Session 22 gutgar@vet.ucm.es

First results from a divergent selection experiment for environmental variability of birth weight in *mus musculus*

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Research Group 920332
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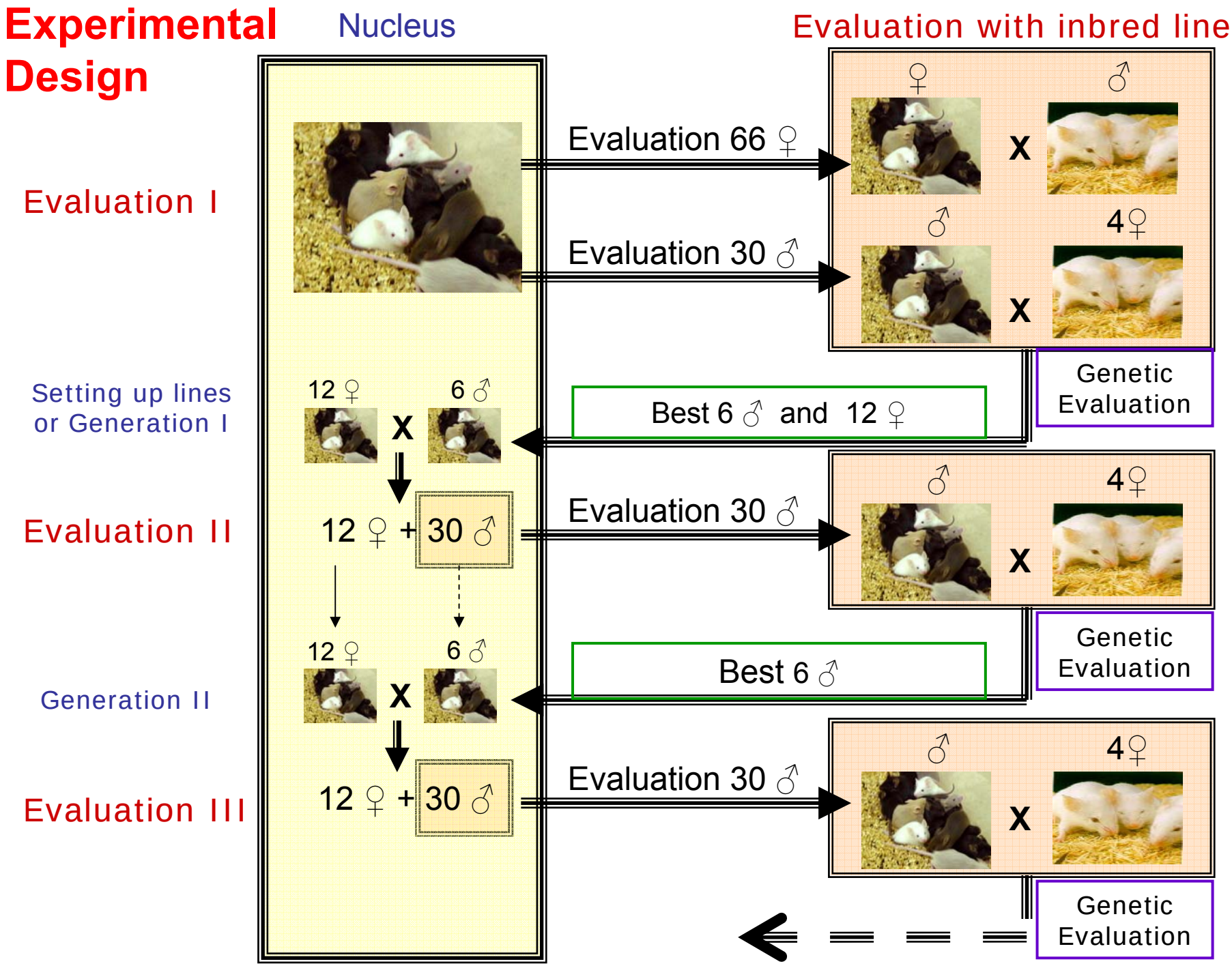
Introduction

- Genetics of variability is becoming important
- Modifying environmental variability by selection is possible?
- Yes under simulated data
- And in real populations?

Objective

- Carry out a divergent selection experiment for environmental variability of birth weight in mice

Experimental Design



Genetic Evaluation

- Trait: Birth Weight
- All available records and 10 generations back of pedigree
- Fixed effects: sex and litter size (16 levels from second generation and covariate in the first), batch of litter
- Random effect: litter
- GSEVM v2.0 (N. Ibáñez-Escriche, M. García, D. Sorensen)

$$y_{ijk} = b_i + u_j + p_k + e^{\frac{1}{2}(b^*_i + u^*_j + p^*_k)\varepsilon_{ijk}}$$

$\rho = 0$

Experimental Design: Mating in nucleus

INITIAL APPROACH:

- **Standard solution**:
  - **30 males (sons from the best 6)**
  - **12 females (daughters from the best 3)**

Male	Female	Sons or Daughters
1	1	3
1	2	2
2	3	3
2	4	2
…..		…..
1	1	2
1	2	2
2	3	2
2	4	2
3	5	2
3	6	2

Experimental Design: Mating in nucleus

IMPROVING THE DESIGN: WEIGHTED SELECTION

- Standard coancestry: average of those coancestries among the 42 offspring of the Standard solution.

- Standard response: Average breeding values of the Standard solution computed as the mean of their parents.

