Causes for the rapid proliferation of the immotile short tail sperm defect within the Finnish Yorkshire population

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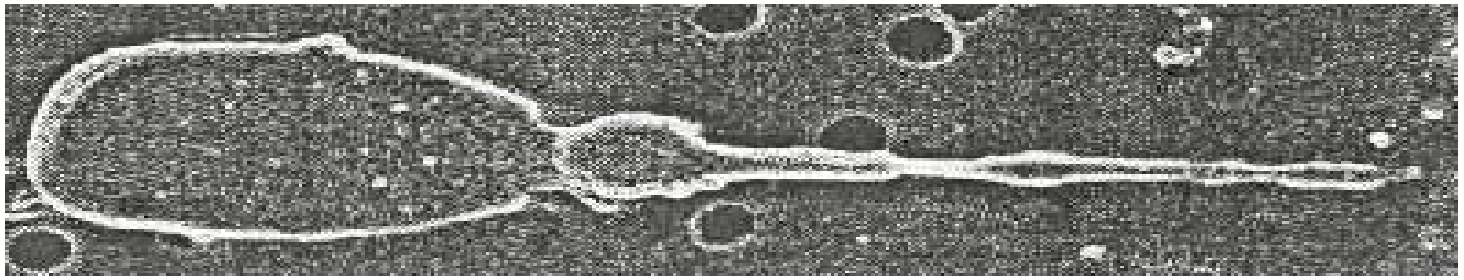
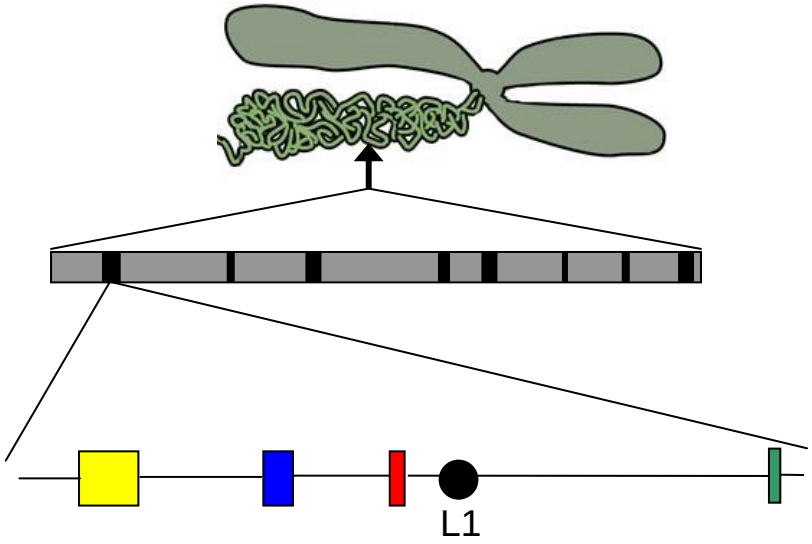
The immotile short tail sperm (ISTS) phenotype

- Immotile sperm
- Shortened sperm tail
- Oligospermia
- All sperm tail structures are severely altered
- No effect on other ciliary tissues

