

Direct and indirect genetic effects for survival in crossbred laying hens

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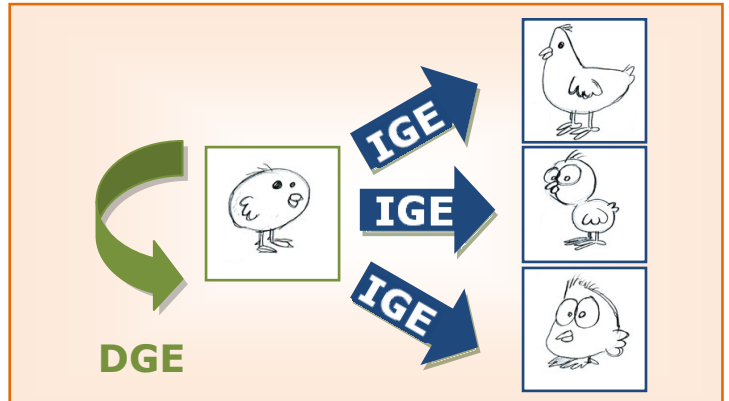
Introduction

Social interactions affect survival in laying hens through feather pecking and cannibalism

Survival depends on the (behavioral) characteristics of the animal itself and those of its social partners

- Heritable effect that an individual has on its own trait value
= **direct genetic effect (DGE)**
- Heritable effect that an individual has on the trait value of a group member
= **indirect genetic effect (IGE)**

1 Cage



Aim

- Quantify the magnitude of IGE's
- Study the nature of IGE's

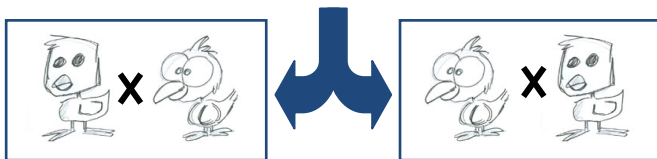
Conclusion

The indirect variance and direct-indirect covariance jointly contribute up to 87% of the total heritable variance

A parent-of-origin effect acts on IGE's, indicating the presence of maternal imprinting or a Z-chromosome-linked effect

Material

Reciprocal cross of two purebred layer lines



7,668 W1xWB

7,344 WBxW1

- Untrimmed beaks
- Four hens per cage
- Daily records on survival

Methods

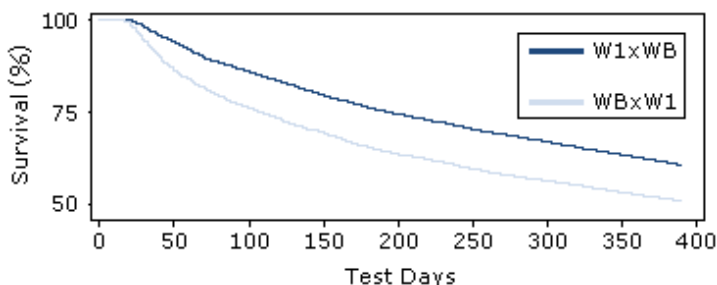


Figure: Kaplan-Meier survival curve. Plots survival (%) against the number of test days (0-398) for the reciprocal crosses of two purebred layer lines

Phenotypic differences between both crosses (Figure)

Treat survival as a different trait for each cross
~> **Bivariate** direct-indirect animal model

Genetic parameters **within** and **between** crosses

Results & Discussion

Magnitude of IGE's

Based on genetic parameters **within** crosses

Table: Genetic and phenotypic (co)variances, with s.e., within each cross

	W1xWB	WBxW1
$\sigma_{A_D}^2$ ¹	536 ± 152	997 ± 226
$\sigma_{A_{DI}}^2$ ²	-197 ± 93	-726 ± 140
$\sigma_{A_I}^2$ ³	536 ± 109	767 ± 148
σ_P^2 ⁴	15,860 ± 289	21,332 ± 401

¹ Direct variance; ² Direct-indirect covariance; ³ Indirect variance; ⁴ Phenotypic variance

Total heritable variance ($\sigma_{A_T}^2$) =

$$\sigma_{A_D}^2 + 2(n-1)\sigma_{A_{DI}} + (n-1)^2\sigma_{A_I}^2$$

- Contribution of $\sigma_{A_I}^2$ and $\sigma_{A_{DI}}$ to $\sigma_{A_T}^2$:
87% in W1xWB
72% in WBxW1

- $\sigma_{A_T}^2$ relative to σ_P^2 :
0.26 in W1xWB
0.17 in WBxW1

Nature of IGE's

Based on genetic parameters **between** crosses

Indirect genetic correlation between crosses = 0.41 ± 0.26

A parent-of-origin effect acts on IGE's

~> Maternal imprinting or a Z-chromosome-linked effect

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