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Effects of racing on reproductive performance in Standardbred trotters and Finnhorses

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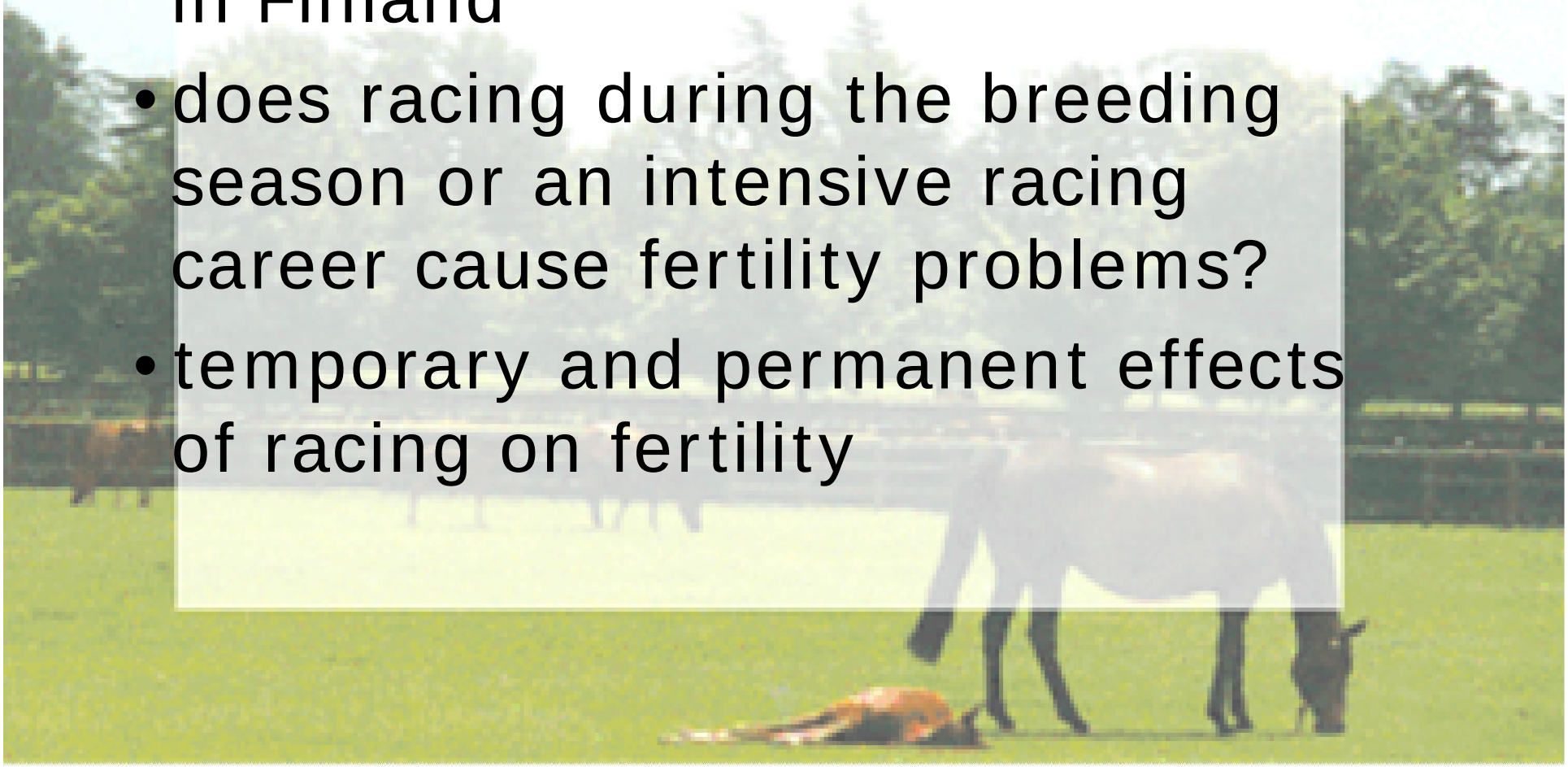
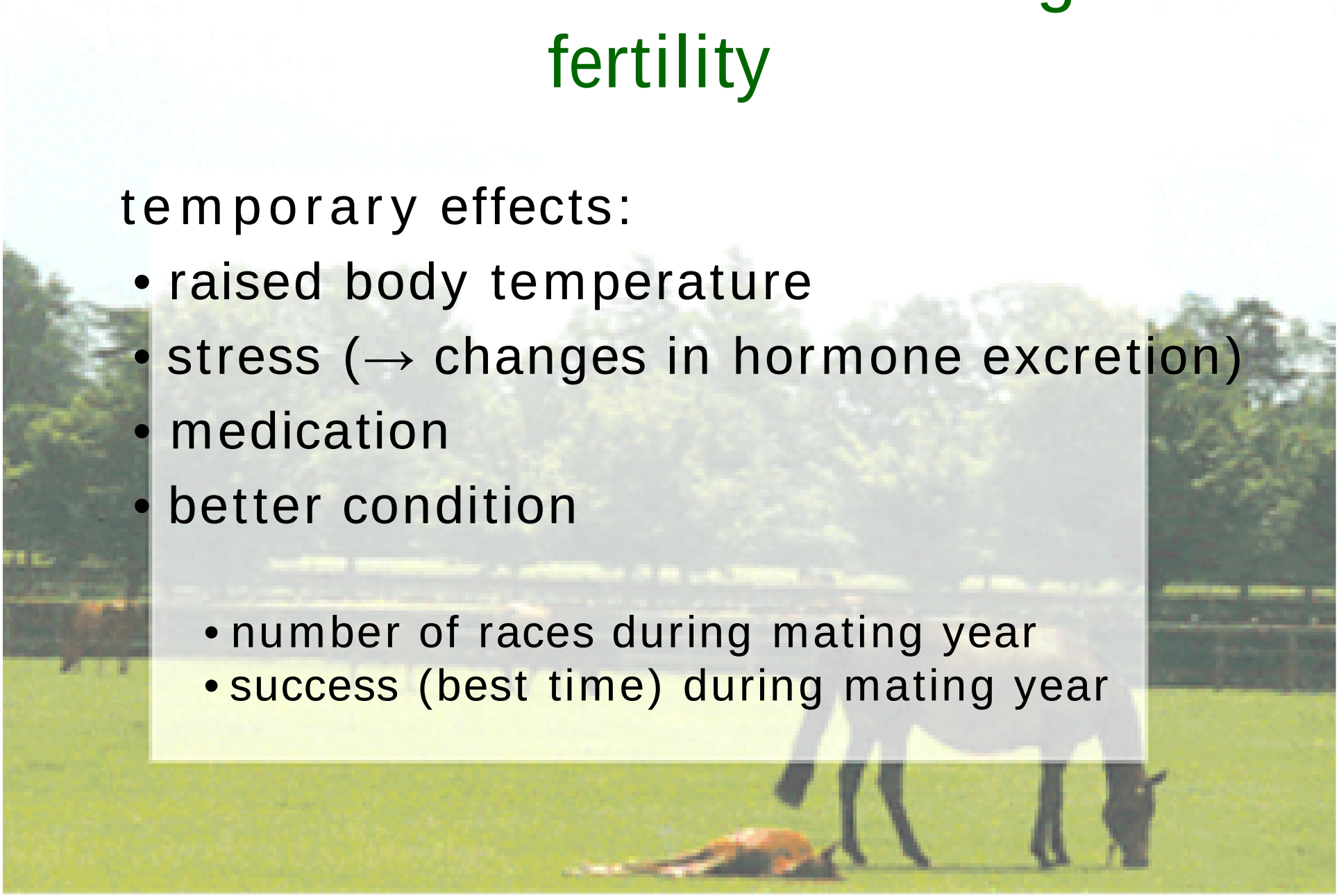
Introduction