  → only affects sperm flagella

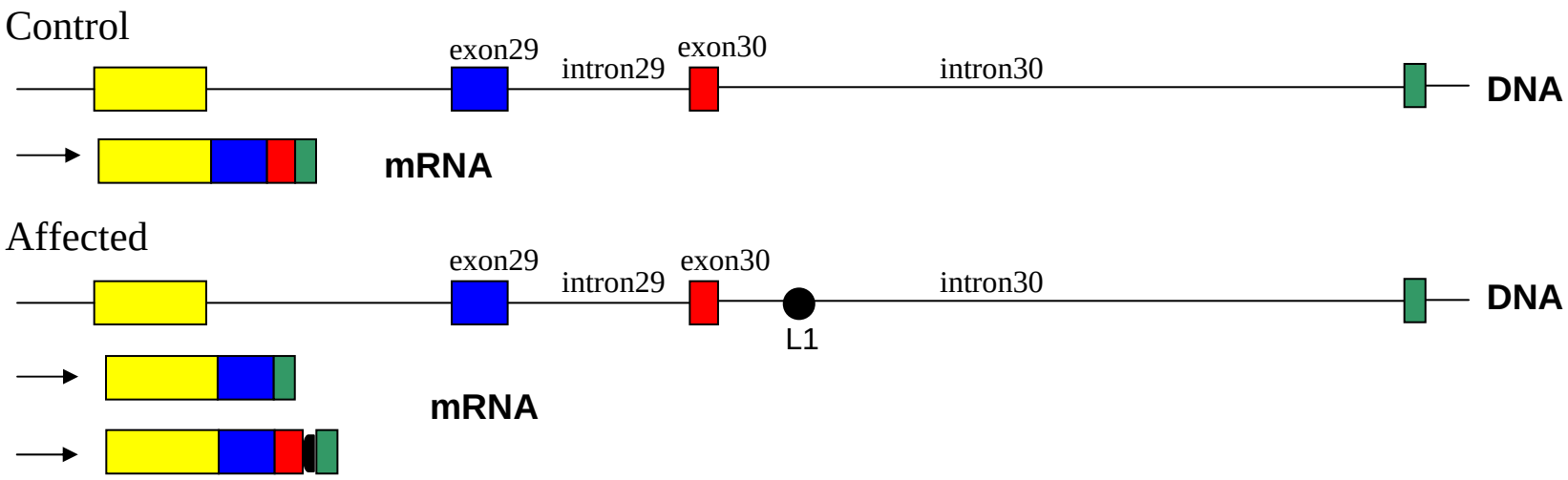


Mapping of the ISTS mutation



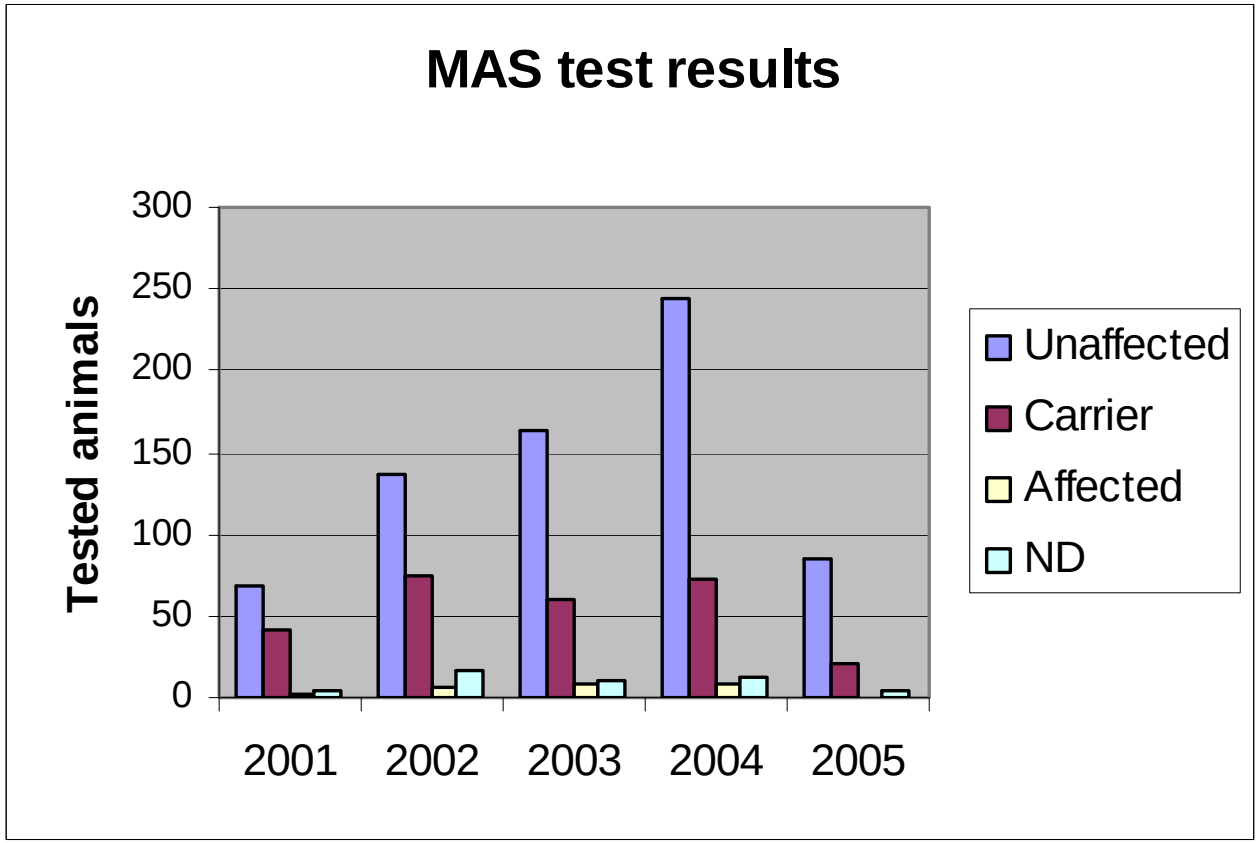
1. Porcine chr 16
2. Human chr 5,
   → 8 genes
3. KPL2 (SPEF2) gene
4. L1 insertion within intron 30

