**Economic impact of blowfly strike**

Blowfly strike is the second most costly parasitic disease of sheep in New Zealand, ranking only behind gastrointestinal roundworms in economic importance. It is estimated that blowfly strike costs the New Zealand sheep industry approximately $37 million per year, with these losses arising from lost meat and wool production, deaths and treatment costs.\(^1\) Research has shown that even relatively small strikes can cause a marked appetite loss in the struck animal, resulting in weight loss. Recovering this lost weight can take significant time.\(^2\) Anecdotal evidence suggests that ewes and ewe hoggets struck in mid-summer/autumn are far less likely to get in lamb than non-struck animals.

**Preventing blowfly strike**

Four species of blowfly are recorded as initiating strikes on sheep in New Zealand, with the Australian green blowfly (*Lucilia cuprina*) and the European green blowfly (*Lucilia sericata*) recognised as the most important species.

Prevention of blowfly strike caused by the larvae of these species is largely reliant upon application of insecticides by a variety of means (e.g. saturation dipping, jetting, low volume pour-ons or spray-ons) to the fleece of at-risk animals, along with good animal husbandry, such as an effective worm control program to prevent faecal soiling and crutching and shearing at appropriate times.

Most blowfly strike preventative products belong to the insect growth regulator (IGR) group of chemicals. In turn, IGs can be divided into two distinct chemical classes based on their different and unrelated modes of action:

1. Triazine/pyrimidine derivatives, e.g. cyromazine (*Vetrazin™* and Cyrex\(^{TM}\)) and dicyclanil (*CLiK™* and CLiKZiN\(^{TM}\)).
2. Benzoyl phenyl urea (BPU) compounds, e.g. diflubenzuron (Zenith\(^{®}\)) and triflumuron (Zapp\(^{®}\)).

The exact mode of action of the triazine/pyrimidine derivatives has not been fully determined. However, observations suggest that first instar maggots are unable to complete moulting and development through to second stage larvae. The triazine derivative, cyromazine, was first registered for use in New Zealand as Vetrazin in the mid-1980s, while dicyclanil has been available as CLiK since 1998. Neither compound is effective against lice. Cyrex Liquid also contains spinosad to provide additional control of lice and knockdown treatment of active flystrike.

BPU compounds are thought to affect the deposition of chitin, a compound necessary for the formation of the insect’s cuticle. Chitin is a key component of the cuticle of all insects, meaning these compounds are also effective for the control of lice. Diflubenzuron was first available as Zenith\(^{®}\) in the early 1990s, followed by triflumuron as Zapp\(^{®}\) in 1998.

**Blowfly resistance in New Zealand**

*Lucilia* spp. blowflies have a remarkable ability to develop resistance to various chemicals used to control or prevent flystrike. Resistance is first manifested as a shorter than expected period of protection, even if the product is correct applied and at the right dosage.

Strains of *L. cuprina* and *L. sericata* resistant to diazinon, an organophosphate, have been recorded throughout New Zealand.\(^3\) Resistance by *L. cuprina* to diflubenzuron was confirmed in Australia in 2002 with cross-resistance to diazinon identified as a factor in its development.\(^4\) The registration of diflubenzuron for the prevention of blowfly strike in sheep in Australia was voluntarily removed in 2008. Other published studies and anecdotal reports from field veterinarians in New Zealand have suggested BPU-resistant strains of fly are also present in New Zealand.

Given the industry’s reliance upon both groups of IGR compounds for blowfly strike control, Elanco and AgResearch conducted a pilot study in 2010 to investigate the variability of susceptibility to dicyclanil and triflumuron. The results of this study suggested that triflumuron-resistant strains of the European Green blowfly, *L. sericata* were present in the South Auckland and Waikato regions.

A larger survey tested the response of 34 field strains of *Lucilia* spp. blowflies over the summer/autumn of 2010/11.\(^5\) An additional 15 strains of *L. sericata* were tested, with five appearing to have a high level of tolerance to triflumuron. Responses by *L. sericata* to dicyclanil were relatively uniform and indicated little decrease in susceptibility to this chemical. This aligned with observations from the field. Conversely, 19 strains of *L. cuprina* were tested, with little variation in response to either active ingredient. This finding is a little surprising, as resistance is typically more common in *L. cuprina* than *L. sericata*. 

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**TECHNICAL UPDATE**

**Blowfly strike resistance**

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**Deposition of eggs in the fleece.**

**Averagelife cycle 2-4 weeks.**

**Flies emerge after 2 weeks’ warm weather.**

**Pupation.**

**2nd and 3rd larval stages. Mouthparts very active and feed constantly.**

**1st larval stage. No mouthparts.**

**Cyrex, CLiK, CLiKZiN and Vetrazin break the life cycle before damaging mouthparts develop.**

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**Average life cycle 2-4 weeks.**

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**Flies emerge after 2 weeks’ warm weather.**

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**Pupation.**

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**2nd and 3rd larval stages. Mouthparts very active and feed constantly.**

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**1st larval stage. No mouthparts.**

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**Cyrex, CLiK, CLiKZiN and Vetrazin break the life cycle before damaging mouthparts develop.**
Blowfly strike resistance

In the laboratory assays, some of the \textit{L. sericata} strains tested were extremely tolerant of triflumuron, which although it was not confirmed in the field, probably indicates a significant level of resistance in these populations. Combined with reports of treatment failures in the field, it is reasonable to assume that resistance in this species is well-established, particularly in North Western regions of the North Island. Veterinarians, rural merchants and their sheep clients need to be aware of the possibility and its implications.

Resistance management guidelines

Minimising the losses caused by blowfly strike requires a planned preventative treatment approach using effective products applied at the correct time. A preventative approach means that treatments are applied before expected fly activity, rather than waiting until some animals are struck before treating sheep when production losses have already occurred.

Resistance management needs to be factored in when planning blowfly strike prevention programs, alongside other key factors such as rainfall, class of sheep, shearing, docking and weaning dates, application method and previous fly challenge.

Recommendations for resistance management of sheep ectoparasites in New Zealand are in their infancy following the demise of the Wallaceville Entomology Group. However, the Australian sheep industry has well-established blowfly strike and lice control strategies that should be considered for use in New Zealand.

A key recommendation is to manage blowfly strike and lice as separate issues. Each parasite should be treated with an effective product at the appropriate time (e.g. the off-shears application of an effective pour-on to control sheep lice). In many cases, this strategy will involve the use of different products and application methods at different times of the year. Other resistance management strategies include the use of chemicals with different modes of action for the prevention and treatment of blowfly strike; and the use of different chemicals for blowfly strike prevention and lice control.

Farmers cannot afford any level of blowfly strike from either an economic or animal welfare viewpoint. Given the increasing complexity of sheep ectoparasite management, veterinarians and animal health suppliers have a key role to play in working with their clients to include blowfly strike prevention as part of an overall animal health plan.

Summary

- Blowfly strike costs the NZ sheep industry more than $37 million per year.
- Resistance to benzoyl phenyl urea (BPU) compounds has been identified in European green blowfly (\textit{Lucilia sericata}).
- Resistance management needs to be considered when implementing preventative programs.

For full product details, contact Elanco Customer Service on 0800 352 626.