- Optimal solution searched by: "simulated annealing":
  Each male mated to ≤ 3 females
  - Maximizing response to selection
  - Restriction: Weighted coancestry ≤ Standard coancestry
  - Assuming: 4 males and 2 females born from each mate

2 ANNEALING after births with real offspring

The “good” results

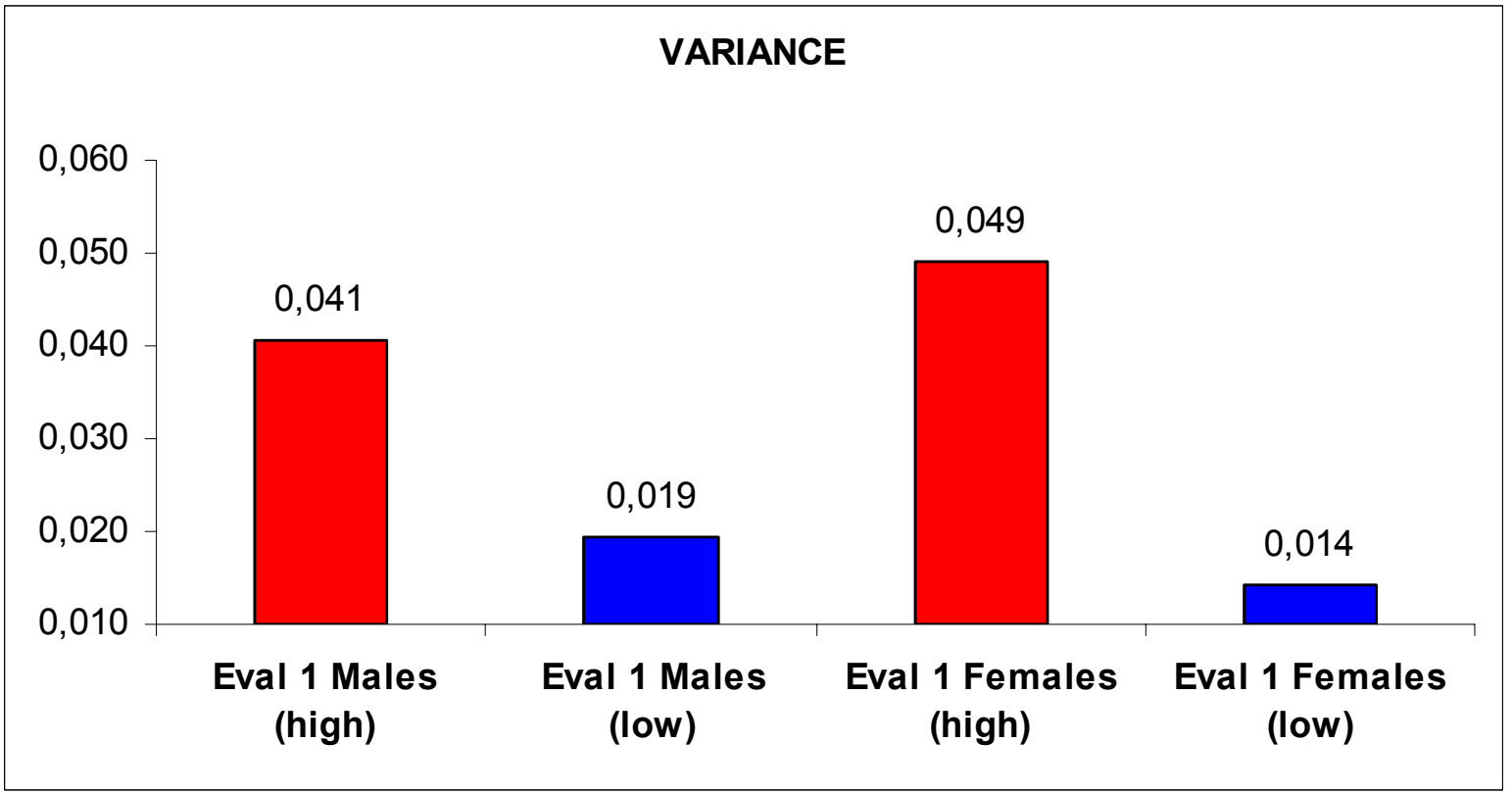
First results: Phenotypic Data

66 evaluated females x inbred males

Evaluation I

