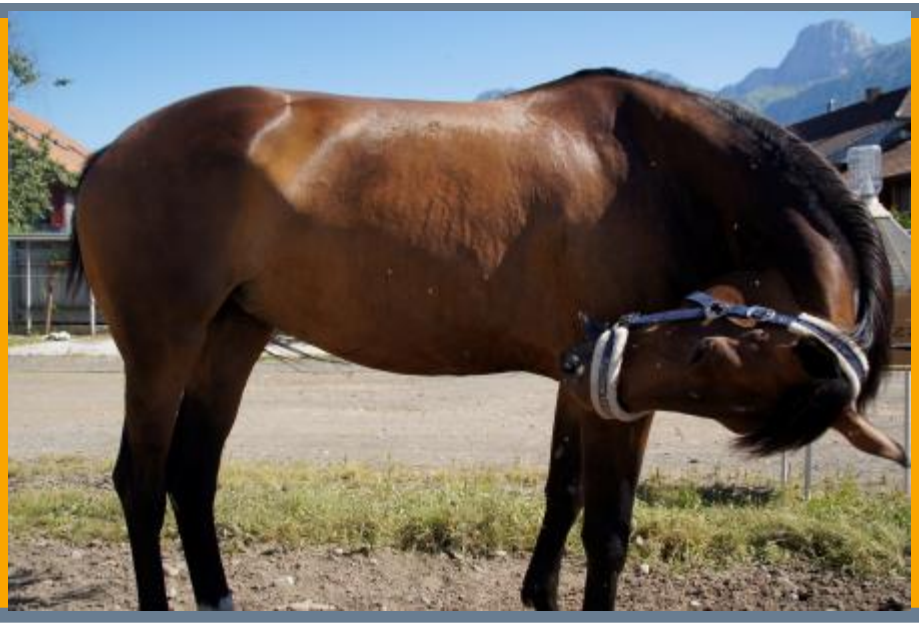
Bern University
of Applied Sciences

Efficacy of the repellent DEET against tabanid flies on horses evaluated in a field test

Conny Herholz, Chris Kopp, Manuela Wenger; Alexander Mathis, Salome Wägeli, Nathalie Roth;



Introduction

- Bern University of Applied Sciences | School of Agricultural, Forest and Food Sciences HAFL

Background of the study

- Bern University of Applied Sciences | School of Agricultural, Forest and Food Sciences HAFL

Background of the study

- According to the European law for products intended for use as a repellent on horses (recreational and sport horses), a field test is mandatory to demonstrate sufficient repellency
- Currently, no agreed protocols are available

- N,N-diethyl-3-methylbenzamide (DEET) is considered as the gold standard of insect repellent substances for the last 60 years (Frances, 2006; Katz *et al*., 2008).
- Few data are available on the efficacy of DEET when applied on horses (Palmer, 1969, Blume *et al*., 1971)

Aim of the study

To establish a protocol for a field test to investigate the efficacy of N,N-diethyl-3-methyl-benzamide (DEET, Brum®, Huebeli-Stud Horse Care AG) in a 15–17% oil-water emulsion against tabanid flies on horses up to four hours

Materials & Methods

Farms & study design

- Three farms (A–C) in the canton Bern (560–1000 m above sea level)
- Farm A: pre-test as well as main-test
- Data logger: temperature & humidity
- Pre-test: end of June 2015 to test the study protocol & the technical requirements (Farm A).
- Main tests: July & August 2015, Ø T = 34°C, humidity 32 %

CROSS-OVER Design:

- On each farm four horses were tested on two consecutive days: two randomly selected horses were not treated on day one, but were treated on day two, and vice versa
- Counts of the tabanid flies with or without repellent application at the same time of the day

Fly trap & study design

- Fly trap (HORSE PAL®fly trap)
- Arthropods collected in the traps were packed in plastic bags, killed by deep-freezing
- The tabanids were morphologically sorted, and three specimens per morphotype genetically identified

Horses & study design

- A total of 12 horses were used for 16 field tests
- four geldings & eight mares
- mean age of 11 (range 3–20) years
- Brown or dark brown horses

Test protocol: time table

Day with repellent treatment	Duration of repellent efficacy					
	Hour 1	Hour 2	Hour 3		Hour 4	
	60min	120min	150min	180min	240min	
	Box		lunging for 10 minutes until horses start to sweat	pasture		

