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# STRATEGIES TO CONTROL BLOWFLY STRIKES

# STRATEGII DE CONTROL A MIAZELOR FACULTATIVE

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*Blowfly strike is a common illness of sheep flocks worldwide. In Northern hemisphere is due to Lucilia sericata, and in Southern hemisphere L. cuprina is involved. This paper presents some aspects concerning current and future strategies to control flystrikes. Current control strategies refer to general management practices, selection of naturally resistant sheep, insecticide use and the use of baits and traps, respectively. The future strategies comprise vaccination strategies against blowfly larvae and fleece rot, sterile male release, use of Bacillus thuringiensis toxins, use of new insecticides, and biological control, respectively.*

**Key words**: blowfly strikes, control, strategies.

## Introduction

Myiasis due to blowflies, especially *Lucilia sericata* in Northern Europe and *Lucilia cuprina* in Australia and New Zealand, is widespread among sheep flocks all over the world. For example, in Australia, 79% of flocks from Queensland were affected (35), and in New South Wales, 60 to 90% of flocks were struck by blowflies (37; 38). In England, around 75% of flocks were affected (1), and in Netherlands about 52% of them are exposed to attacks of *L. sericata* (30).

The control of blowfly strike is realized mainly by the use of insecticides with neurotoxic activity such as organophosphates, pyrethrines or insect growth inhibitors (16; 17).

In the last few years, the control of populations of pest insect species using non-return traps and targets, usually accompanied by semiochemical baits, has been widely considered (5; 24; 29; 36).

This paper reviews the main control strategies applied to control blowfly populations and to reduce the damages inside the flocks.

### 1. Current control strategies

*1.1. General management practices*

Some management strategies like pizzle-dropping, mulesing, shearing or crutching are used by farmers to reduce de incidence of calliphorid flystricke in their flocks. Because some of these operations imply surgical removal of skin and

wool portions, the lambs should not be exposing to blowflies attack till their healing (31).

*1.2. Selection of naturally resistant sheep*

There were carried out studies concerning selection of resistant sheep to fleece rot and body strike, mainly in Australia (19; 20; 22). The selected sheep, like Trangie breed, seems to develop a greater inflammatory response to excretory-secretory larval antigens intradermical inoculated than other sheep breeds. Probably, the decrease plasma leakage into skin after releasing of mast cell mediators may be the main mechanism to induce resistance in these sheep.

These data are encouraging, indicating the feasibility of selecting sheep for resistance to these two major inconvenient due to metallic green blowfly attack.

*1.3. Insecticide use*

One of the main strategies to control blowflies is to use insecticides by dipping, dusting or jetting. Newest products can be used also pour-on or spot-on.

Organochlorines were widely used starting with 1948, but because their residual problems were withdrawn after 10 years. This kind of products were replaced by organophosphorus insecticides such as coumaphos, chlorfenvinphos, malathion, diazinon etc. Even now, when resistance phenomenon was observed to these compounds, diazinon is widely used by farmers, because it is still effective. Some years ago *Shanahan* (26) said that "the failure to select resistance in *L. cuprina* to diazinon is most comforting. Maybe this fly has no capacity to develop organophosphate resistance, at least to diazinon. Time alone will tell". The degree of protection decreased from 12 weeks to 4-6 weeks, but it is preferred by sheep owners (15). Organophosphorus drugs were also effective against other pests of sheep: lice, ticks, mites and sheep ked, respectively.

One of the most effective insecticides against blowfly populations is cyromazine, an insect growth regulator, which acts by disrupting the molting process. This drug confers at least 8 weeks protection (12). Its action mechanism is not very well known, but it doesn't interact with chitin synthesis and is strictly specific for dipterans larvae (10). On the other hand, there are others insect growth regulators like diflubenzurone, but resistance in *L. cuprina* has been developed, and now it could be used to control lice (14).