30 evaluated males x inbred females

ONLY SELECTED ANIMALS



JPG1

JPG2

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JPG1 JP; 27/04/2010

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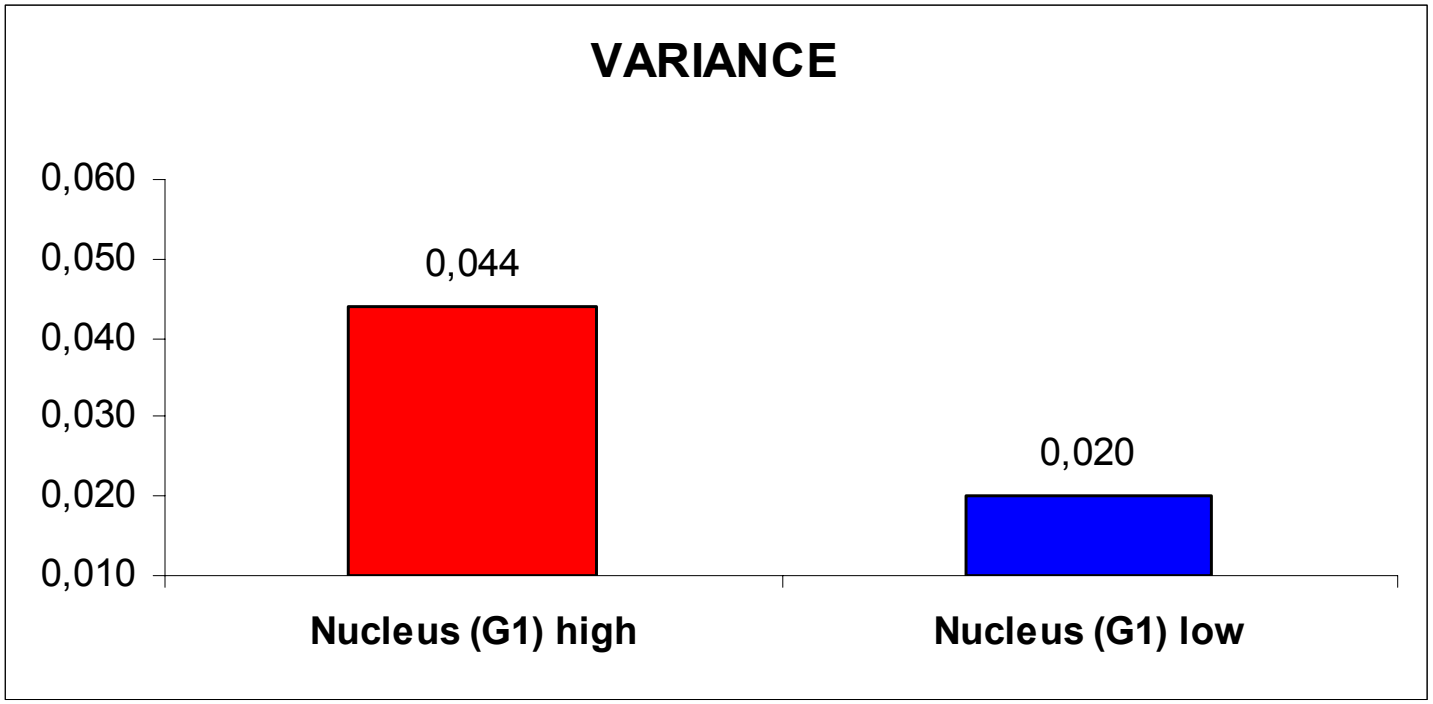
JP; 27/04/2010

First results: Phenotypic Data

First Generation

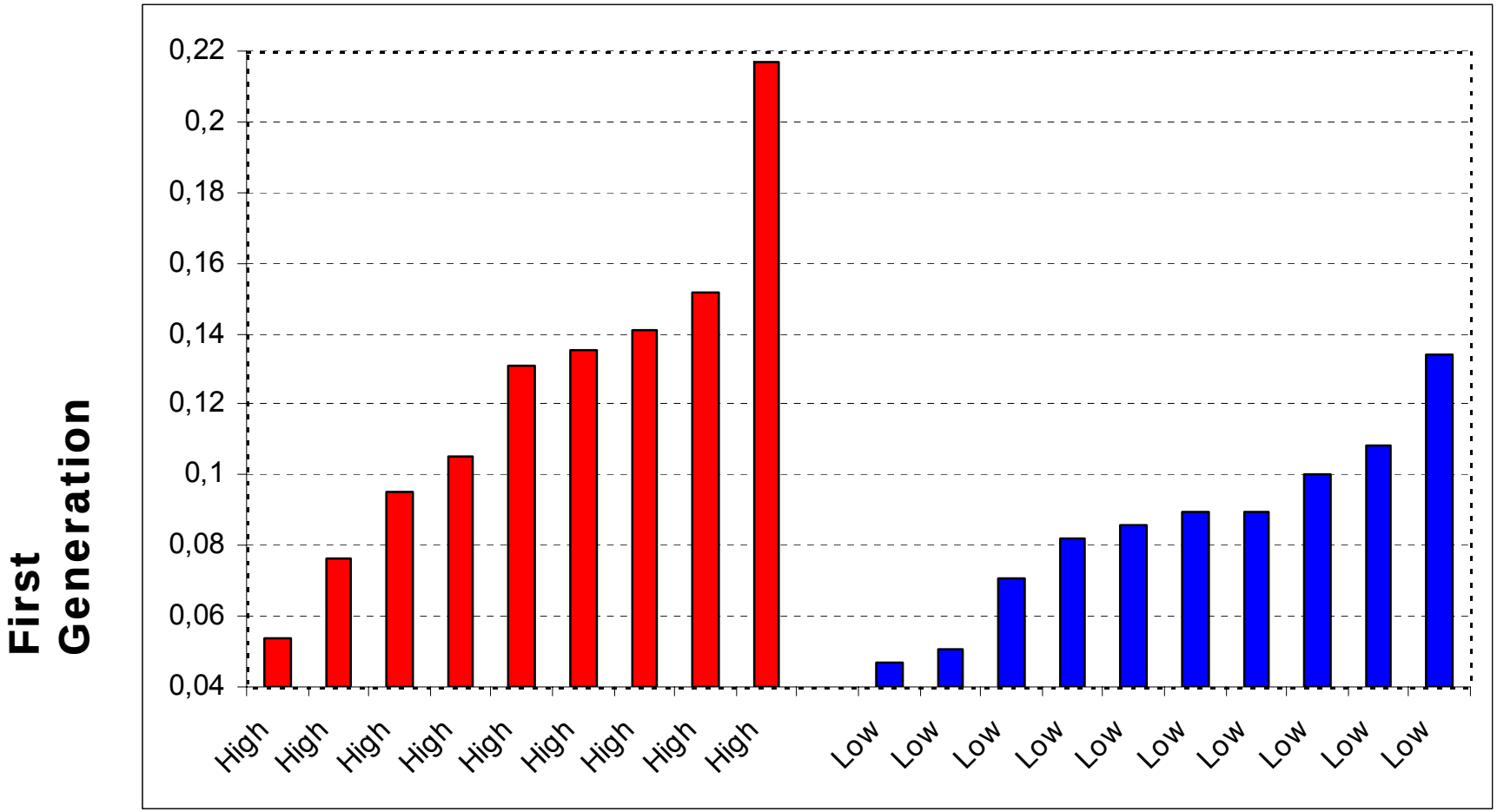
HIGH variability	LOW variability
Best 6 males x Best 12 females	Best 6 males x Best 12 females

