7. Flies on pastured cattle

7.1 Biting midges on heifers

The Danish Veterinary Laboratory, Roskilde University Centre and Danish Pest Infestation Laboratory all participated in a project financed by the Ministry of Food, Agriculture and Fisheries and the Danish Environmental Protection Agency. The goal of the investigation was to monitor the effect of biting midges *(Culicoides spp.)* on grazing cattle. Two groups of five heifers each received regular treatments with synthetic pyrethroid compounds; two other groups of five animals each were not treated. All groups were grazing adjacent to a bog, known for many midges. A fifth group of five heifers was grazing at some distance, where no biting midges were present. During the grazing season 1998, recordings of weight, double skinfold thickness in the belly region as well as sampling of blood and faeces were performed on all the animals. The animals were slaughtered by October and pathology inspection and histopathology were performed on samples from belly and udder.

Light traps were used to determine the number of biting midges as well as the number of species. It was demonstrated that the exposure of the heifers to the midges was very low (5-10 times) in the summer of 1998 compared to previous years.

There was no statistically significant effect of the insecticide treatment on the growth rate of the animals. The experimental groups were significantly different regarding macroscopic lesions on the belly and udder at slaughter, but this could not be related to exposure to the midges. The presence of minor skin lesions was related to measurable serum levels of Tumor Necrosis Factor (TNF) on an individual animal basis. There were few changes in the investigated haematological and clinico-chemical parameters.

Due to the low erratic numbers of midges during the summer, it was not possible to relate the individual heifer's exposure to midges to the physiological parameters mentioned.

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7.2 Microbial control of flies on pastured cattle

This project aims to gain information on entomopathogenic fungi as potential candidates for microbial control of horn flies (*Haematobia irritans*), face flies (*Musca autumnalis*) and other fly species on pastured cattle. The survey of naturally occurring fungal pathogens in these fly species, started in 1997, was continued in 1998. Live flies were sampled from cattle at three locations on a weekly basis between July and September. As in 1997 the fungal prevalence was in general very low. However, in contrast to the first year of the survey we recorded not only hyphomyceteous fungi but also entomophthoralean fungi (*Entomophthora muscae*, *Furia* sp.) from hornflies, sheep head flies (*Hydrotaea irritans*) and stable flies (*Stomoxys calcitrans*). Transmission experiments including *E. muscae* and *E. schizophorae* were carried out with cattle flies as receptors, but no transmission was observed. The low field prevalence and the low susceptibility in the laboratory of cattle flies to fungal isolates from the *E. muscae* complex indicate that these fly species are not likely to be controlled naturally by this group of fungi.

As in 1997 we recorded epizootics of *E. muscae* in other flies present in the pastures. Fungus-killed cadavers were found at two locations and like the previous year the cadavers were almost exclusively found attached to the upper part of thistles. Whereas the dominant fly species in 1997 in these epizootics was the muscid *Phaonia perdita*, in 1998 it was the yellow dungfly (*Scatophaga stercoraria*). The identity of the fungi involved is not yet clear. The *E. muscae* in *P. perdita* (1997) had very large conidia which contained more nuclei than any species previously described from the species complex. The *E. muscae* in the yellow dungfly (1998) had conidia with 15-18 nuclei on average and may correspond to *E. scatophagae*, a species that is only separated from the complex with difficulty, mainly based on its specificity to yellow dungflies. However, we have shown that the fungus can easily be transmitted from yellow dungflies to houseflies. The work with the identification of these fungi will continue, but in future the project will focus on infection experiments with hyphomyceteous fungi as microbial control agents of cattle flies.

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7.3 Manipulation of fly-load on heifers

The Department of Biological and Ecological Chemistry, IACR-Rothamsted, UK, The Laboratory for Behavioural Physiology, Institute for Animal Science and Health, NL and the Danish Pest Infestation Laboratory all participated in a project financed by the EEC. The project was presented as a poster at the 9th International Congress on Pesticide Chemistry held in London 2-7 August. The overall goal was to find new ways to control dipteran pests on cattle. Current control measures rely heavily on the use of synthetic insecticides. Due to a build-up in resistance to insecticides and public concern for the environmental impact, alternative methods of control based on the use of semiochemicals are being investigated. Studies on cattle/fly interaction have revealed differences in fly-load between individual heifers within herds, which have been attributed to differences in volatiles produced by the host. A new approach of pest control, using cattle derived semiochemicals as part of a "push-pull" strategy, is therefore being developed. The feasibility of this approach was demonstrated by an experiment on two herds, each including cattle with different fly-loads. By moving susceptible and less susceptible cattle between the two herds, it was possible to re-distribute the fly population in both. Volatiles emitted by susceptible and less susceptible cattle were collected by means of air entrainment techniques and analysed by coupled GC-EAG and GC-MS. Of the eighteen EAG-chemicals identified, only 1-octen-3-ol and m-/p-cresol have previously been identified as semiochemicals influencing dipteran host location. One newly identified compound in particular, 6-methyl-5-hepten-2-one, elicited high EAG and behavioural activity. Preliminary field trials with this compound applied to two individuals in a herd resulted in a significant re-distribution of the fly-load within the whole herd.

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