# Relationship between adult feed intake and litter weight in mice selected for litter size

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We need feed
efficient animals

Energy from food = Energy in product + Loss

Output traits are selected *upwards* to *more (no limit)*

Input traits are selected *downwards* to *less (limit = 0)*

First law of thermodynamics: law of conservation of energy

= energy can not be created or destroyed, it can only be changed from one form to another

Pig Breeding = selection for improved
lean growth efficiency

→ Increased growth rate
→ Reduced body fatness
→ Improved feed efficiency

But: improved leanness and feed efficiency
= negatively correlated with feed intake

→ Selection resulted in decreased feed intake capacity

= Lower voluntary feed intake or appetite

→ Recommended to increase ad lib feed intake during entire growth period

Sows in commercial production systems originate from lean types of pigs:

During lactation sows must:

- Maintain a genetically increased litter size, a
- Genetically increased growth rate
- On reduced amounts of body fat reserves
- With a reduced appetite

→ Excessive mobilization of body reserves

= Frequent reproduction problems

→ Voluntary feed intake should be considered in breeding programs

This study:

To investigate the phenotypic correlation between growth, mature & lactation feed intake in a mouse model

# Material and Methods

104th Generation of selection experiment for litter size at birth

48 S-line: selected = 21 pups/litter

42 C-line: control = 10 pups/litter

Feed intake measurements:

Growth: 21 to 42 d of age
Maturity: 42 to 69 d of age
Lactation: 1 to 21 d in lactation

Growth intake = Average intake 21 to 42 d
Mature intake = Linear between 42 and 69
Lactation intake = Linear between 5 and 14 d

Fits are 96 to 100% (average = 100%)

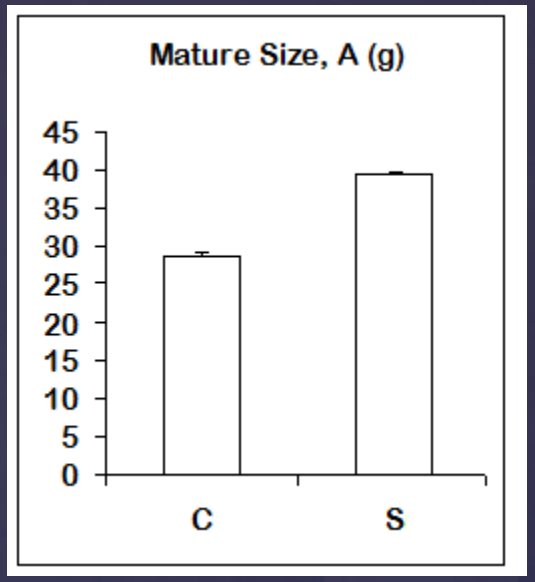
Other parameters:

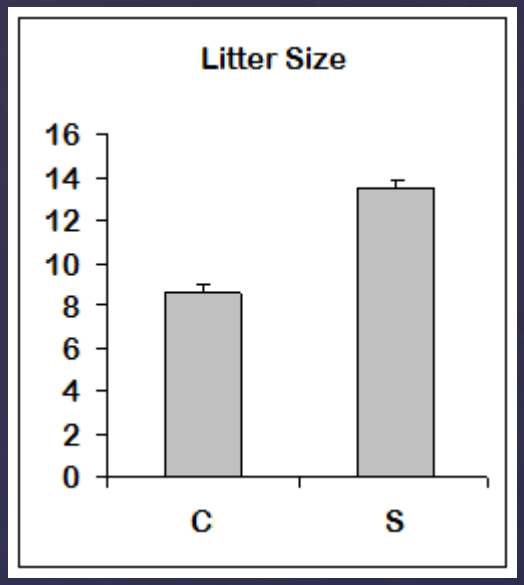
1. Litter size
2. Litter weight
3. Mature body weight (A)

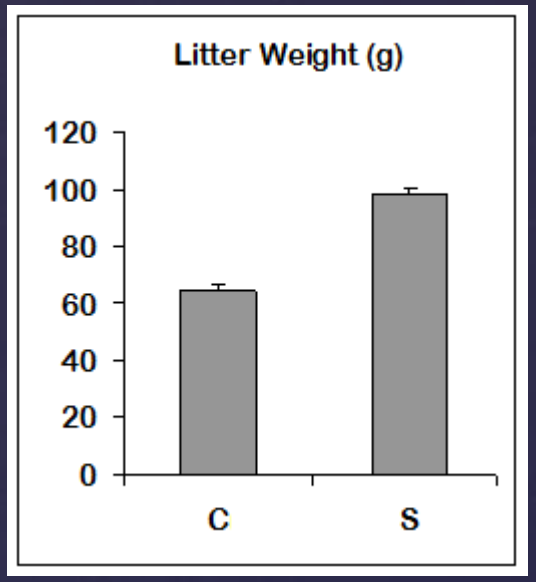
$$Y_{ijk} = \mu + Line_i + Stand_j + e_{ijk}$$