NUCLEUS

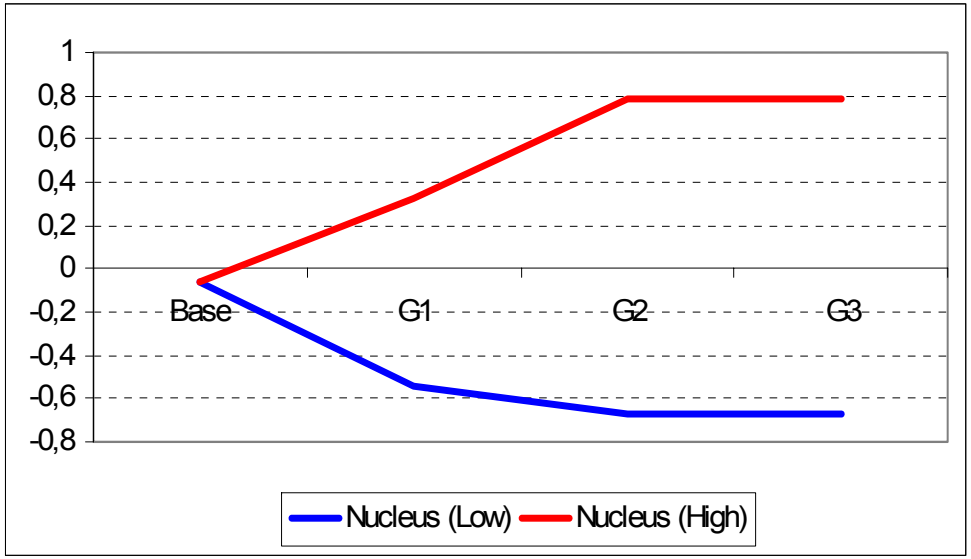


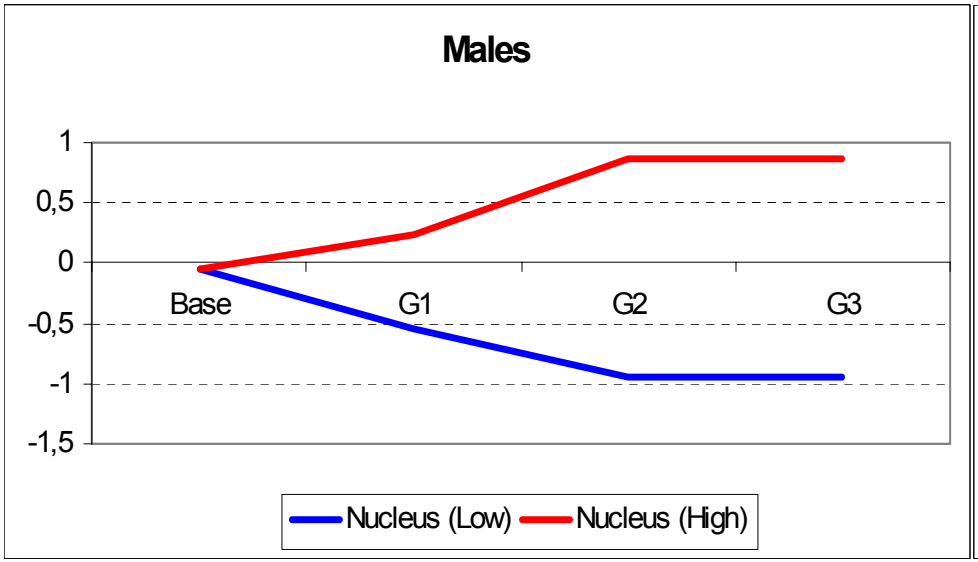
First results: Phenotypic Data

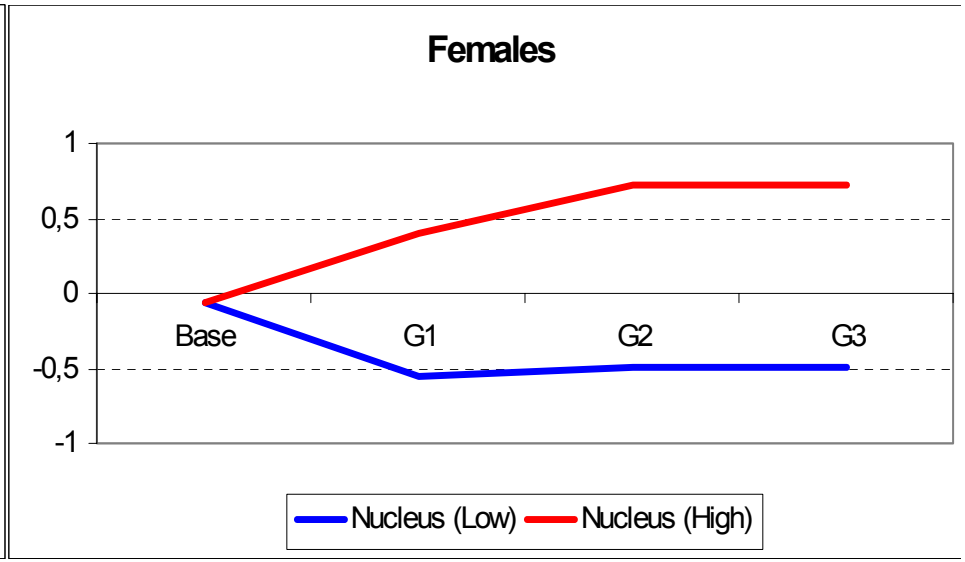
Coefficient of Variation for each litter within lines HIGH and LOW