Another class of insecticides used in blowfly control was the synthetic pyrethroids one. There are some of them widely used in the last few years, with contradictory results, especially in Romania. It seems that their major role is to suppress the oviposition of these kinds of flies (13).

Last weapon in the blowfly control strategies was the discovery of macrocyclic lactones, which had a great effect against all dipteran stages of *Lucilia spp*. Different products containing the macrocyclic lactones ivermectin, doramectin or moxidectin are used in numerous countries in increasing quantities owing to their long duration of action and excellent antiparasitic effect against several nematode and ectoparasite species (8; 33). Also, the active ingredients and/or their

metabolites appearing in the faeces of treated animals can kill, for a certain period of time, the larvae of fly species developing there (9).

But, because their possibility to harm more or less the environment, animals and also man, the use of chemicals to control flystrickes will decrease in the future.

*1.4. Baits and traps*

The control of populations of blowfly species using non-return traps and targets, usually accompanied by semiochemical baits (for example LuciTrap®) was studied for a long period, but the large numbers of adult females that need to be attracted to achieve effective population management is seldom achievable (1). That is why these traps or targets are usually only used as monitoring tools.

An exception is the effectiveness of traps against *Glossina spp*., the tsetse fly (34).

**2. Future strategies**

*2.1. Vaccination strategies*

It is known that the naturally acquired resistance to metallic green flies is very weak, but a strong humoral response against the E/S products of the larvae and gut and salivary glands was observed (25; 27).

The larval E/S proteases are potential antigens to manufacture a vaccine against blowflies. They can induce a hypersensitivity response in vaccinated sheep that lead to rejection of larvae, but also can produce the starvation of larvae by limiting of the nutrients (3; 23).

Antigens originated in the midgut of *L. cuprina* larvae were considered good candidates to induce immunization in sheep. They are also known as *peritrophic membrane proteins* (PM) (32; 39). It was observed that the blowflies larvae fed on PM vaccinated sheep had a markedly reduce growth rate (6). *Elvin et al*. (7) obtained encouraging results by testing in vaccination trials of some recombinant proteins produced after determination of the cDNA sequence coding 3 peritrophins.

*2.2. Vaccination against fleece rot*

Fleece rot, which is a bacterial infection, mainly with *Pseudomonas aeruginosa*, is an important predisposing factor to flystrike, because it produce skin inflammations and flies are attracted. *Burrell and MacDiarmid* (2) had tried to produce a vaccine, but this acts only against *P. aeruginosa*, not against other species of bacteria. Future researches are needed.

*2.3. Sterile male release*

This kind of strategy had a great success to control the New World screw worm *Cochliomya hominivorax* in USA and Mexico. Concerning metallic green blowflies, such as trials were conducted in Australia against *L. cuprina*. The semi-

sterile males were released in restricted areas and competed the normal males to fertilize females. These males carried chromosomal translocations and, also, lethal mutations which were spread in the wild population, and so, a decrease of these populations was achieved (Hall and Wall, 1995). On of these mutations was an eye-color mutation which leads to blindness.

*2.4. Use of Bacillus thuringiensis (Bt) toxins*

*Lyness et al.* (18) observed that jetting the sheep with this toxin which has insecticidal activity provide an 11 weeks protection against flystrike. The most powerful toxin was the insect-specific delta endotoxin which acts by lysis of larval midgut epithelial cells. Consequent, the gut was paralyzed, the feeding process was altered and larvae died (4).

*2.5. New insecticides*

Dicyclanil, a new drug from insect growth regulators group, was tested with good results. Its activity is 10-fold greater than cyromazine and lasts around 24 weeks (33).

*2.6. Biological control*

*Octosporea muscaedomesticae*, a microsporidian organism, has shown a good activity in reducing the survival and fecundity of *L. cuprina* (28).

Another opportunity is to manipulate bacteria normally living on wool to produce strictly specific toxins against blowfly larvae (21). In this mode, the degree of protection will be permanent.

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