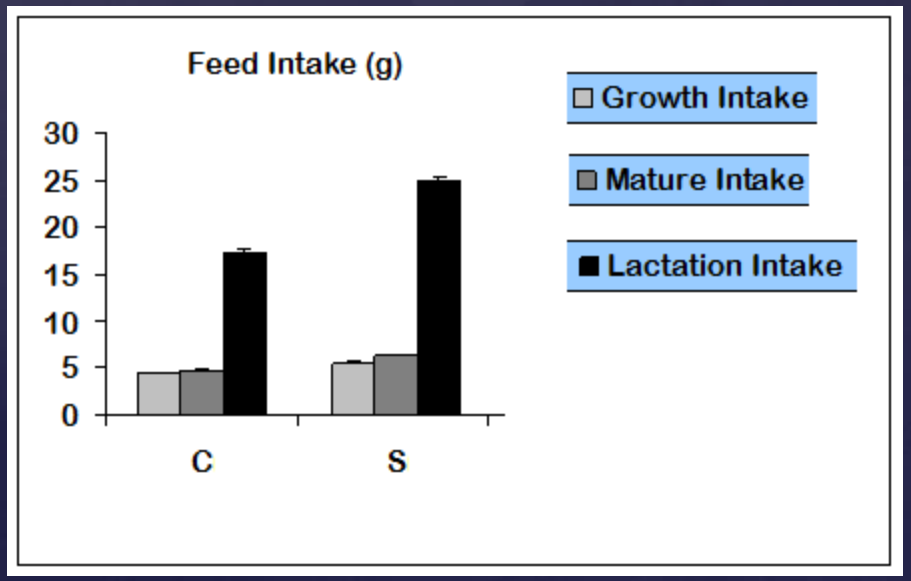
(Interaction not significant)