L1 affects KPL2 splicing in the testis



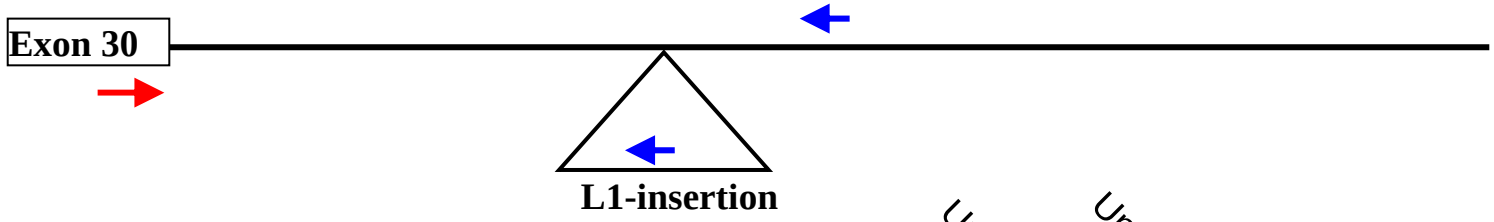
- In most affected testis specific transcripts exon 30 is skipped
- In a few cases, exon 30 is present together with part of the insertion sequence
- Translation stop codons are created in both cases