Treatment

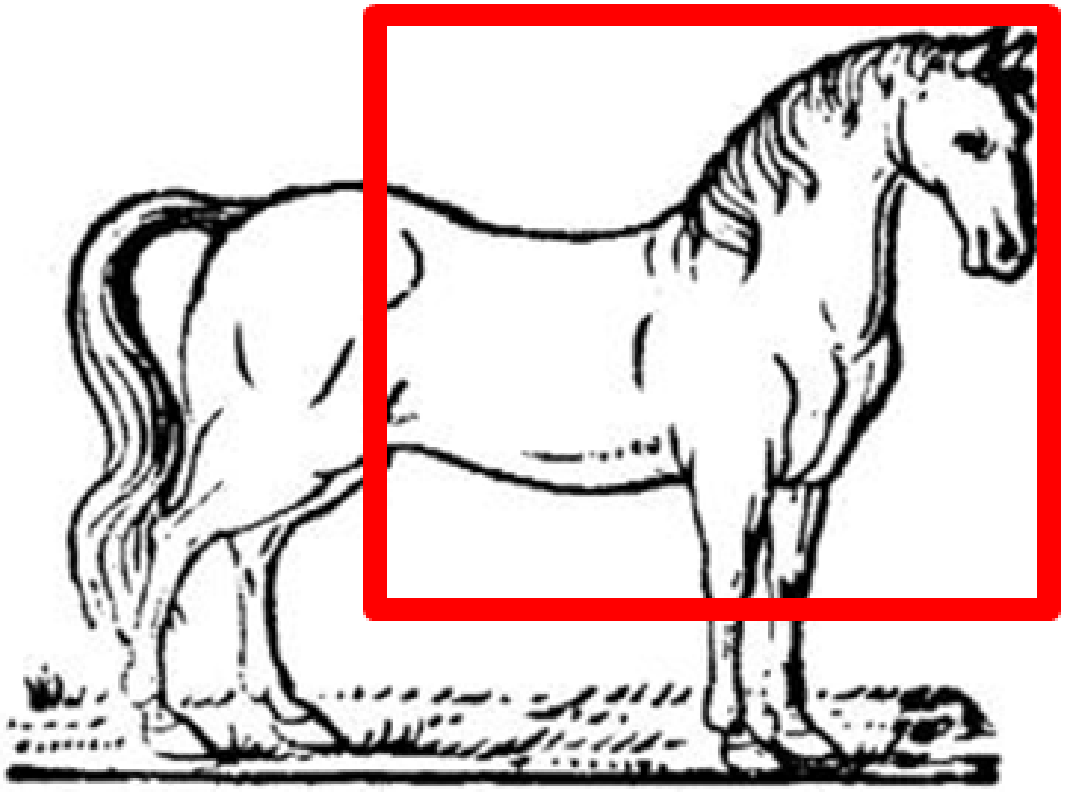
Horses are photographed in 30sequences of ten seconds each during

Lunging until the horses start to sweat

- Bern University of Applied Sciences | School of Agricultural, Forest and Food Sciences HAFL

Tabanid fly count

- Tabanid flies were photographed & directly counted on the right side of the horses



Treatment with the repellent DEET

- In total eight spray bursts of 0.2 ml / horse







Statistical analysis

- relative reduction of the number of tabanid flies after 3h and 4 h
  rel.3 h = (control.3 h − treated.3 h)/control.3 h
  rel.4 h = (control.4 h − treated.4 h)/control.4 h
- Exact lower confidence bounds for the median of the distribution of the relative reductions were computed

- Statistical analysis was performed using R (version 3.0.2.)

Results

- Bern University of Applied Sciences | School of Agricultural, Forest and Food Sciences HAFL

HORSE PAL® fly trap

Prior to the tests the following arthropods species were caught in the HORSE PAL®fly traps:

- Farm A: Tabanus brominus (n = 3);
- Farm B: T. brominus (n = 4) and Haematopota pluvialis (n = 4)
- Farm C: T.brominus (n = 2) & other arthropods (n = 3)

Descriptive statistics

After 3 h the repellent treated horses have a lower

- median (0.5 vs. 5),
- mean (1.06 vs. 8.56)
- maximum (4 vs. 29)

