Weight gain of F2-gilts depends on its paternally inherited *IGF2*-allele

Henri Heuven, Birgitte van Rens, Ilse van Grevenhof, Henk Bovenhuis

WAGENINGEN UNIVERSITY
WAGENINGEN UR

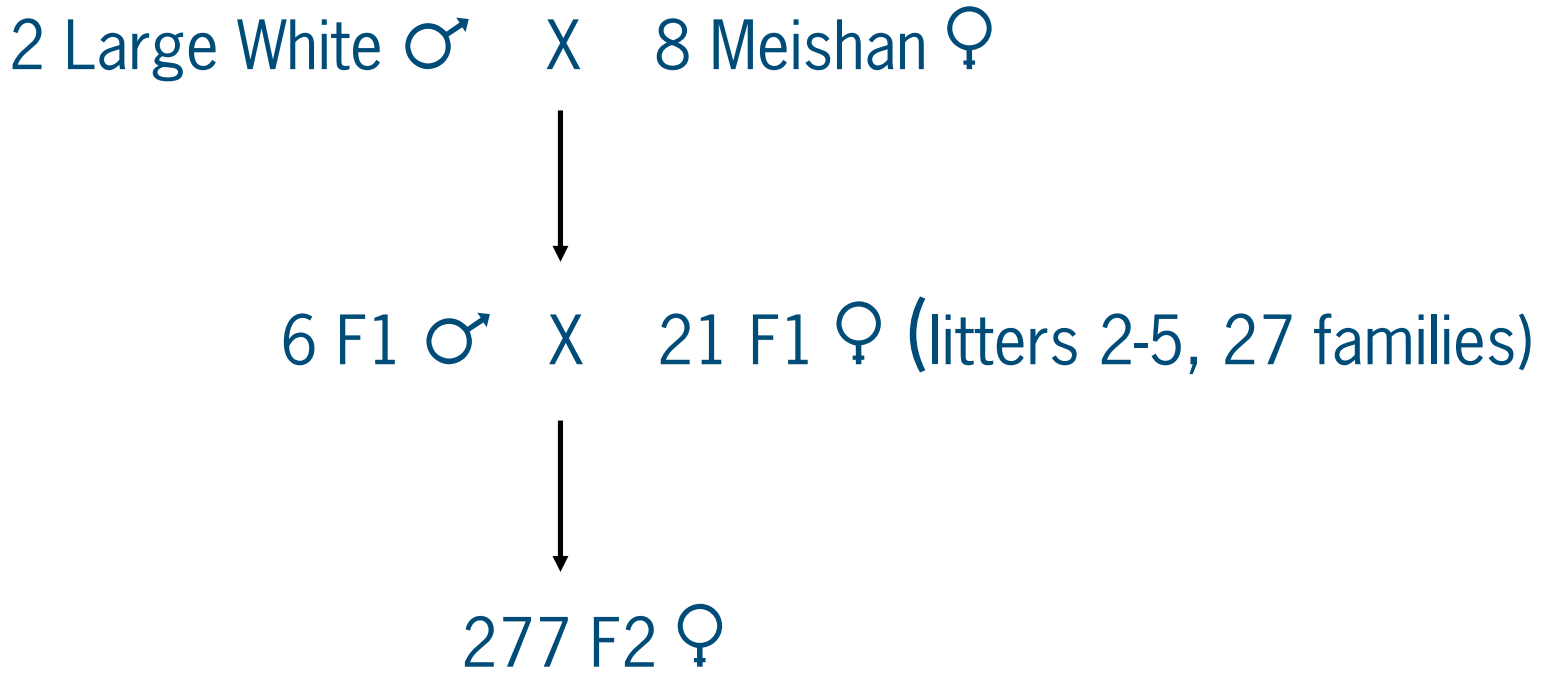
Animal Breeding and Genomics Centre

Introduction

- *IGF2* stimulates myogenesis
- Parent-of-origin effect: only paternal expression
- *IGF2*-mutation affects: (Van Laere et al. 2003)
  - Muscle growth, fat dep. and heart size.
  - No effect on birth weight