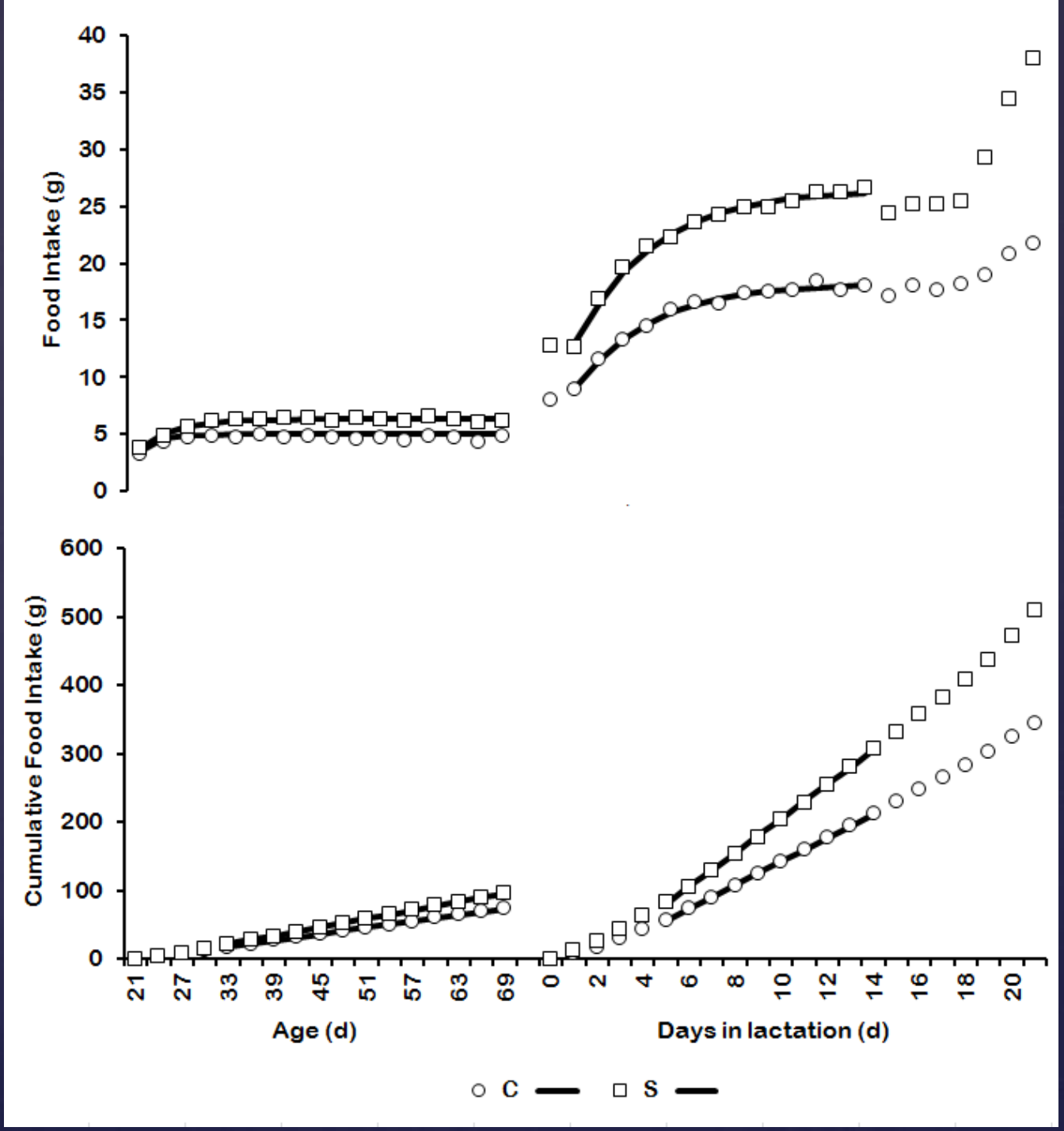
# Results & Conclusions




Food Intake (g)
0
5
10
15
20
25
30
35
40
Cumulative Food Intake (g)
0
100
200
300
400
500
600
21
27
33
39
45
51
57
63
69
Age (d)
0
2
4
6
8
10
12
14
16
18
20
Days in lactation (d)
C
S

# Growth & Mature intake:

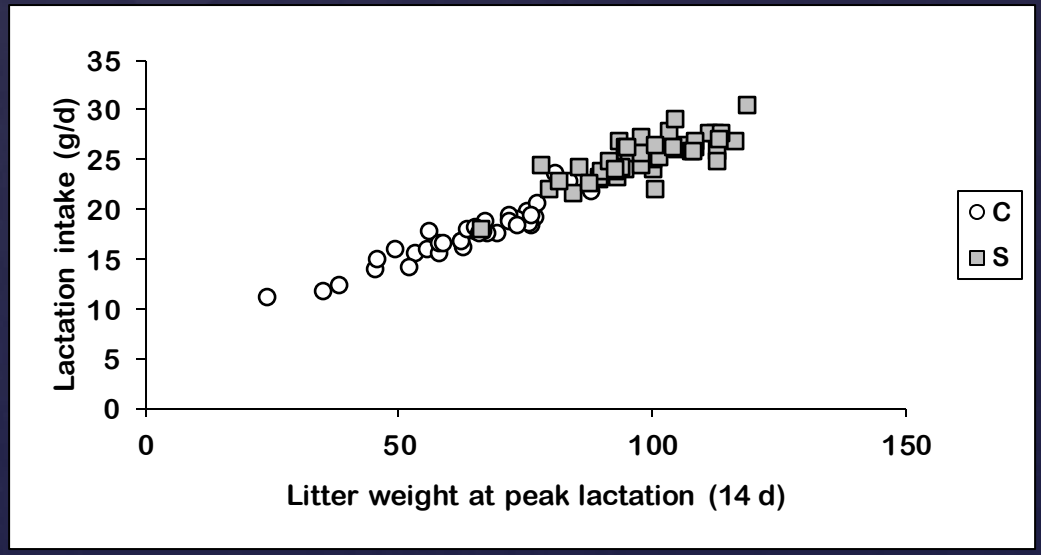
| | C | S |
|---|---|---|
| | Growth intake | |
| Mature intake | 0.63*** | 0.67*** |
| Mature body weight | 0.54*** | 0.31* |
| | Mature intake | |
| Mature body weight | 0.43** | 0.46** |

Growth and maturity = large influence of body size (maintenance requirement)