Marker assisted selection 2001-2005

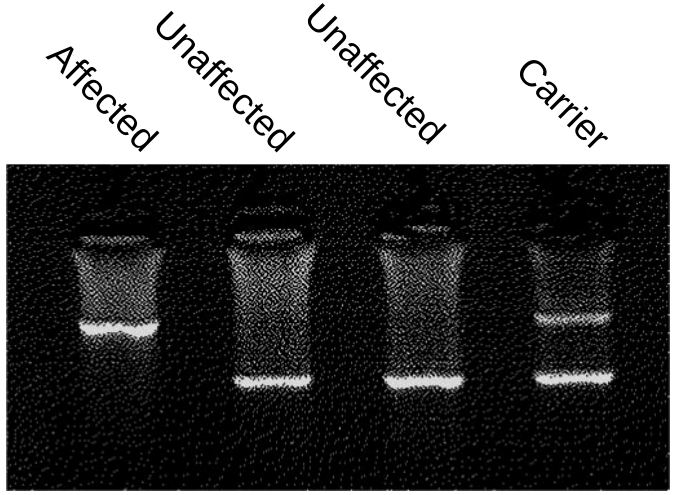


Markers: SW2411 and SW419

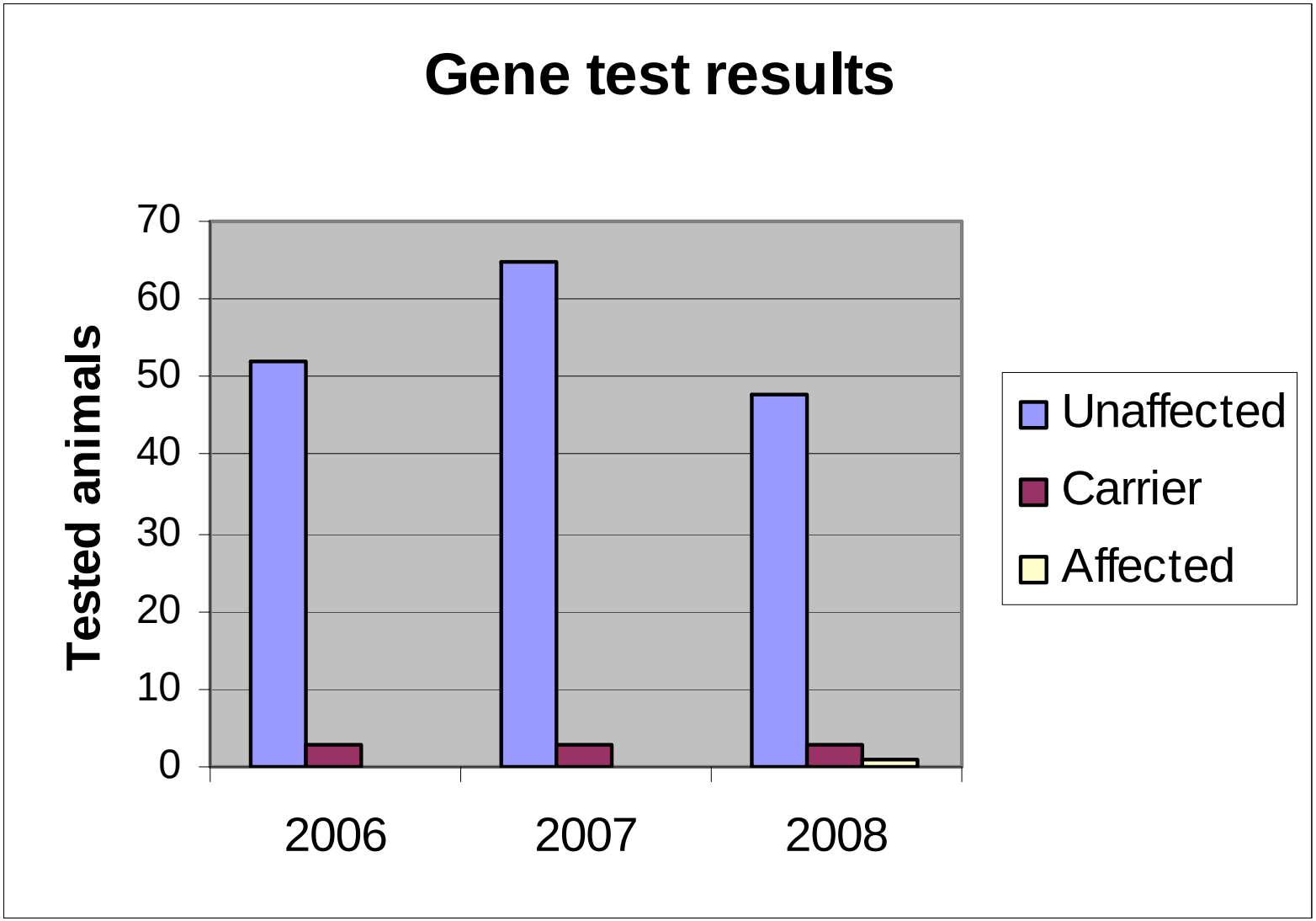