First results: Genetic Trends



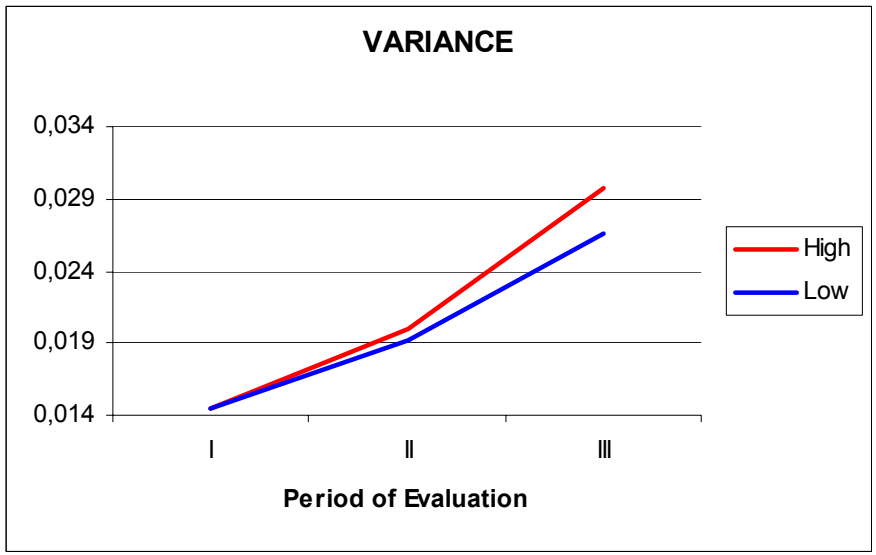


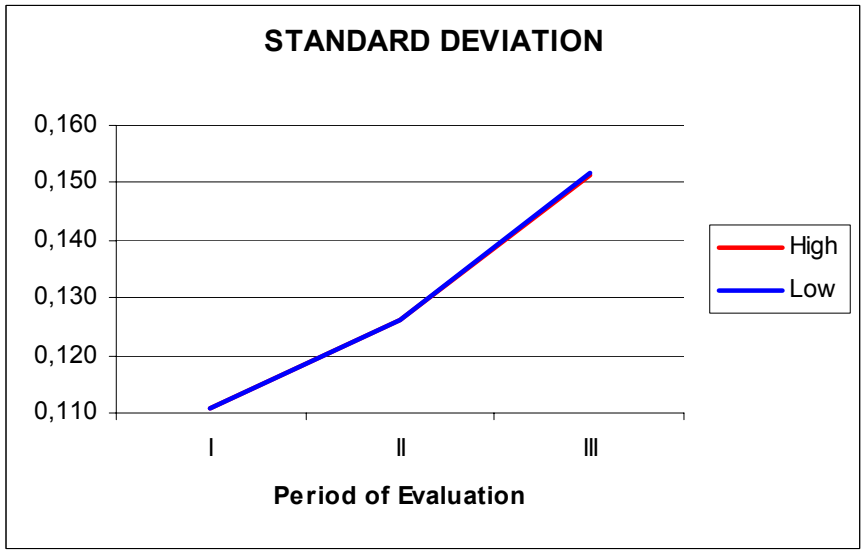


The “bad” results

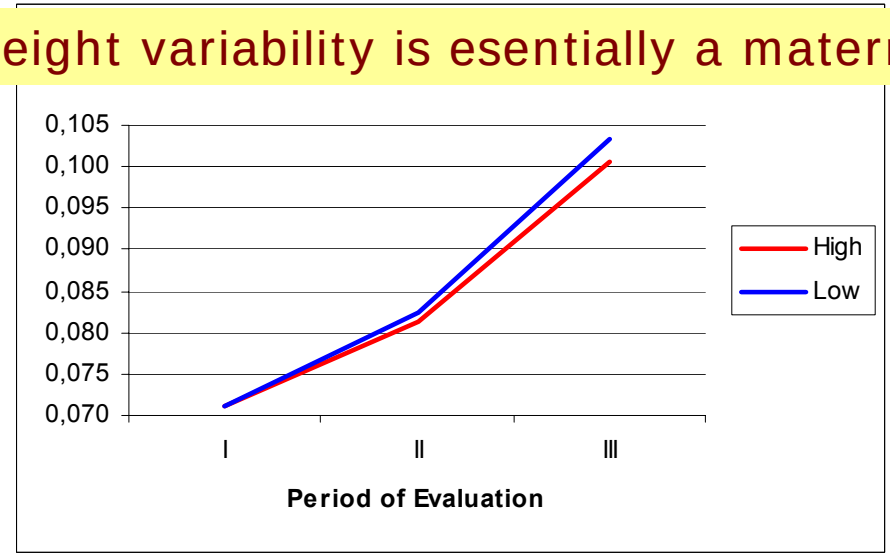
First results: Phenotypic Data

Birth weight variability in the litters for Evaluation step





