Heritability and repeatability of insect bite hypersensitivity in Dutch Shetland breeding mares

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NEDERLANDS SHETLAND PONY STAMBOEK

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Introduction – IBH

Insect bite hypersensitivity (IBH)

- Chronic, recurrent, seasonal dermatitis
- Allergic reaction: intense itch
  - Cause: bites certain *Culicoides* spp.
- Clinical signs
  - Summer months
- Affected areas

Culicoides obsoletus
(van der Rijt et al., 2007)

Affected base of tail and hindquarters

Affected mane and shoulder

Introduction – IBH

- Discomfort and disfiguration
  - Welfare reduced
  - Unsuitable for riding/showing
  - Commercial value reduced
- No effective treatment or prevention

- Multifactorial etiology
- Heritability estimates (0.08 - 0.36)
  - Small populations
  - Only Icelandic horses
- Repeatability estimates

Introduction – aim

Estimate heritability and repeatability of insect bite hypersensitivity in Dutch Shetland breeding mares

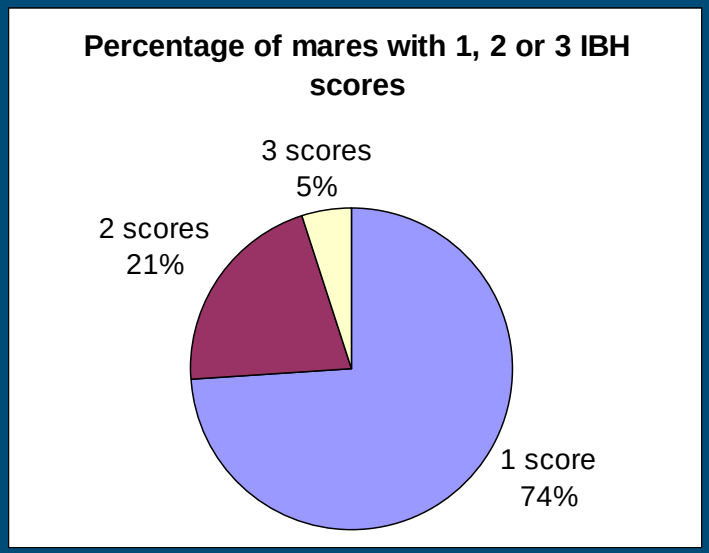
Materials and methods – data collection

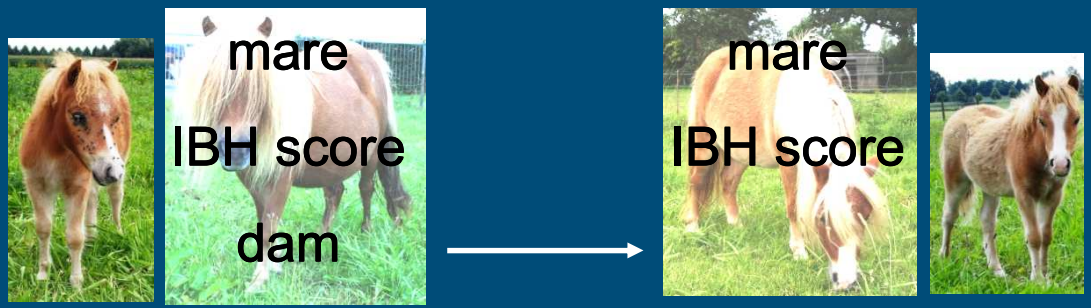
- Dutch Shetland breeding mares
- During foal inspections at home
- 16 inspectors
- Year: 2003, 2005, 2006

- Score clinical signs of IBH
  - Visual observation
  - Score: 0, 1, 2
  - Scores 1 and 2 grouped together
  - Binary

Materials and methods – data

- 7,924 IBH scores
- 6,073 mares
  - 26% repeated observations
- Mares descended from
  - 984 sires
  - 4,455 dams
    - 34% ≥1 IBH score





Mare A with foal
Mare A is dam of mare B

Mare B with foal

Materials and methods – data

- Age: 8.1 yr (SD = 4.1)
- Withers height categories (WHC)
  - 29% Mini (≤ 86 cm)
  - 22% Small (87 through 92 cm)
  - 24% Middle (93 through 98 cm)
  - 25% Tall (99 through 107 cm)