- reproductive efficiency of trotters in Finland
- does racing during the breeding season or an intensive racing career cause fertility problems?
- temporary and permanent effects of racing on fertility



Introduction: effects of racing on fertility



temporary effects:

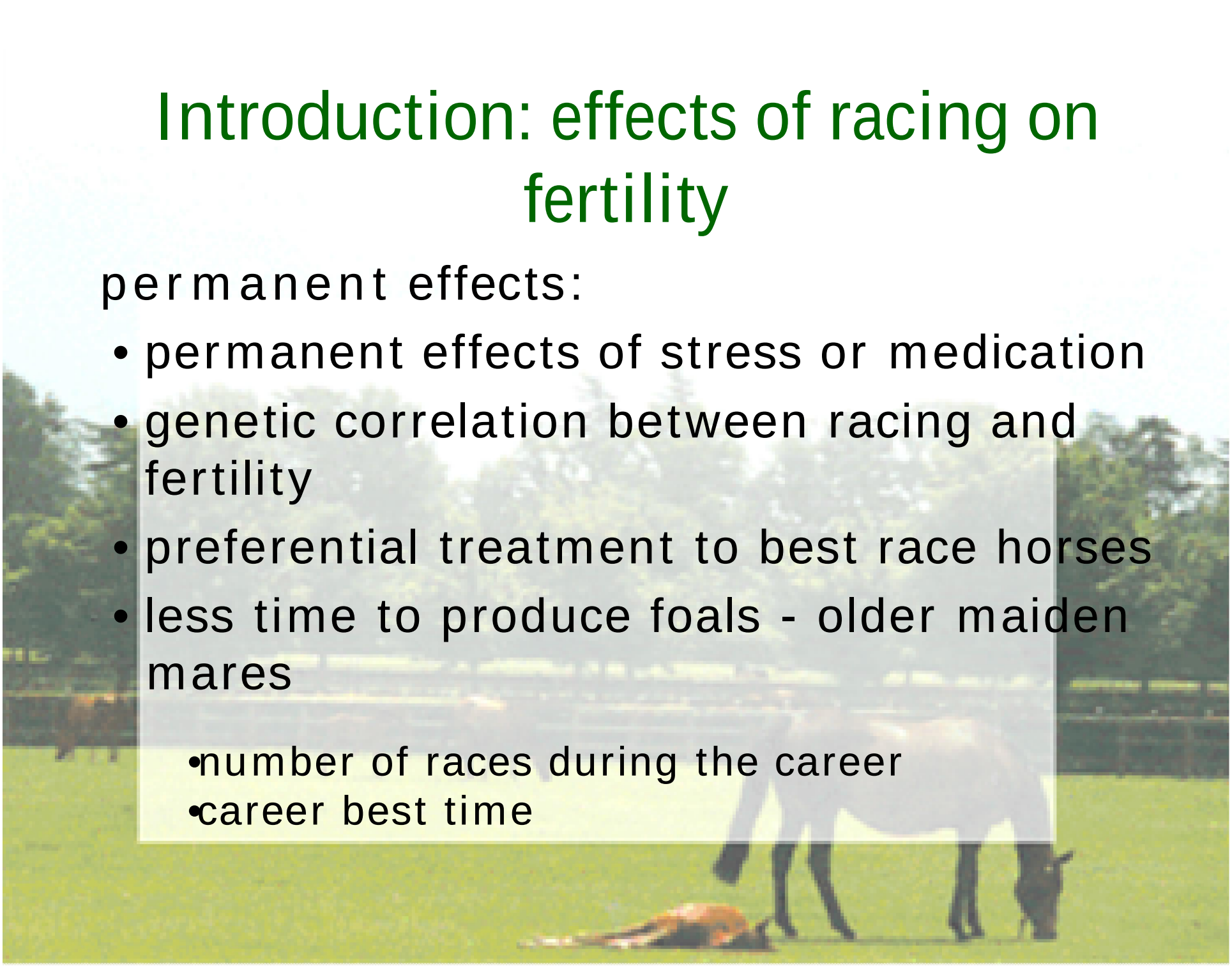
- raised body temperature
- stress (→ changes in hormone excretion)
- medication
- better condition