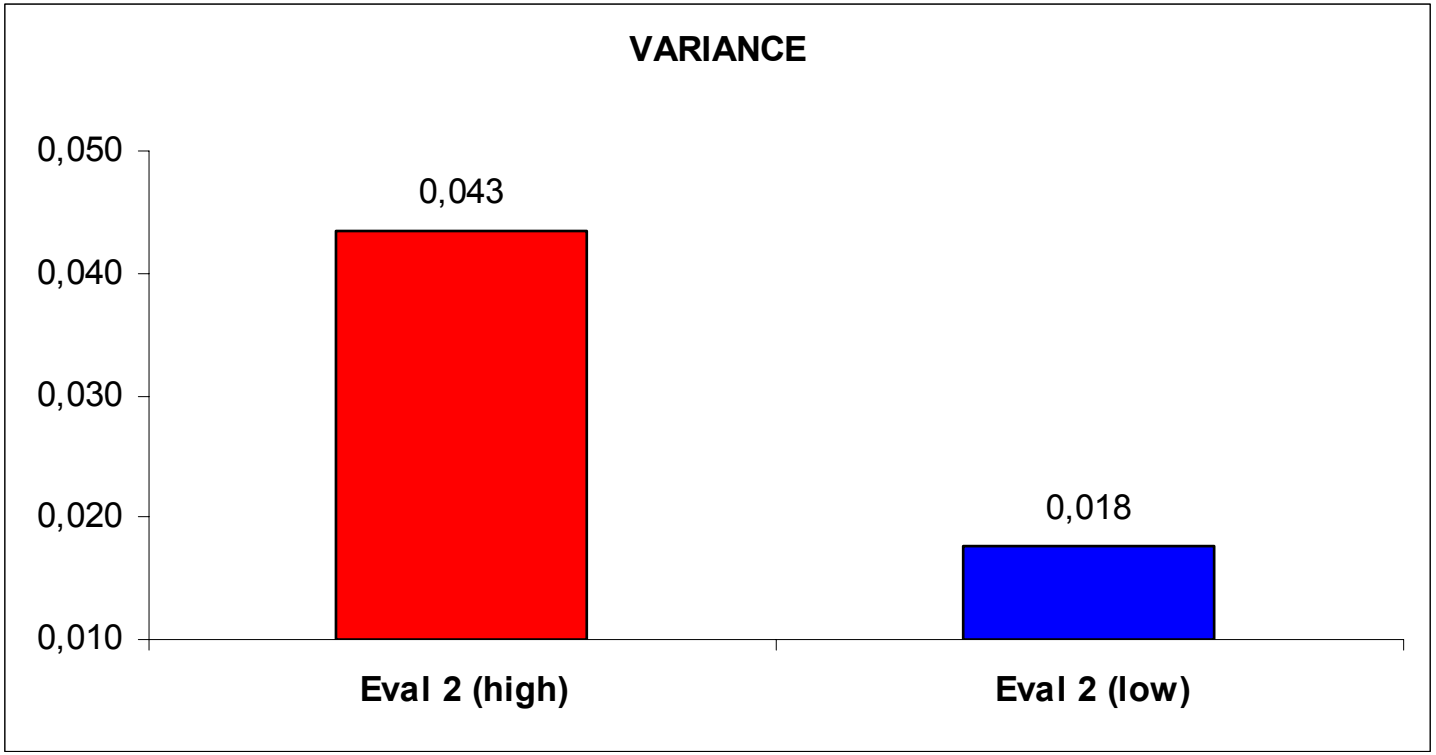
Birth weight variability is esentially a maternal trait



First results: Phenotypic Data

HIGH	LOW
30 males x inbred females: Evaluation II	30 males x inbred females: Evaluation II