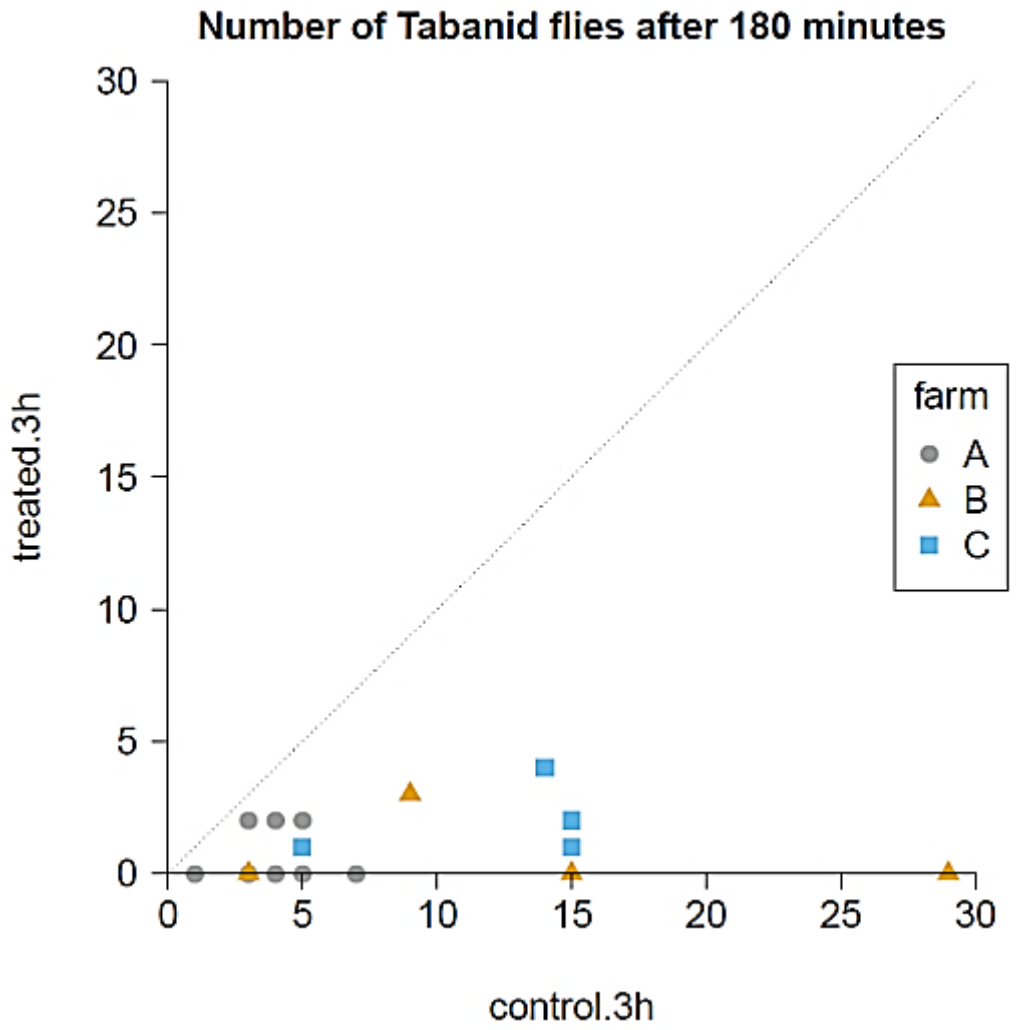
number of counted tabanid flies than untreated horses