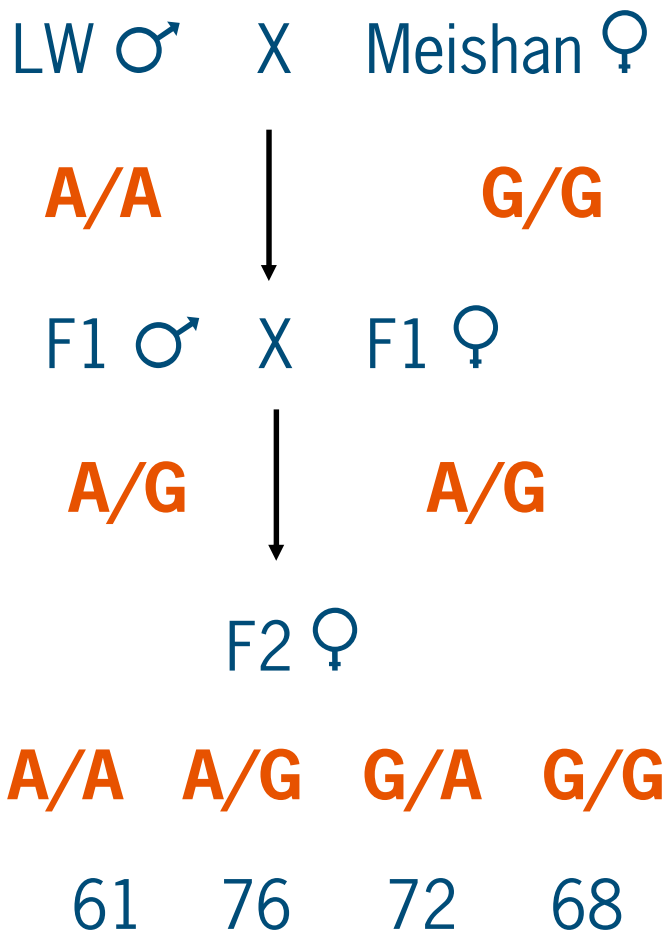
- Objective is to study the effect of *IGF2* on growth of Meishan F2-gilts

Material (ESR-population of van Rens, 2001)



Genotyping and haplotyping

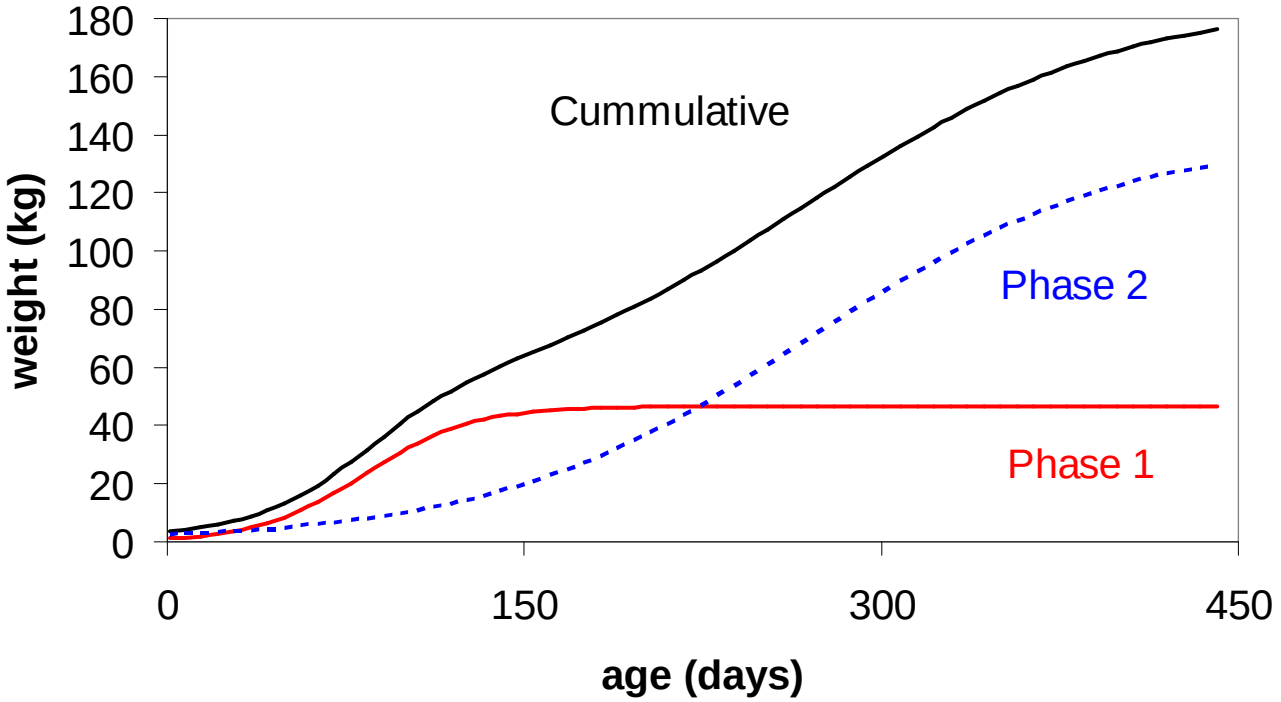
- 3 SSRs and 14 SNPs including *IGF2-A/G*
  - *IGF2-A* = mutant type
  - *IGF2-G* = wild type
- SSRs in 19 cM and SNPs in 2 cM region
- Haplotyping with Cluster Variation Method (CVM) (Albers et al. 2007)