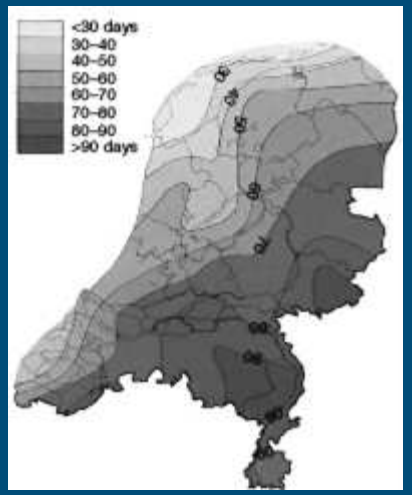
Mare, coloured, WHC Mini

Mare, black, WHC Tall

Materials and methods – model

- Linear repeatability animal model:

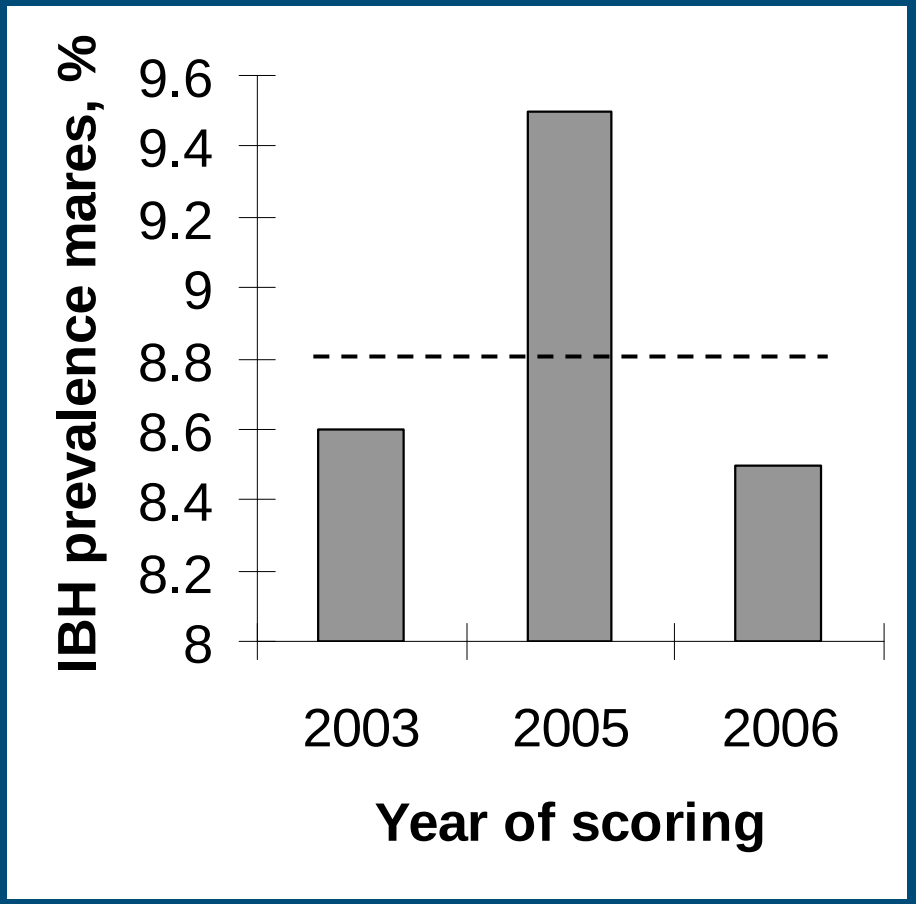
$$\text{IBH score} = \mu + \text{yearmonth} + \text{climate} + \text{habitat} + \text{WHC} + \text{age} + \text{animal} + \text{pe} + \text{e}$$



Map of the Netherlands expressing the annual number of warm days
(van Grevenhof et al., 2007)