- Similar differences are found after 4 h

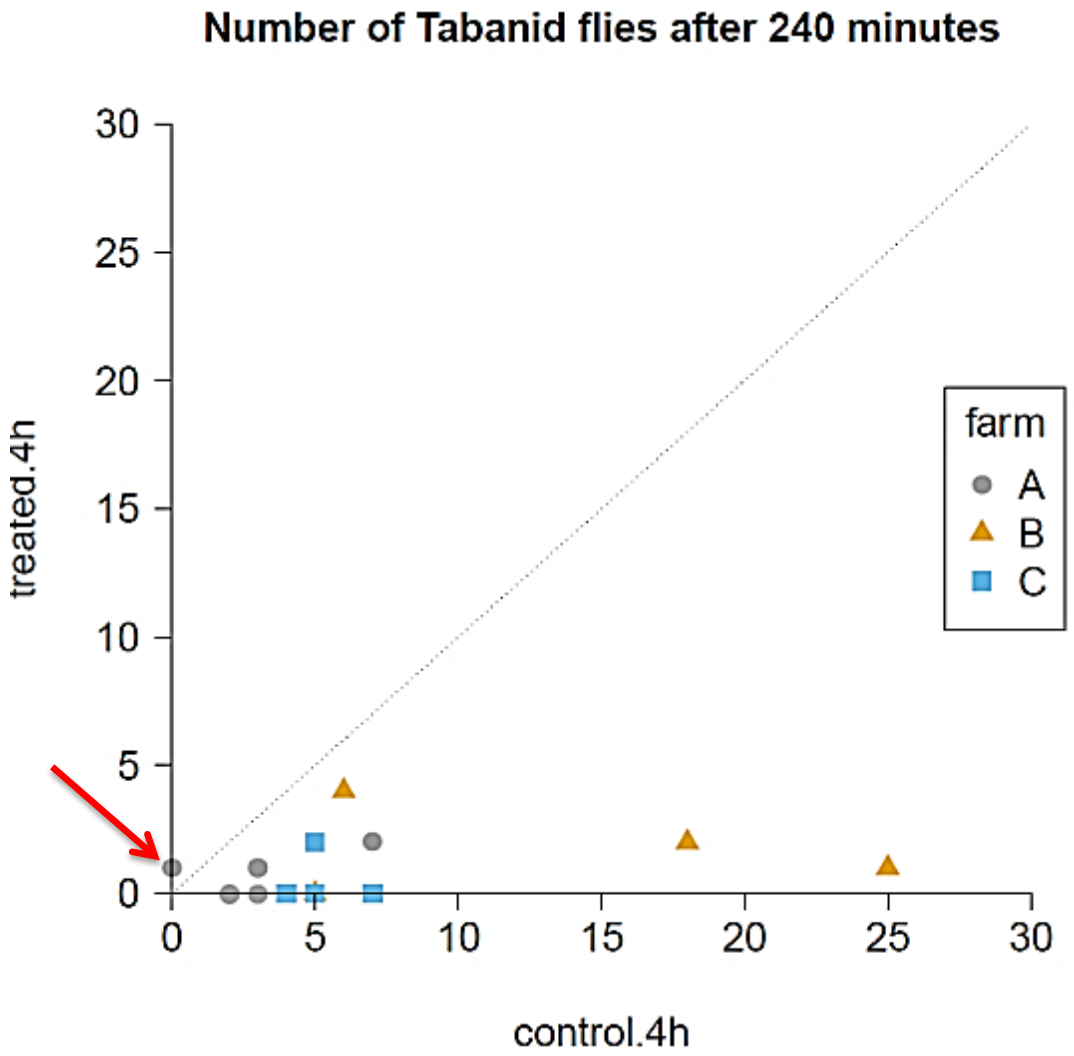
- In 16 of the 32 measurements no single tabanid fly was observed on repellent-treated horses

Tabanid fly counts

Tabanid fly counts after 3 h



Tabanid fly counts after 4 h



Relative reduction

- 100 % relative reduction in 8 of 16 horses after 3h & 4h

Diskussion

- Bern University of Applied Sciences | School of Agricultural, Forest and Food Sciences HAFL

Repellent DEET

- In the study of Blume *et al*., 1971 horses were shown to be protected from certain tabanids for up to 3 h when sprayed with a 75% concentration of DEET
- the horses of our study were protected from tabanids for as much as 4 h with a product containing a much lower DEET concentration of 15–17%

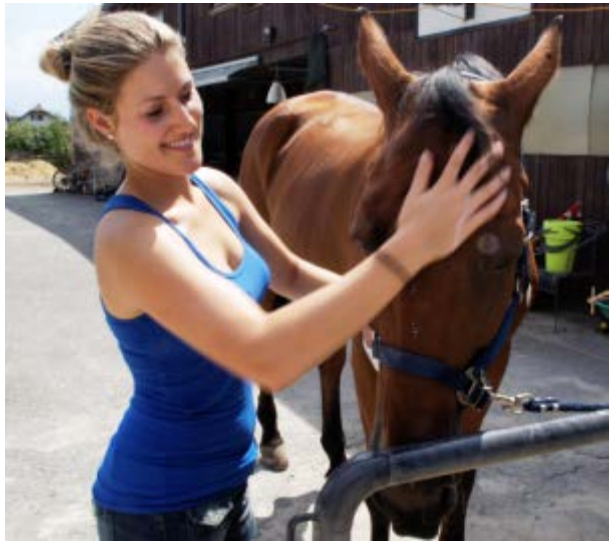
- Differences:
  Concentration of repellent, tabanid fly species??

Study design

- The horses were lunged until sweating before tabanid flies were counted so that the study design simulated the practical conditions very well
- Differentiation of tabanid flies and other arthropods was facilitated by direct counting

Conclusion

- The efficacy of DEET in a 15–17% oil-water emulsion was at least 80% and 71%, respectively, three or four hours after application with a confidence of 89% and its use can be recommended
- Follow manufacturer's recommendations and treat the horses on a concrete surface to avoid contamination of the environment