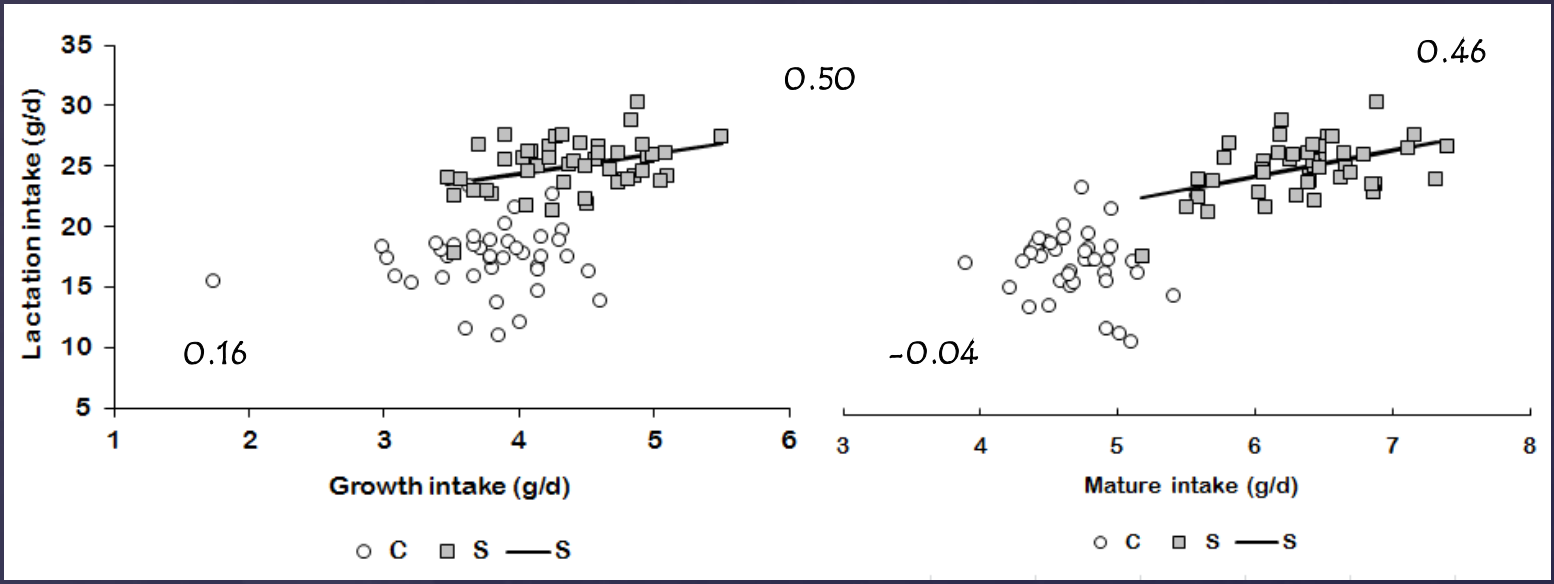
## Lactation intake:

Not influenced by size → Intake regulated by a different factor

| | C | S |
|---|---|---|
| | Lactation intake | |
| Mature body weight | –0.06 | 0.15 |
| Litter size | 0.77*** | 0.36* |
| Litter weight | 0.94*** | 0.79*** |



# Growth & Mature intake vs. Lactation intake?




Correlation between lactation intake and growth & mature intake in S, but no correlation in C-line

When can we expect a positive correlation:

→ When they eat to their capacity (or a similar proportion thereof) in each period

Control line: lactation intake related to litter weight, not growth/mature intake

→ Animals with highest growth/mature intakes not necessarily have largest litters

Selection line: lactation intake related to litter weight and growth/mature intake

→ They eat to their potential (not as much as they should, but as much as they could)

Animals with highest growth/mature intakes also supported the largest litters (weight)

Results suggest that lactating Control females eat to support a given litter size

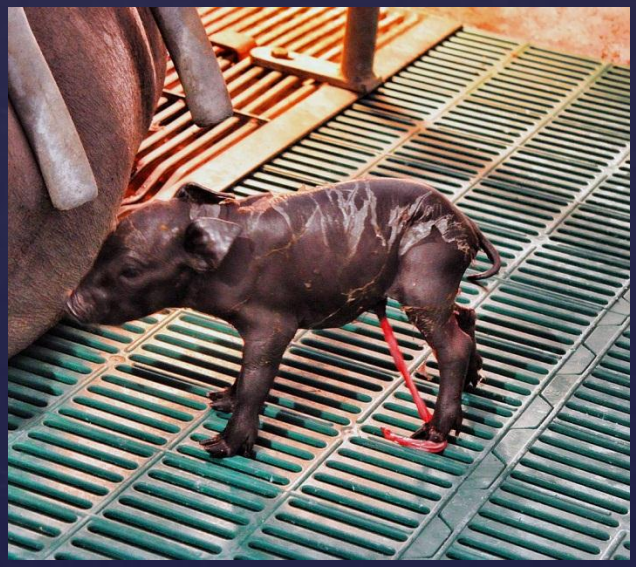
Lactating Selected females support the maximum litter weight that is allowed for by their intake capacity

Selected females have been 'genetically programmed' to eat to their potential intake capacity as a correlated effect, allowing for maximum lactation

Sows can be suggested to produce at their maximum potential

But: milk production is reasonably independent of energy intake → sows lose body weight

Possible: relationship not between growth and lactation intake, but between growth and body condition instead



Thanks
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