  - number of races during mating year
  - success (best time) during mating year

Introduction: effects of racing on fertility

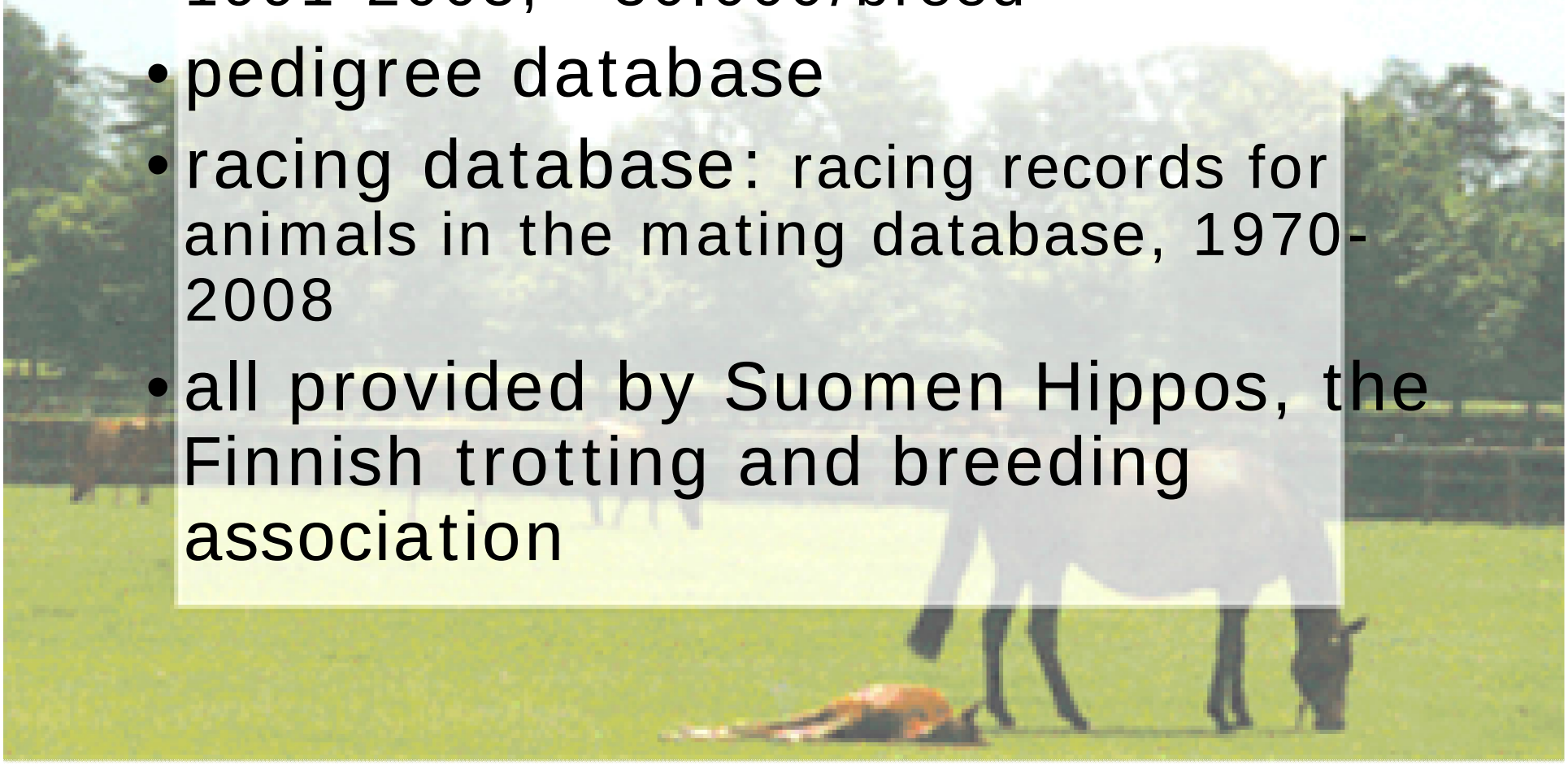
permanent effects:

- permanent effects of stress or medication
- genetic correlation between racing and fertility
- preferential treatment to best race horses
- less time to produce foals - older maiden mares
  - number of races during the career
  - career best time