100% DNA-test



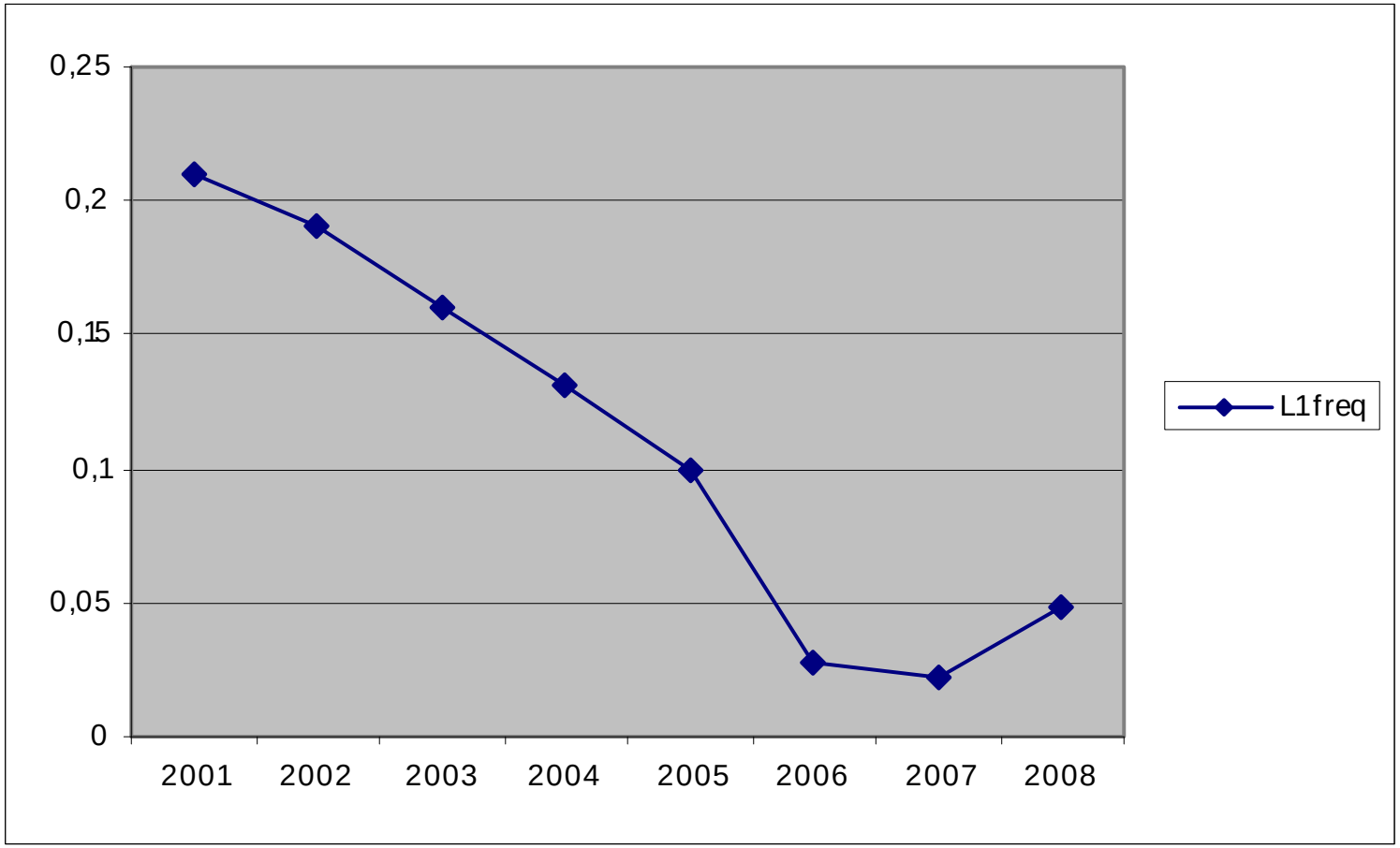
- Forward primer (→) within exon 30
- Reverse primers (←) within and beyond the insertion