Weight recording

- During lactation (6x)
  - Birth weight, 7, 14, 21, 28 and 35 days
- After weaning (5x)
  - 42, 56, 63, 70 and 77 days
  - Ad lib feeding of commercial diets
- Rearing
  - Every 30 days until farrowing (> 8x)
  - Restricted feeding scheme
  - Insemination in 4th estrus period
- Around farrowing (2x)
  - After farrowing, at weaning

Analysis using bi-phasic logistic growth curves



3 parameters per phase

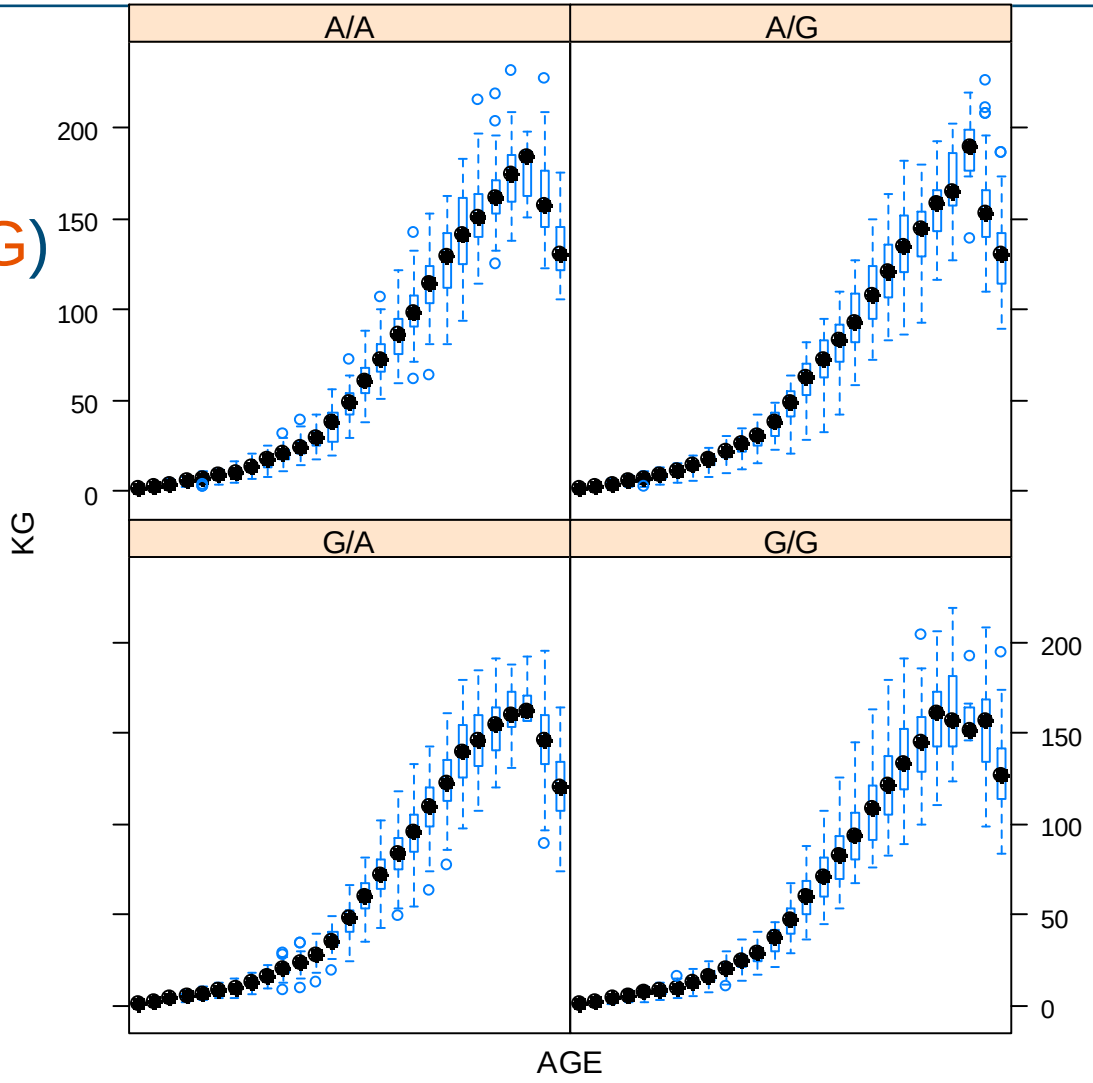
- Asymptotic weight
- Age at inflection
- Slope of growth on age