Data

- mating database: all reported matings, 1991-2005, ~30.000/breed
- pedigree database
- racing database: racing records for animals in the mating database, 1970-2008
- all provided by Suomen Hippos, the Finnish trotting and breeding association



Measuring fertility

foaling outcome is a binomial trait:

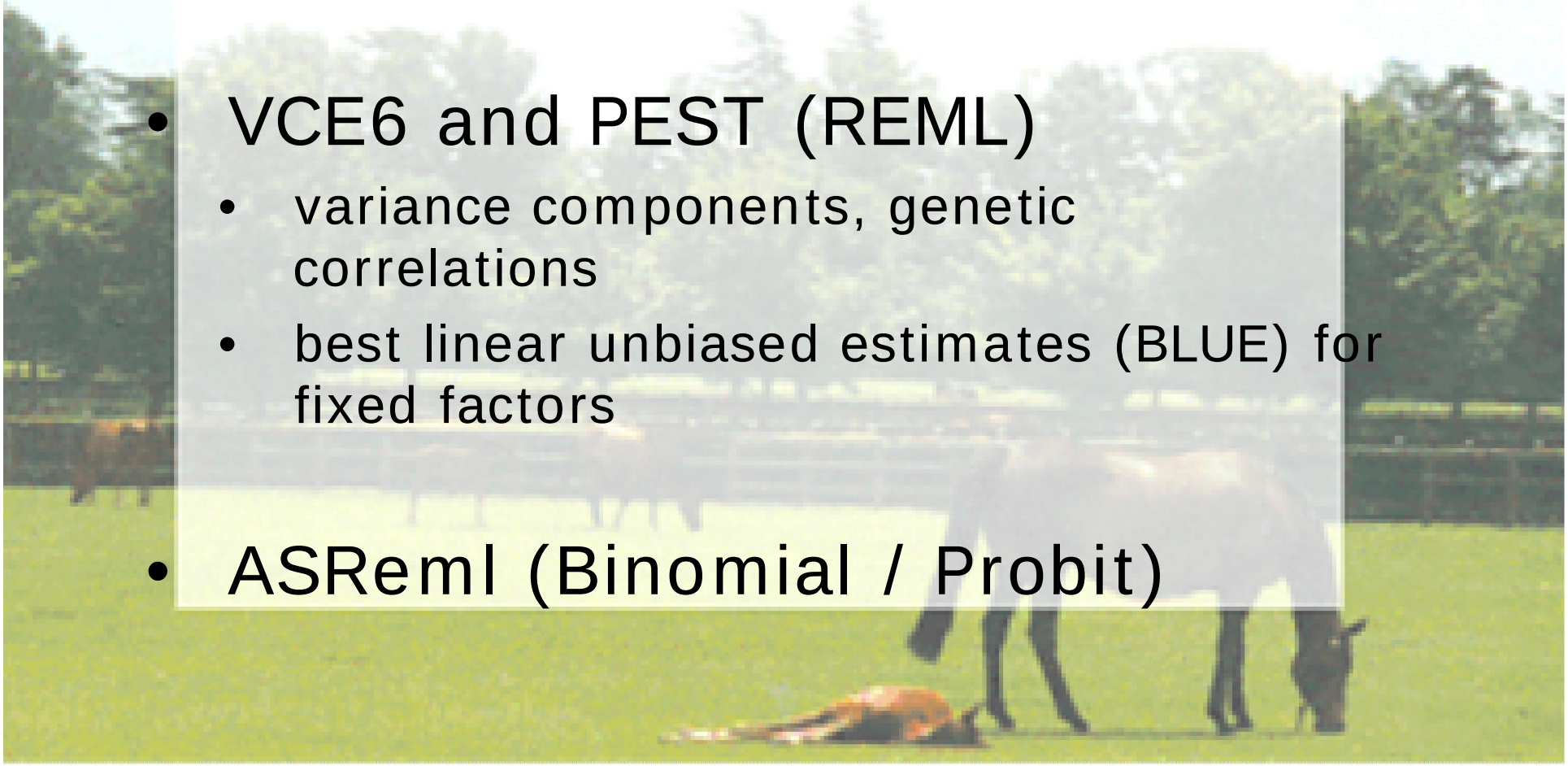
- 0: not born/did not produce foal
- 1: born/produced foal

foaling rates: 72.6% (Standardbred) and 66.3% (Finnhorse)

trait of the mare or the expected foal

Methods and models

- Linear model / threshold model
- VCE6 and PEST (REML)
  - variance components, genetic correlations
  - best linear unbiased estimates (BLUE) for fixed factors
- ASReml (Binomial / Probit)



