin	42	42
TOPDEC/MOXIMAX POUR-ON FOR CATTLE AND RED DEER**	5g/L moxidectin	0	0

PASTORAL AG MOXIDECTIN POUR-ON FOR CATTLE**	5g/L moxidectin	0	0
MAXIMUS POUR-ON FOR CATTLE**	5g/L moxidectin	0	0
MOXIMAX CATTLE POUR-ON**	5g/L moxidectin	0	0

WHP = With Holding Period for milk and/or meat: **=registered only to “aid in control of buffalo fly”

ESI = Export Slaughter Interval

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