

## SAFE, MIDGE-PROOF INTERNATIONAL TRAVEL FOR HORSES ON THE CARDS

Further to our article in the January 2014 issue of the ERC Newsletter (Exciting research into ensuring horses can travel internationally 'midge free') Principal Investigator, Dr Patrick Page, and his team have over the past two years conducted research on the possibility of making jet-stalls 'midge-proof'. Two papers have been submitted on this topic, the more recent having just been published. The first paper compared the efficacy of untreated and alphacypermethrin insecticide-treated high density polyethylene mesh against biting midges, while the second paper dealt with the efficacy of alphacypermethrin insecticide-treated mesh applied to jet stalls housing horses.

*Culicoides* biting midges are of economic and veterinary significance worldwide, primarily due to the Orbiviruses they transmit. They are the principal vectors of African horse sickness virus (AHSV), equine encephalosis virus and bluetongue virus in South Africa. In addition to their impact on horses and livestock in South Africa, these viruses have been shown to have a devastating effect on naïve populations, and concerns have been raised over the introduction and spread of viruses such as AHSV, and the need for optimal preventative strategies. The global expansion of containerised trade, including intercontinental movement of horses, provides potential mechanisms for introducing these viruses. While clear recommendations for pre-export quarantine and testing of horses for AHSV have been in place for many years, the World Organisation for Animal Health (OIE) have now included recommendations that an appropriate gauge mesh, impregnated with an approved insecticide be placed over containers during transport of horses through regions not free of AHSV. Measures developed to protect horses during transport should ideally also be directly applicable to protect the local horse population against AHSV.

Following are summarised versions of these two papers.

### **1. Field and *in vitro* insecticidal efficacy of alphacypermethrin-treated high density polyethylene mesh against *Culicoides* biting midges in South Africa**

The objective of this study was to determine if alphacypermethrin insecticide-treated high density polyethylene (HDPE) mesh applied to light traps will reduce the entry of *Culicoides* midges, particularly *C. imicola* which is implicated as the principal vector of AHSV, into the traps. It was proposed that the results would support the potential of alphacypermethrin-treated HDPE nets for protecting horses against *Culicoides* midges, and be applicable to containerised transport systems (jet stalls) for horses.

The results showed that the HDPE mesh had a significant effect in reducing the numbers of *Culicoides* midges, predominantly *C. imicola* collected by the light trap. The magnitude of reduction for the untreated HDPE mesh and the alphacypermethrin-treated HDPE mesh was 4.2 and 7.2 times, respectively. While the light trap with the alphacypermethrin-treated HDPE mesh consistently collected fewer *Culicoides* midges than the untreated HDPE mesh, a significant repellent effect was not demonstrated, likely due to the attraction of the light overriding any repellent effect. The greater efficacy of the alphacypermethrin-treated mesh was therefore more likely due to an insecticidal effect.

*C. imicola* midges were additionally exposed to the treated mesh in a laboratory contact bioassay. This resulted in a rapid insecticidal effect, with the initial magnitude and rate of midge death being greater after 3 minutes exposure compared with 1 minute exposure of the midges to the mesh. Subsequently, at 30 minutes post exposure both groups had reached maximal (100%) effect which was maintained up to the final assessment at 24 hours.

The positive results of this study showed that HDPE mesh had potential to reduce exposure of housed horses to *Culicoides* midges during high risk periods for AHSV transmission, or during containerised transport. Additionally, treating the mesh with alphacypermethrin could increase the overall reduction of *Culicoides* midge biting rates.

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## **2. Efficacy of alphacypermethrin-treated high density polyethylene mesh applied to jet stalls housing horses against *Culicoides* biting midges in South Africa**

The objective of this study was to determine if alphacypermethrin-treated HDPE mesh applied to a jet stall would reduce the number of *Culicoides* midges, particularly *C. imicola* and *C. bolitinos*, mechanically aspirated ('vacuumed') from horses housed in the stalls under field conditions. This would support use of the mesh to reduce risk of midge-borne Orbivirus transmission during international transport of horses.

The study was conducted in 3-compartment commercial jet stalls, covered with 70% shade cloth treated with alphacypermethrin, at the Faculty of Veterinary Science, Onderstepoort. Comparisons between a mesh-treated and an untreated jet stall were done by 'vacuuming' midges around sunset from two horses housed in each of the stalls. An additional sentinel horse, in a paddock located 35m from the jet stalls, was monitored concurrently by aspiration of midges.

A total of 499 *Culicoides* midges were aspirated from four horses housed in two stalls and one sentinel horse during 36 collections made around sunset for 12 nights. The insecticide-treated mesh significantly reduced the number of *Culicoides* midges 'vacuumed' from horses housed in the treated stall compared with the untreated stall. The mesh reduced the *Culicoides* midge attack rate in the treated stall compared to the untreated stall and the sentinel horse by 6 times and 14 times,

respectively. Furthermore, a nil midge biting rate on horses in both the treated and untreated jet stalls, along with a considerably lower biting rate compared to attack rate for the sentinel horse was determined.

‘Vacuuming’ of midges from horses is considered more reliable for assessment of treatment efficacy than light traps (see the summarised publication on this topic in the April 2014 issue of the ERC Newsletter). The attraction of insects to a light is an artificial response and different cues are involved in the attraction of *Culicoides* midges to hosts than towards light traps. While light traps are useful for screening for potential protection against *Culicoides* biting midges, ‘vacuuming’ of midges from horses is vital to confirm the protective efficacy of treatment methods.

The second study concluded that alphacypermethrin-treated HDPE mesh could be used to reduce exposure of horses to *Culicoides* midges, and the risk of midge-borne Orbivirus transmission during transport in jet-stall containers. Similarly, this mesh could be applied to stable openings to reduce the midge attach rate during AHSV outbreaks. The mesh was not 100% effective, however and therefore further investigation of use of the mesh in conjunction with additional control measures is required.

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