Gene assisted selection 2006→



Frequency of the L1-insertion



Association of ISTS with production and reproduction traits

- 361 sows
  - GLM, fixed effect: sire (161), covariate: ISTS status
- 93 boars, 6 families
  - T-test between ISTS control vs. carriers
  - Nested effect GLM, ISTS status tested within sire families
- 421 piglets from carrier-carrier crosses
  - GLM, fixed effect: gender, tester (7), sire (41), dam (40) Covariate: ISTS status
- Marker: Line-1 insertion within KPL2

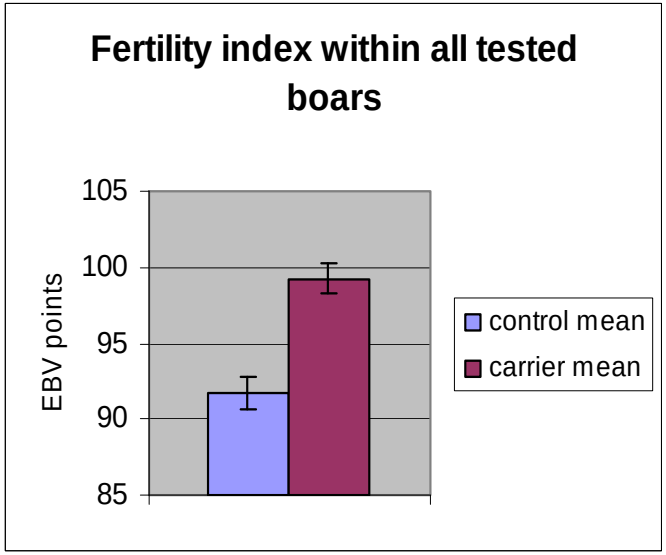
Reproduction traits

- Age at first farrowing
- First and second farrowing interval
- Total number of piglets born in first and later parities
- Number of stillborn piglets in first and later parities
- Piglet mortality between farrowing and weaning for first and subsequent parities
- Fertility-index (calculated based on all reproduction traits)

