

## Does rain reduce the efficacy of Butox 7.5 pour on (deltamethrin) against biting midges (*Culicoides* specimens)?

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**Abstract** Previous studies have shown that cattle and sheep that are treated topically with Butox 7.5 (deltamethrin) on the neck or along the back are protected from biting *Culicoides* spp. for up to 4 weeks. During these studies, the animals were provided with adequate shelter against the rain. The efficacy of deltamethrin on wet animals was, therefore, not tested. The present experiment was done to determine if thoroughly wetting the test subjects twice a week would affect the efficacy of deltamethrin. Cattle and sheep were treated with Butox 7.5 along the neck or dorsal midline. Test animals were wet thoroughly with tap water twice weekly. Control animals remained dry. Hair was

clipped off the legs, near the claws, at day 7, 14, 21, and 28 after treatment of test and control animals. Recently caught *C. obsoletus* midges were then exposed to the hair for 15, 30, 60, and 120 s. Time taken for the midges to die after exposure was recorded. The product remained effective for at least up to 28 days, although, differences in the time taken to kill the midges were noted. Differences in time taken for the midges to die were also seen between those exposed to treated cattle hair and those exposed to treated sheep hair.

### Introduction

Bluetongue is an insect borne viral disease of ruminants. The disease can be severe in domestic ruminants (cattle and sheep) and is responsible for considerable economic losses on farms. Bluetongue is also found in wild ruminants such as deer and cervids, but these animals rarely show clinical signs (Conraths et al. 2007; Conte et al. 2007). In 2006, the Bluetongue virus (serotype 8) was introduced into Western Europe (Belgium, The Netherlands, and West Germany) and from there, it spread into Central Europe (Mehlhorn et al. 2007, 2008a, b; 2009; Mehlhorn and German midge-monitoring team 2009; Thiry et al. 2008; Saegerman et al. 2008). It has been determined that *Culicoides obsoletus* has been the main vector of the bluetongue virus in Europe.

At the start of the epidemic, an inactivated vaccine against serotype 8 was not available. Domestic ruminants were treated with pyrethroid based insecticides to prevent *Culicoides* bites. The main biting sites of the midges are the belly and feet of the animals. The ability of insecticides used along the dorsal midline to reach these

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**Table 1** Sheep. Time in minutes taken for *Culicoides* midges to die after contact with treated hair. Reading are taken at day 7, 14, 21, and 28 after treatment for wet (s. wet) and dry (s. dry) sheep

Hair contact (seconds)	1st week a. t.		2nd week a. t.		3rd week a. t.		4th week a. t.	
	S. wet	S. dry						
15 s	71–85 min	35–47 min	55–102 min	50–74 min	92–130 min	50–70 min	145–205 min	76–100 min
30 s	35–52 min	35–45 min	38–79 min	28–52 min	74–103 min	32–50 min	138–190 min	40–81 min
60 s	19–41 min	25–27 min	39–72 min	18–34 min	72–94 min	20–36 min	58–94 min	25–47 min
120 s	16–29 min	18–21 min	27–38 min	17–27 min	44–67 min	12–38 min	61–98 min	17–33 min

sites in effective concentrations had to be determined. It was shown that insecticides such as cyfluthrin, deltamethrin, permethrin, or cypermethrin reach the hair of the feet and are present in effective concentrations for 3–5 weeks depending on the product and formulation (Mehlhorn et al. 2008a, b; 2009; Mehlhorn and German midge-monitoring team 2009; Schmahl et al. 2008, 2009; Liebisch and Liebisch 2008). All results were, however, obtained in dry weather or from experiments where animals were provided with shelter against the rain. Therefore, it was decided to determine the efficacy of Butox 7.5 pour on in wet animals.

## Methods

A group of four cattle and four sheep were treated along the dorsal midline with Butox 7.5 pour on according to the product instructions. Two of the cattle and two of the sheep were wet thoroughly twice weekly with tap water for the duration of the experiment. The remaining two cattle and two sheep remained dry. At day 7, 14, 21, and 28 after Butox treatment, the hair of all animals was clipped from the legs, close to the claws. *C. obsoletus* (caught the previous night) were exposed to the treated hair for 15, 30, 60, and 120 s. The midges were then transferred to filter paper in plastic Petri dishes and observed. The time taken for the midges to die was recorded.

## Results

The results—representing the speed of kill at different days after treatment of the animals—are shown in Tables 1 and 2.

## Conclusions

In both cattle and sheep, deltamethrin remained active for at least up to 4 weeks (end of the experiment) even in the animals wet with water twice weekly over the 4-week period. In sheep, the time between exposure and death of the midges was definitely lengthened in animals that were wet (see Table 1). In cattle, the results were different in that in some cases, time between exposure and death of the midges was shorter in wet animals than in dry animals while in other cases the results were similar. Compared with the sheep, the time between exposure and death is generally quicker, probably, due to differences in hair structure (see Table 2). All midges exposed to hair from treated sheep or cattle, wet or dry, died even after only 15 s of exposure to the hair. In cases where the period between exposure and death of the midges is very long, it is likely that the midges were unable to bite as they showed signs of paralysis immediately after contact with treated hair.

The fact that Butox 7.5 pour on remains effective in animals regularly exposed to rain is an important finding. Recently, serotypes 1 and 6 have been isolated from

**Table 2** Cattle. Time in minutes taken for *Culicoides* midges to die after contact with treated hair. Readings are taken at day 7, 14, 21, and 28 after treatment for wet (s. wet) and dry (s. dry) cattle

Hair contact (seconds)	1st week a. t.		2nd week a. t.		3rd week a. t.		4th week a. t.	
	S. wet	S. dry						
15 s	22–34 min	39–45 min	33–86 min	37–75 min	74–128 min	65–90 min	98–145 min	86–140 min
30 s	13–24 min	25–41 min	32–61 min	28–43 min	52–102 min	40–65 min	82–134 min	62–83 min
60 s	9–18 min	10–16 min	22–36 min	20–23 min	41–90 min	20–32 min	82–142 min	50–78 min
120 s	5–10 min	6–10 min	14–28 min	9–16 min	27–50 min	16–24 min	74–122 min	23–56 min

domestic ruminants in Central Europe. As there are no inactivated vaccines available against these serotypes, control of bluetongue through the use of insecticides is becoming more important.

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