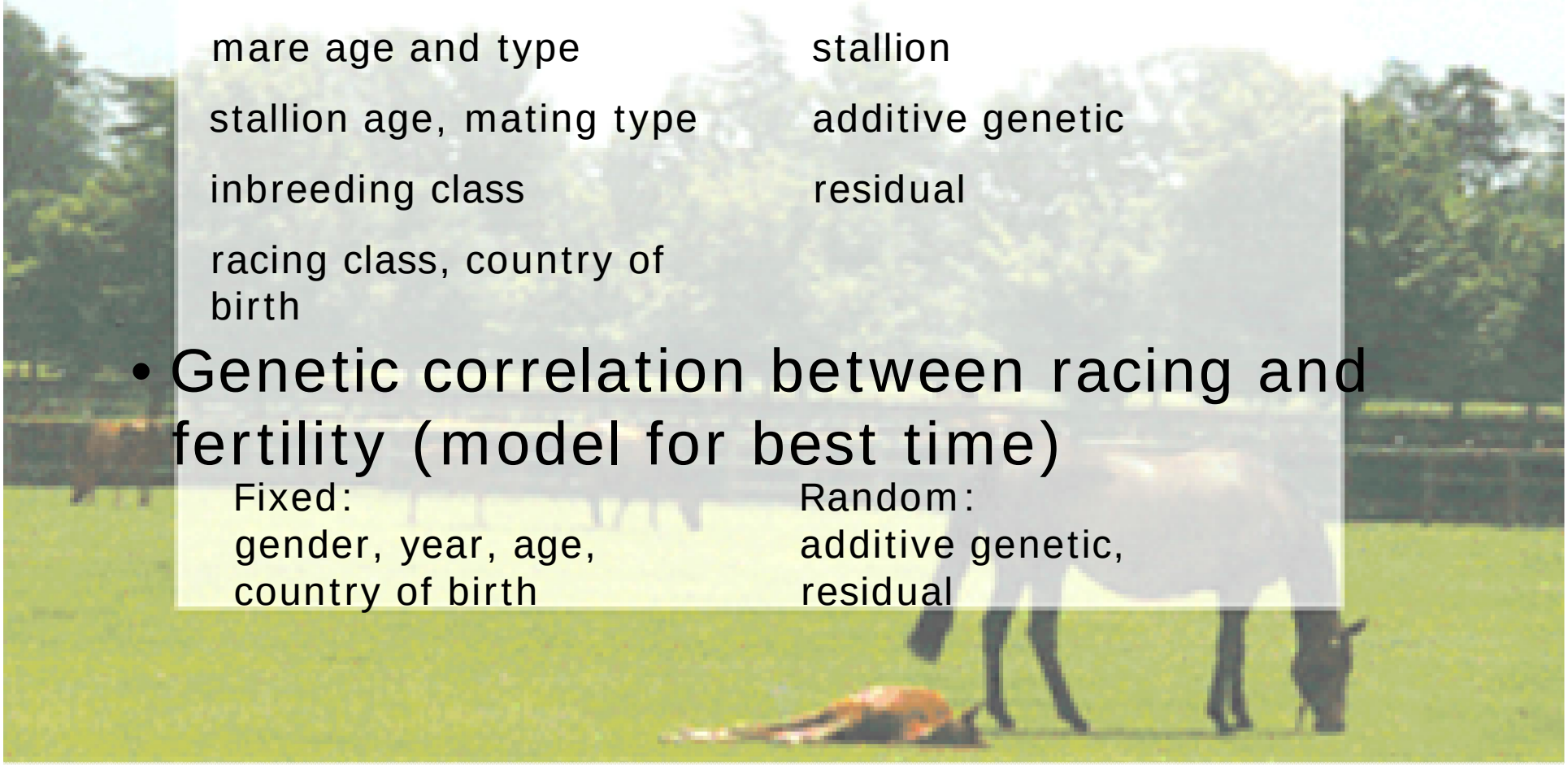
Methods and Models

- Racing as fixed factor (model for foaling outcome)

