

THE POTENTIAL ECOLOGICAL IMPACT OF ANTHELMINTICS USE IN NATURE CONSERVATION AREAS

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BACKGROUND

Large herbivores such as cattle, horses and sheep are often used in nature conservation areas for vegetation management. If herbivores become infected with gastro-intestinal parasitological worms they may be treated with anti-worm (anthelmintic) pharmaceuticals. It is well known that such anthelmintics are excreted in dung and that they are toxic to dung flies and dung beetles. However, very little is known about anthelmintics use patterns in nature conservation areas and if this use poses a risk to biodiversity.

METHODS

2005 - Survey on the use of anthelmintics among 20 unit managers of nature conservation areas in The Netherlands (total management area 26,700 ha, with 3360 heads of cattle, 1870 horses and 1500 sheep).

2006 - Ivermectin analysis in dung from treated fjord horses and sheep (oral administrations) and from yearlings (topical 'pour-on' treatment). Dung sampling 1-4 days after treatment (Fig. 1).

RESULTS

Survey - Treated with anthelmintics are:

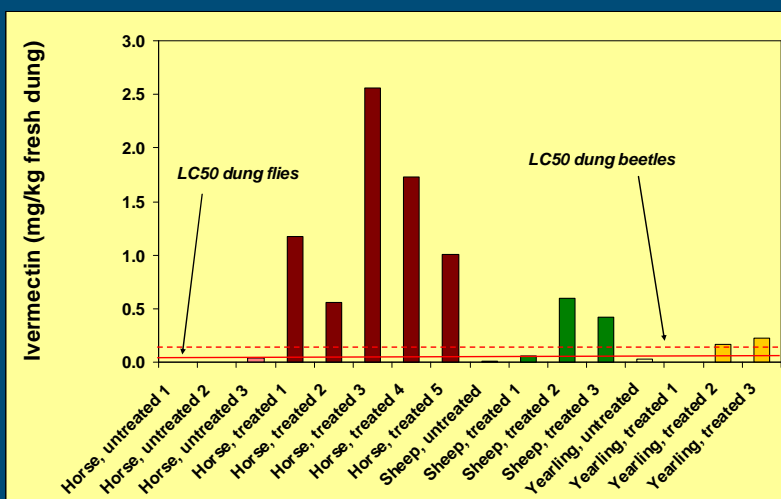
- herbivores in 80% of the reserves,
- 60% of the cattle in the areas (two third preventively),
- 50% of the horses (preventively in c. half of the cases),
- 100% of the sheep, all preventively.

Overall, preventive routine treatments occur in 75% of the reserves (1-3 times a year). Ivermectin is used in 75% of areas.

Dung analysis – Measured ivermectin levels in dung of treated herbivores are larger than in dung of untreated control animals (Fig. 2). Concentrations in treated samples exceed the EC50 for yellow dung flies in almost all cases and often exceed the EC50 for dung beetles as well.



Figure 1: A fjord horse takes a keen interest in the dung sampling. The sheep continue grazing without even paying attention.



*Figure 2: Results of ivermectin analysis in dung of different large herbivores treated with this parasiticide. Residue analysis according to Åsbakk et al. (J. Agric. Food Chem. 1999, 47, 999-1003). Solid line: 48h-LC50 of 0.036 mg/kg wet wt for larvae of the yellow dung fly *Scatophaga stercoraria* (Strong & James, 1993, Vet. Parasitol. 48: 181-191). Dotted line: 3wk-LC50 of c. 0.19 mg/kg wet wt for larvae of the dung beetle *Aphodius constans* (Hempel et al., 2006, Environ. Toxicol. Chem. 25: 3155-3163).*

CONCLUSION

It is highly likely that the (routine) use of anthelmintics impacts invertebrate dung fauna in nature conservation areas, at least at the individual level.

ADDITIONAL REMARKS

- Effects on populations in landscapes are not well investigated → 'toxic sink' hypothesis (dung fauna is attracted to contaminated dung where it is killed).
- Secondary effects on wildlife through food depletion are largely unknown → the invertebrate dung fauna is an important food source for insectivorous birds and bats.
- Accumulation of adverse levels of residues in wildlife "seems remote" for ivermectin and related compounds¹.
- There are good possibilities for risk mitigation by 'best practice' measures in collaboration with area managers (highly motivated), tenants and vets.

¹ Floate et al., 2005, *Annu. Rev. Entomol.* 50: 153-179