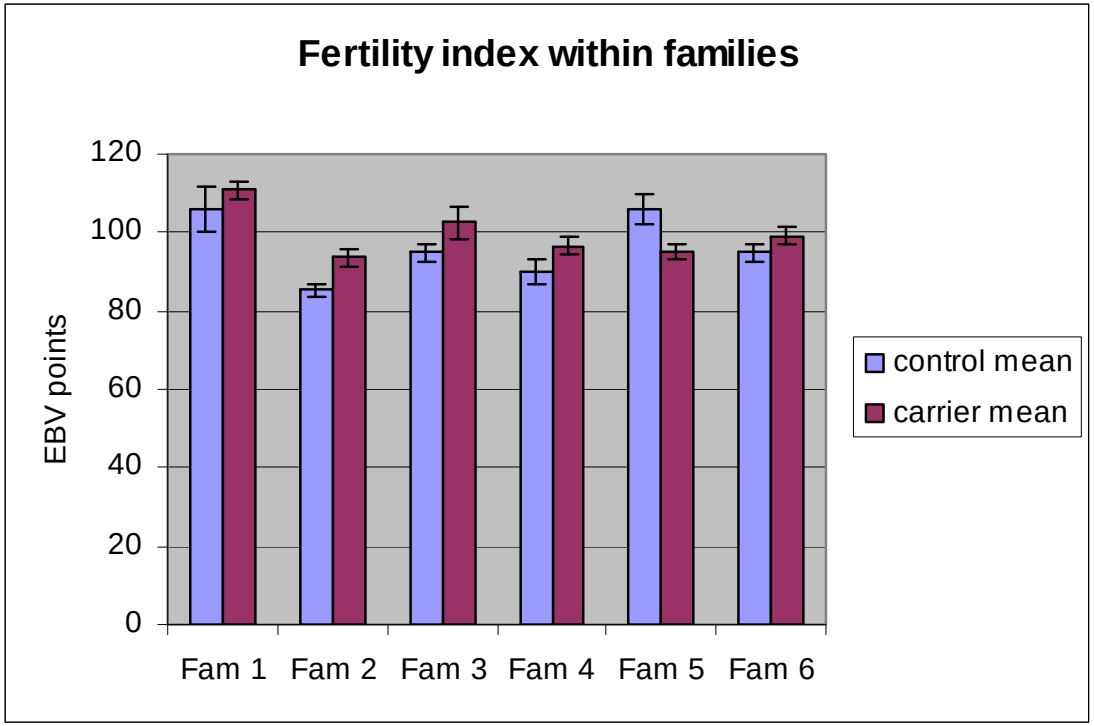
Production and product quality traits

- Feed conversion ratio feed unit/kg
- Growth 0-30 kg and 30-100 kg
- Fat %,
- Meat %,
- Meat quality (pH and Minolta colour values)