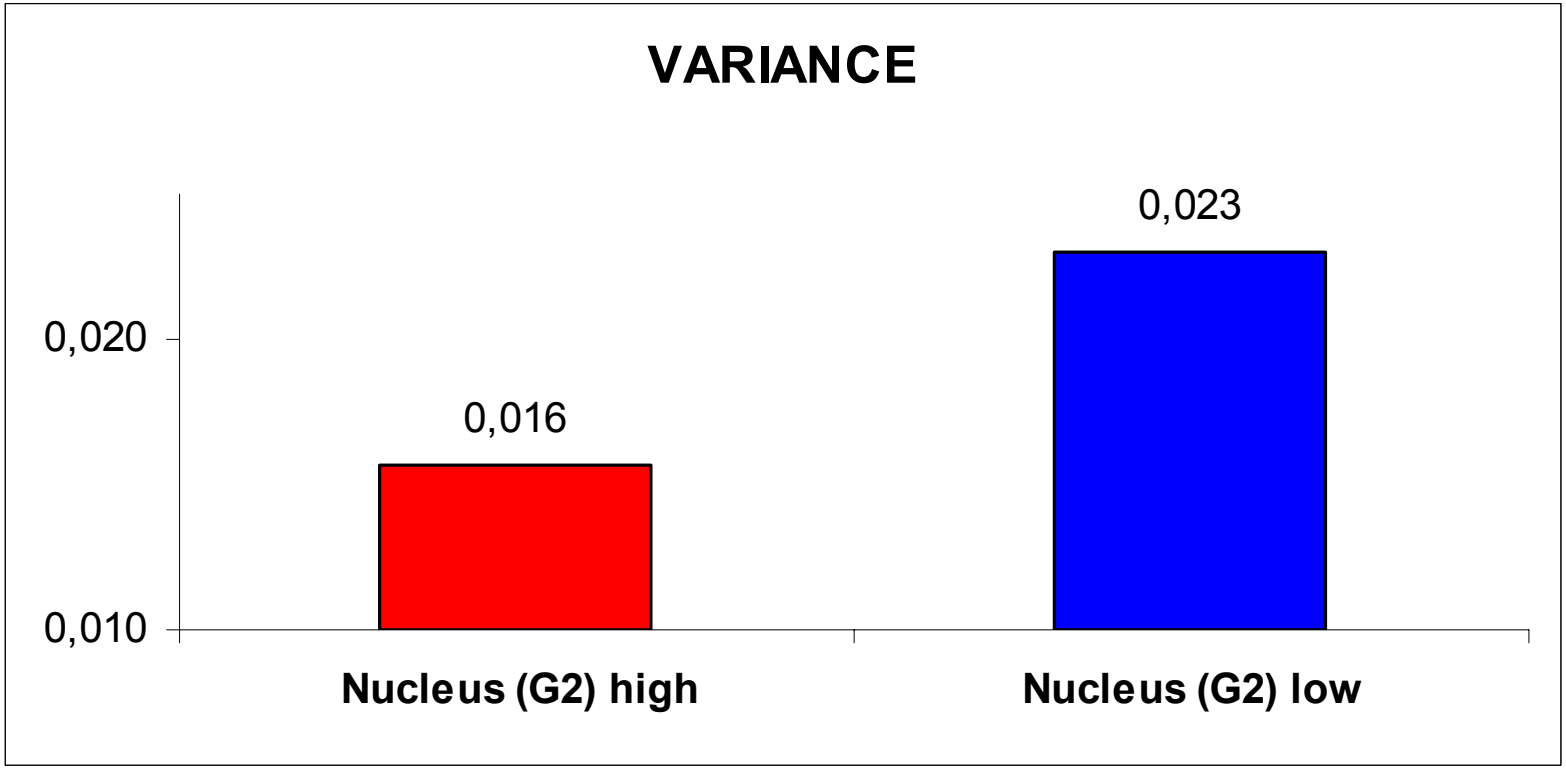
Only litters of selected



First results: Phenotypic Data

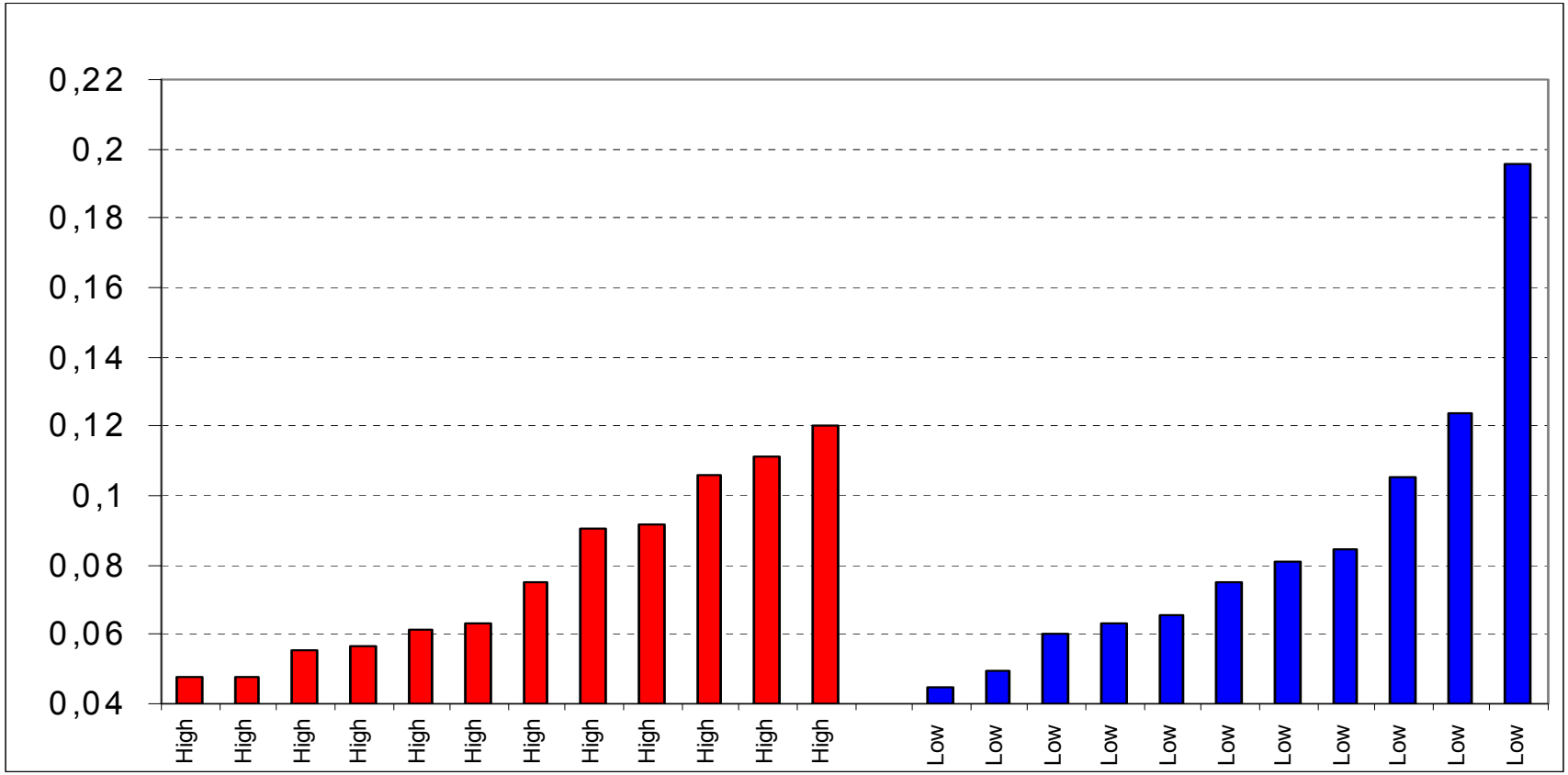
Second Generation

HIGH	LOW
Best 6 males x Best 12 females	Best 6 males x Best 12 females



First results: Phenotypic Data

CV for each litter withon lines HIGH and LOW

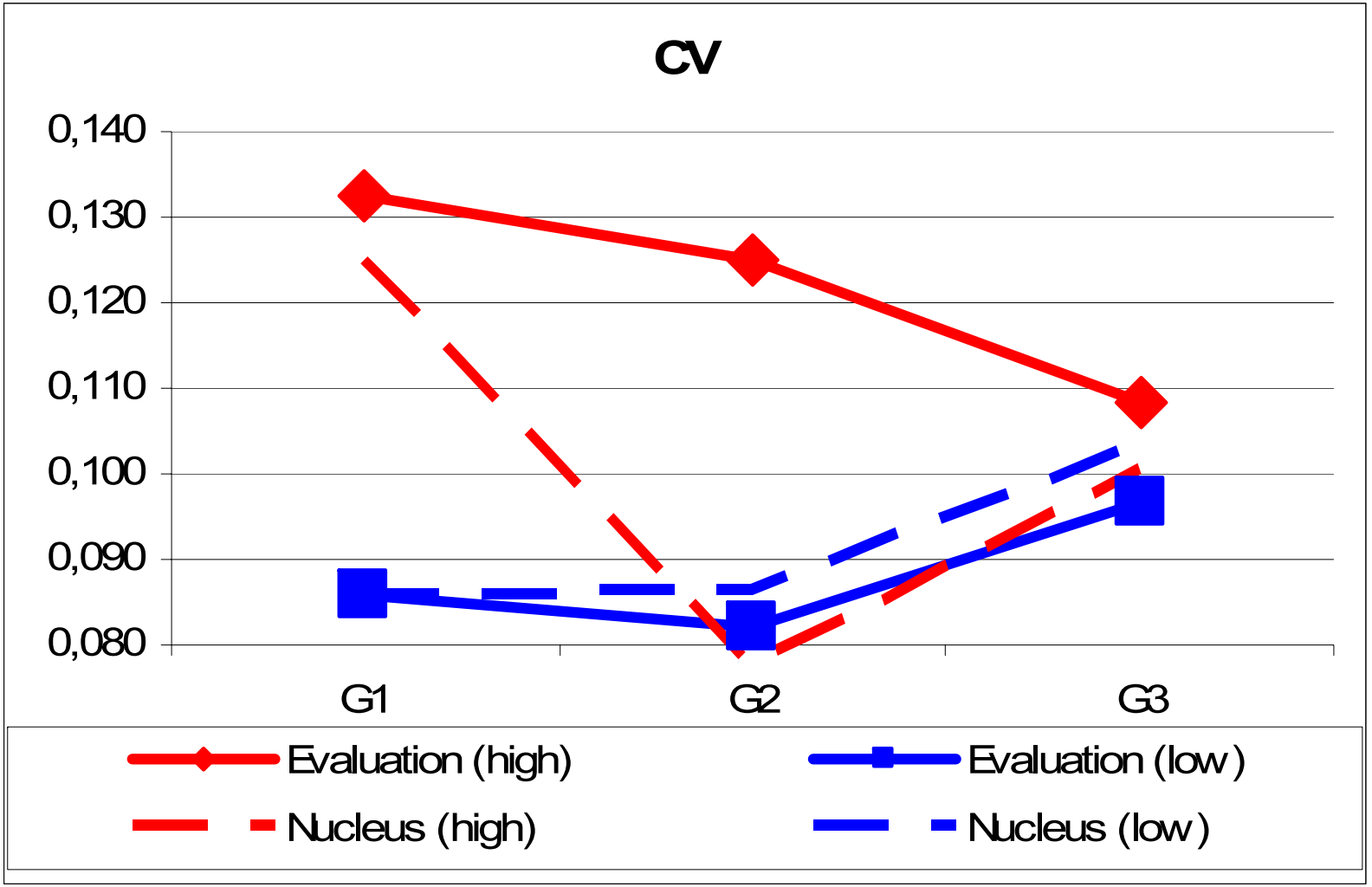


Second Generation

This has been very similar in the third generation

First results: Phenotypic Data

Evaluation + Nucleus Data



CONCLUSIONS

- Why have not we found phenotypic response to divergent selection?
- Is only a maternal trait?
- Has been lost of genetic variability?
- What will we find after some generations?

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THANKS

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