Fixed:	Random:
month, year	mare
mare age and type	stallion
stallion age, mating type	additive genetic
inbreeding class	residual
racing class, country of birth	

- Genetic correlation between racing and fertility (model for best time)

Fixed:	Random:
gender, year, age, country of birth	additive genetic, residual



Results: racing as fixed factor

- racing during mating year (number of races)

	Standardbred			Finnhorse		
Racing status of mare	n	estimate	s.e.	n	estimate	s.e.
never raced	4421	-0.4	0.79	10315	-0.8	0.70
raced, but not during mating year	24950	0		19025	0	
1-5 starts during mating year	2501	1.9	1.05	2059	3.0	1.15
6-10 starts during mating year	1078	-0.3	1.45	744	3.0	1.75
>10 starts during mating year	729	-5.8	1.71	588	-1.4	1.96

	Standardbred			Finnhorse		
Racing status of stallion	n	estimate	s.e.	n	estimate	s.e.
never raced	498	4.7	2.77	2172	6.1	1.66
raced, but not during mating year	27130	0		16955	0	
1-5 starts during mating year	1921	1.0	1.15	2798	-0.7	1.10
6-10 starts during mating year	815	-0.1	1.67	2152	1.5	1.26
11-15 starts during mating year	583	2.8	1.97	2639	-0.4	1.22
16-20 starts during mating year	722	-2.6	1.95	2571	-0.5	1.31
>20 starts during mating year	446	-0.6	2.40	3382	0.0	1.20

Results: racing as fixed factor

- career results (best time)

best time of mare	Standardbred n	estimate	s.e.
never raced/no rec.	4725	-0.9	0.86
≥22,1	2216	-1.0	1.09
20,1-22	2751	-1.1	0.99
18,1-20	7145	-0.5	0.71
16,1-18	9666	0	
14,1-16	6059	0.1	0.77
≤14.0	1103	5.0	1.52

best time of mare	Finnhorse n	estimate	s.e.
never raced/no rec.	10822	-2.5	1.17
≥40,1	4590	-2.2	1.27
35,1-40	4773	-1.1	1.25
32,1-35	4177	-1.4	1.28
30,1-32	2587	-2.2	1.42
28,1-30	2775	0	
26,1-28	1802	-1.3	1.59
≤26	1143	-0.3	1.86

best time of stallion	Standardbred n	estimate	s.e.
never raced/no rec.	626	4.9	2.46
≥14.6	2044	5.6	1.37
12.6-14.5	16365	0	
10.6-12.5	13173	1.0	1.05
≤10.5	1457	-2.6	2.30

best time of stallion	Finnhorse n	estimate	s.e.
never raced/no rec.	2184	8.2	1.78
≥28.1	1880	6.8	1.72
25.1-28.0	7133	-0.3	1.28
23.1-25.0	9244	0	
21.1-23.0	8585	2.4	1.39
≤21.0	3643	3.3	2.31