Publication

Veterinary Parasitology 221 (2016) 64–67

Contents lists available at ScienceDirect

Veterinary Parasitology

journal homepage: www.elsevier.com/locate/vetpar

Short communication

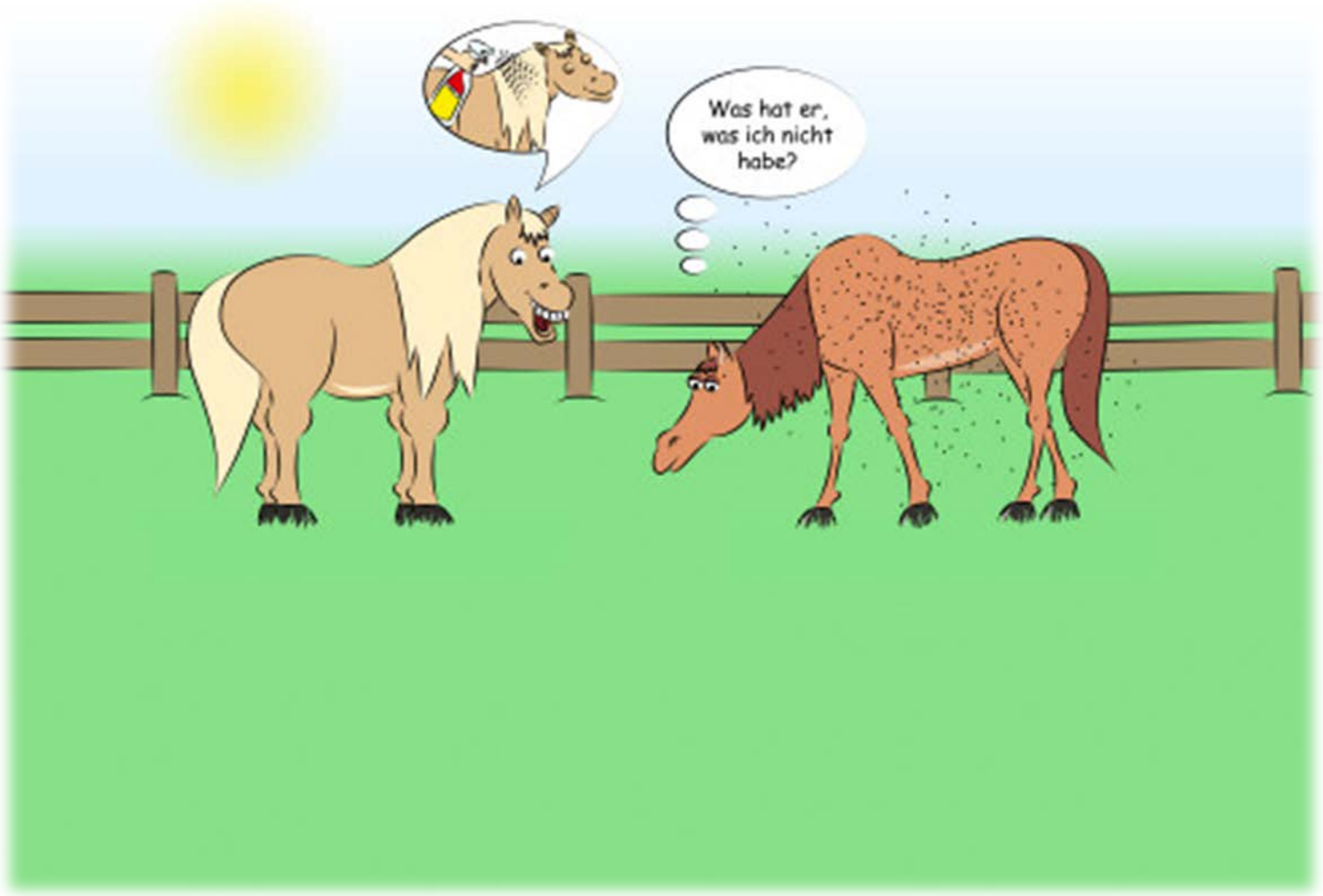
Efficacy of the repellent *N*,*N*-diethyl-3-methyl-benzamide (DEET) against tabanid flies on horses evaluated in a field test in Switzerland

C. Herholz[a,*], C. Kopp[a], M. Wenger[a], A. Mathis[b], S. Wägeli[a], N. Roth[a]

[a] Bern University of Applied Sciences, School of Agricultural, Forest and Food Science, Laenggasse 85, CH-3052 Zollikofen, Switzerland
[b] Institute of Parasitology, National Centre for Vector Entomology, Vetsuisse Faculty, University of Zurich, Winterthurerstrasse 266a, CH-8057 Zurich, Switzerland

Acknowledgements to:

- Huebeli-Stud Horse Care AG who provided the repellent and also partly funded this study
- All farmers and horse owners for their brilliant support during the study
- The Federal Office of Health for constructive comments on the study design


Was hat er, was ich nicht habe?