Boar data results: reproduction

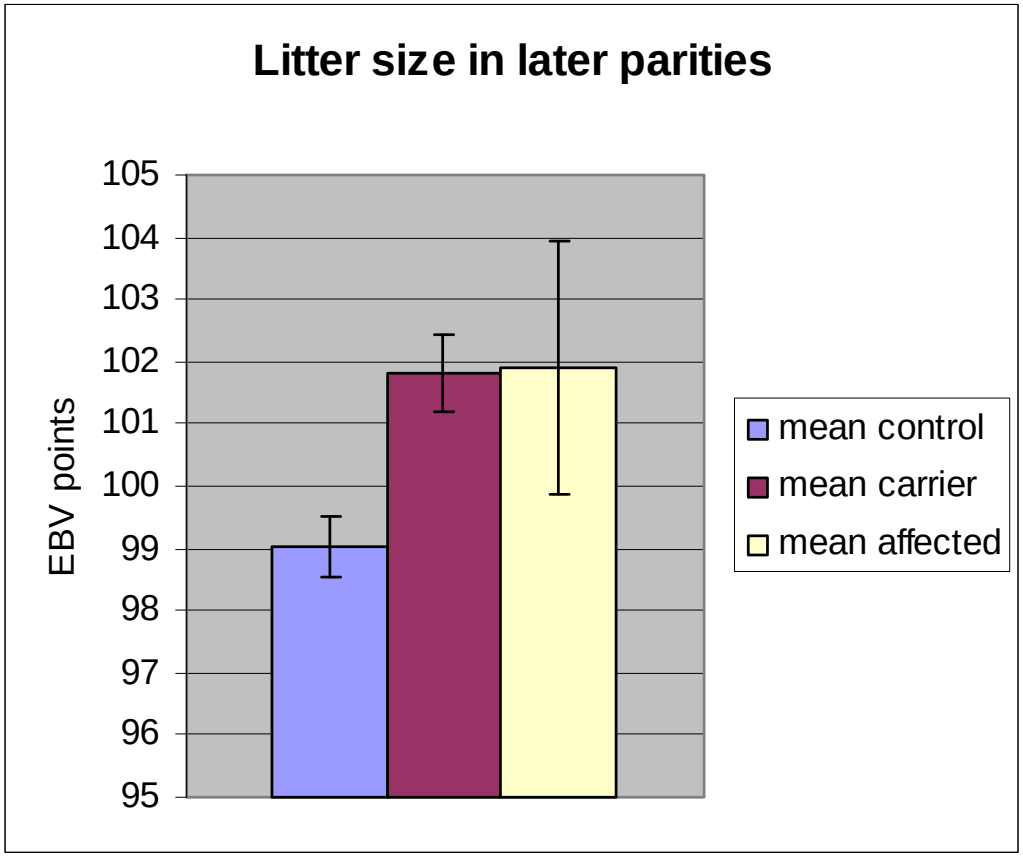


P = 0.01



P = 0.33

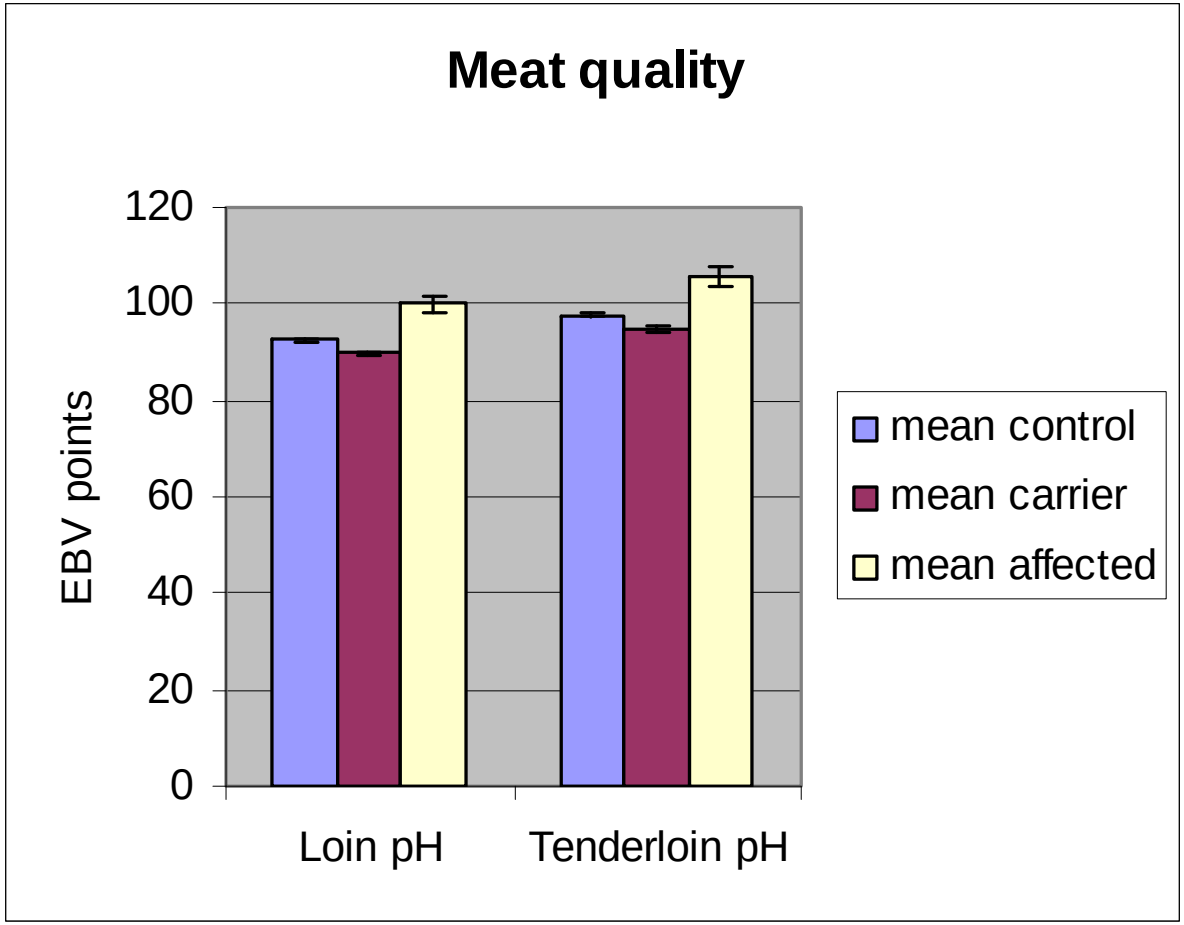
Sow data results: reproduction



P = 0.07

→ carriers produce 0.12 extra piglets in parities >1

Sow data results: production



P = 0.01 P = 0.007

Conclusions

- Marker and gene assisted selections have reduced the frequency of ISTS mutation from 0.21 (2001) to 0.05 (2008)
- L1 insertion within *KPL2* gene appears to be positively association with litter size
- L1 insertion is associated with meat quality

Thank you for your attention!

Collaborations:

Faba Breeding, Finland

Finnzymes Diagnostics, Finland

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