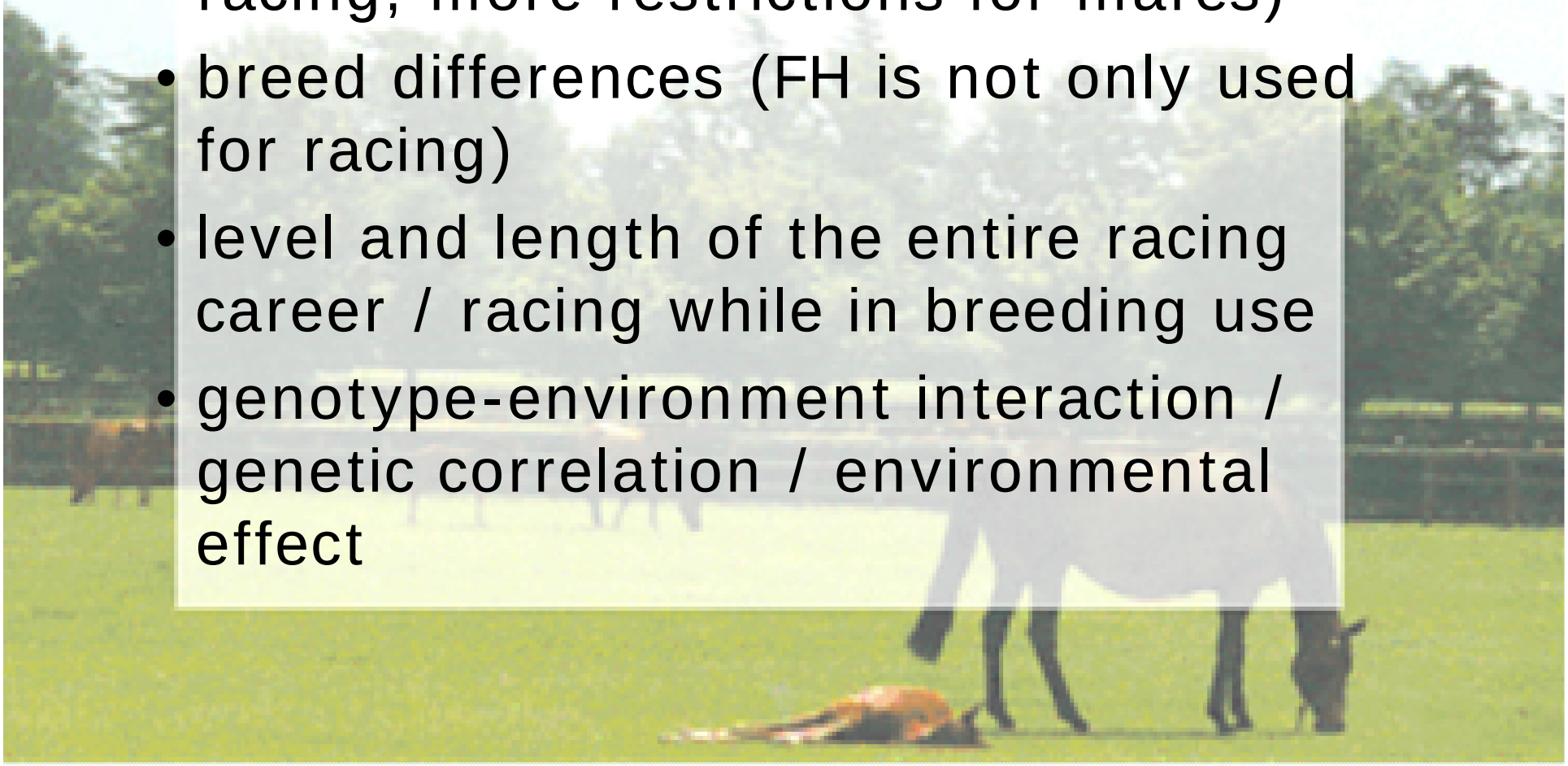
Results: genetic correlation between racing and fertility

Bivariate model (mare trait)

	SB		FH	
foaling outcome	% of total var.	s.e.	% of total var.	s.e.
additive genetic	1.2	0.39	3.1	0.58
mare	2.0	0.54	4.4	0.67
stallion	2.0	0.35	1.9	0.35
residual	94.9	0.63	90.6	1.60
best time				
additive genetic	30.7	2.44	32.7	2.84
residual	69.3	2.44	67.3	2.84
	correlation	s.e.	correlation	s.e.
genetic	-0.06	0.12	-0.26	0.08
phenotypic	-0.04		-0.01	

Conclusions

- mares / stallions (different effects of racing, more restrictions for mares)
- breed differences (FH is not only used for racing)
- level and length of the entire racing career / racing while in breeding use
- genotype-environment interaction / genetic correlation / environmental effect



Thank you for your attention!