Models

- 4 models were applied
  - Full model (A/A),(A/G),(G/A),(G/G)
  - Paternal model (A/A,A/G), (G/A,G/G)
  - Maternal model (A/A,G/A), (A/G,G/G)
  - Genotypes combined (A/A,A/G,G/A,G/G)
- Parameters estimated
  - Full 24
  - Pat 12
  - Mat 12
  - Comb 6

Results

- Means per genotype (A/A),(A/G),(G/A),(G/G)
- Last 2 points
  - Farrowing weight
  - Weaning weight
- Variance increases with age
- (G/A) and (G/G) level off



Parameters of the full model

Phase	Parameter	Genotype A/A	A/G	G/A	G/G
1	Asymptotic weight (kg)	47.8	48.4	46.9	48.4
1	Age at inflection (days)	85.8	86.1	82.3	81.5
1	Slope of growth ($days^{-1}$)	23.1	23.6	22.5	23.0
2	Asymptotic weight (kg)	145.8	152.8	130.6	125.0
2	Age at inflection (days)	270.5	291.2	260.9	260.2
2	Slope of growth ($days^{-1}$)	66.7	73.3	61.1	60.3

Parameters of Paternal model

Phase	Parameter	Genotype **A**/A,**A**/G	Genotype **G**/A,**G**/G	st.error
1	Asymptotic weight (kg)	47.9	47.6	5.2
1	Age at inflection (days)	85.8	81.8	2.2
1	Slope of growth ($days^{-1}$)	23.2	22.7	2.5
2	Asymptotic weight (kg)	149.1	127.6	7.6
2	Age at inflection (days)	280.6	260.0	4.4
2	Slope of growth ($days^{-1}$)	70.2	60.6	4.3

Parameters of Maternal model

Phase	Parameter	Genotype A/**A**,G/**A**	Genotype A/**G**,G/**G**	st.error
1	Asymptotic weight (kg)	47.0	46.6	5.2
1	Age at inflection (days)	83.8	82.7	2.1
1	Slope of growth ($days^{-1}$)	22.6	22.4	2.6
2	Asymptotic weight (kg)	139.3	139.2	7.4
2	Age at inflection (days)	266.3	272.3	4.4
2	Slope of growth ($days^{-1}$)	64.2	67.4	4.3

Analysis of variance

Model	Factor	df	MS	F-stat.	p-value
Full	IGF2 genotype	3	3242	3.03	0.030
	Animal (genotype)	243	1071		
Maternal	IGF2 mat.allele	1	89	0.08	0.777
	Animal(mat.allele)	245	1102		
Paternal	IGF2 pat.allele	1	4453	4.11	0.044
	Animal(pat.allele)	245	1084		

Summary

- *IGF2* affects growth rate in pigs
- Effect is due to paternal *IGF2*-allele
- Effect mainly at later age (phase 2)
  - Higher asymtotic weight: 21.5 kg (± 7.6)
  - Later inflection age: 20.6 days (± 4.3)
  - Higher slope of growth 9.6 $days^{-1}$ (± 4.4)
- Gilts with paternally inherited *IGF2*-G allele mature earlier (similar to the pure Meishan pigs)

Analysis of birth weight

- Curves do not fit very well at birth (day 1)

- Significant effect of paternal *IGF2* allele (p=0.035)
- Effect of *IGF2*-A is +63.4 gram (± 30.0)

- Effect is confirmed in larger Meishan F2 population
- Highly significant effect (p=0.0032)
- Effect of *IGF2*-A is +48.1 gram (± 16.3)

Conclusions

- Paternally inherited *IGF2* allele affects growth of pigs
- Pigs inheriting *IGF2*-G seem to mature earlier
- Differences are already significant at birth and increase with age

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