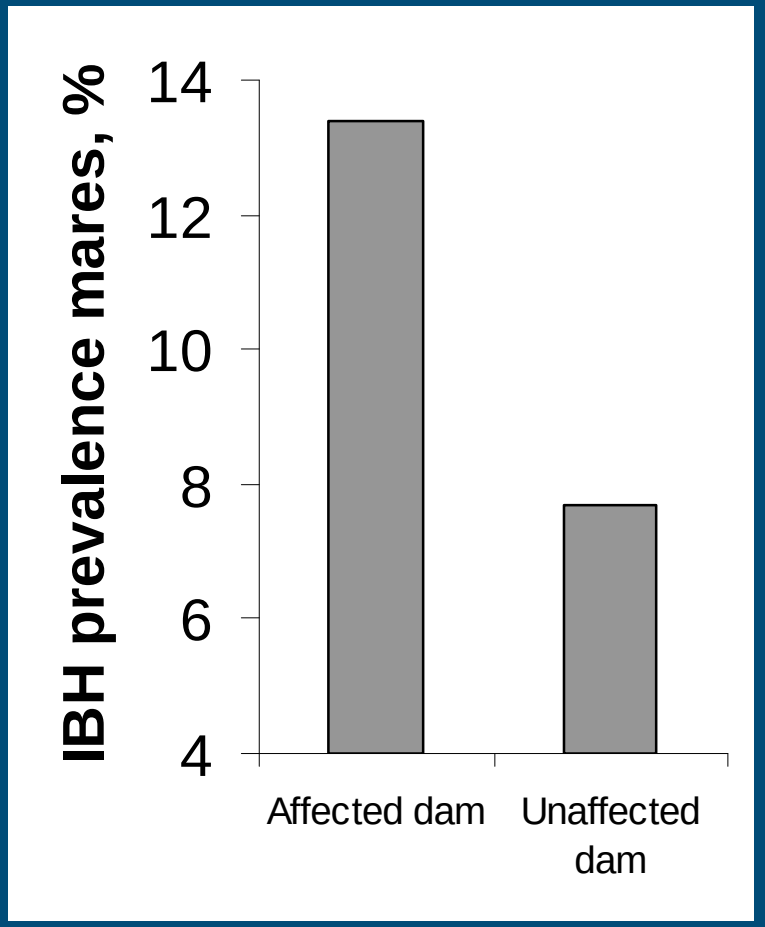
Results and discussion – IBH prevalence

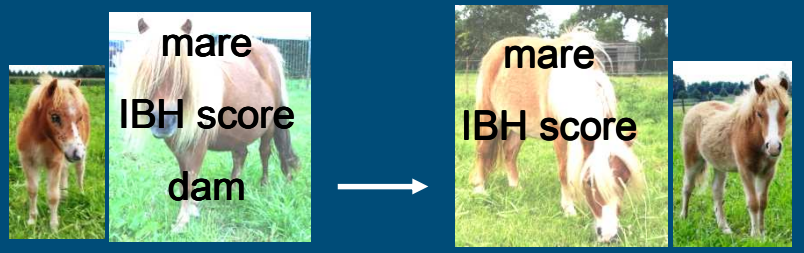
- Prevalence



Results and discussion – IBH prevalence

- Prevalence
- Prevalence mares descending from
  - Affected dams (n = 93)
  - Unaffected dams (n = 1,376)





Results and discussion – IBH prevalence

- Prevalence
- Prevalence mares descending from
  - Affected dams (n = 93)
  - Unaffected dams (n = 1,376)
- Prevalence paternal half-sib groups (n = 106)
  - 0 – 37%

Results and discussion – heritability

- Literature Icelandic horses
- Hard to compare due to differences in:
  - Observed prevalence
  - Breed
  - Analysis method
  - IBH scoring

Research	h^2_{obs} (SE)	h^2_{und} (SE_{und})
Our research		
0/1	0.08 (0.02)	0.24 (0.06)
Lange (2004)		
0/1	0.36 (0.08)	0.65
Detailed score	0.34 (0.09)	
Eriksson et al. (2008)		
0/1	0.08	0.27 (0.17)
0/1/2	0.09	0.30 (0.19)
0/1/2/3	0.10	0.33 (0.19)

Results and discussion – repeatability

- Repeatability lower than expected
  - IBH is considered to be permanent
- Due to:
  - Fluctuations in environmental factors
  - Changing environments caused by sale
  - Intervention by owners
  - Inspectors scored inconsistent?

Repeatability	
r (*SE*)	0.30 (0.02)

Presence and activity of *Culicoides* species

Clinical signs first observation	Clinical signs second observation		Total
	Absent	Present	
Absent	94.8 (1,374)	5.2 (76)	100 (1,450)
Present	72.8 (75)	27.2 (28)	100 (103)

Conclusions and implications

- Heritable trait
- Selection against IBH possible
- Selection
  - Decrease economic losses
  - Increase animal welfare

- Bottlenecks selection Shetland ponies

Selection against insect bite hypersensitivity is possible!

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