

**A new polymorphism in *myostatin*  
influences beef traits  
in a Blonde d'Aquitaine crossbred population**

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# Blond d'Aquitaine breed

Highly muscled cattle



[www.midatest.fr](http://www.midatest.fr)

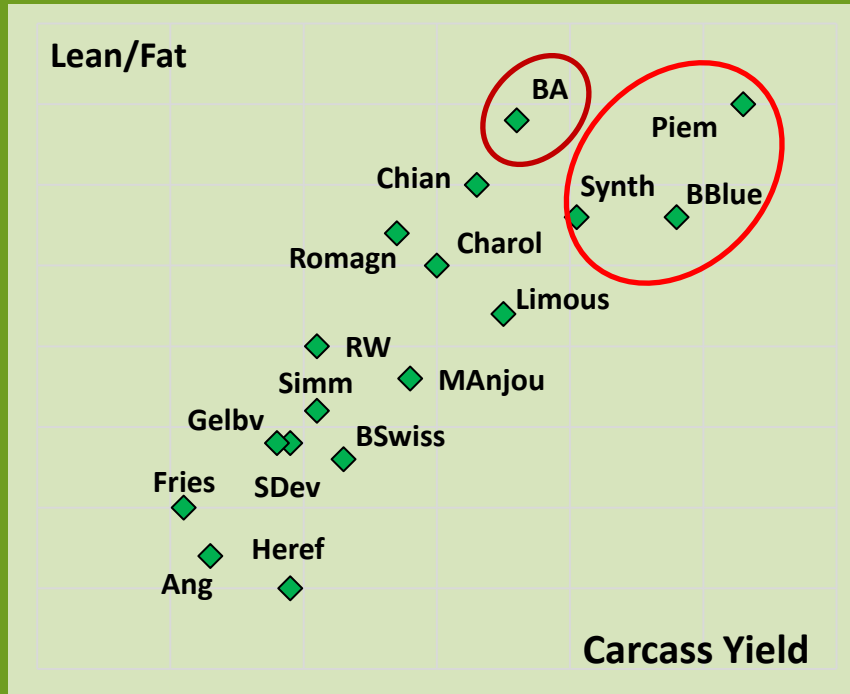
High Carcass Yield

High Lean/Fat

# Blond d'Aquitaine breed

## Sire breed effects on beef traits

Synthesis of 15 terminal cross-breeding experiments (*Renand et al., 1992*)



Is the high muscling of Blonde d'Aquitaine related to double-muscling ?

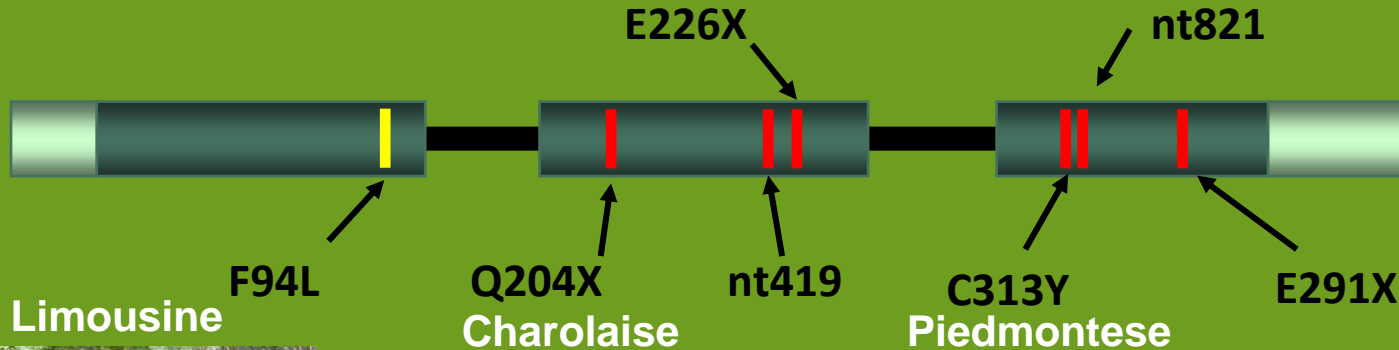
# Bovine *myostatin* gene

## Mutations in the coding-regions

- Disruptive mutations
- Missense mutation



Belgian Blue



www.limousine.org.com

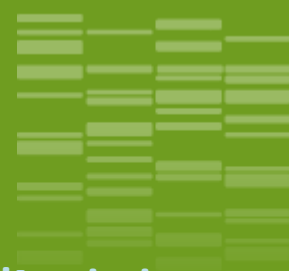


www.genesdiffusion.com

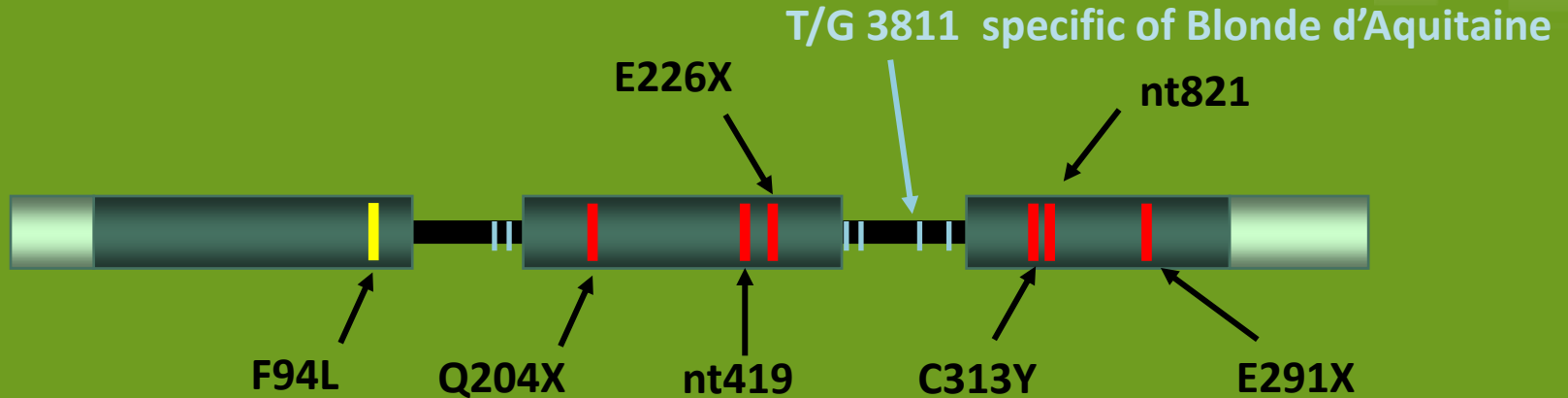


www.anaborapi.it

# Bovine *myostatin* gene



## Polymorphisms in non-coding region



# T/G 3811 polymorphism in *myostatin* intron 2

↙ aberrant cDNA: 41-bp inclusion in the Blonde d'Aquitaine transcripts

↙ premature termination codon

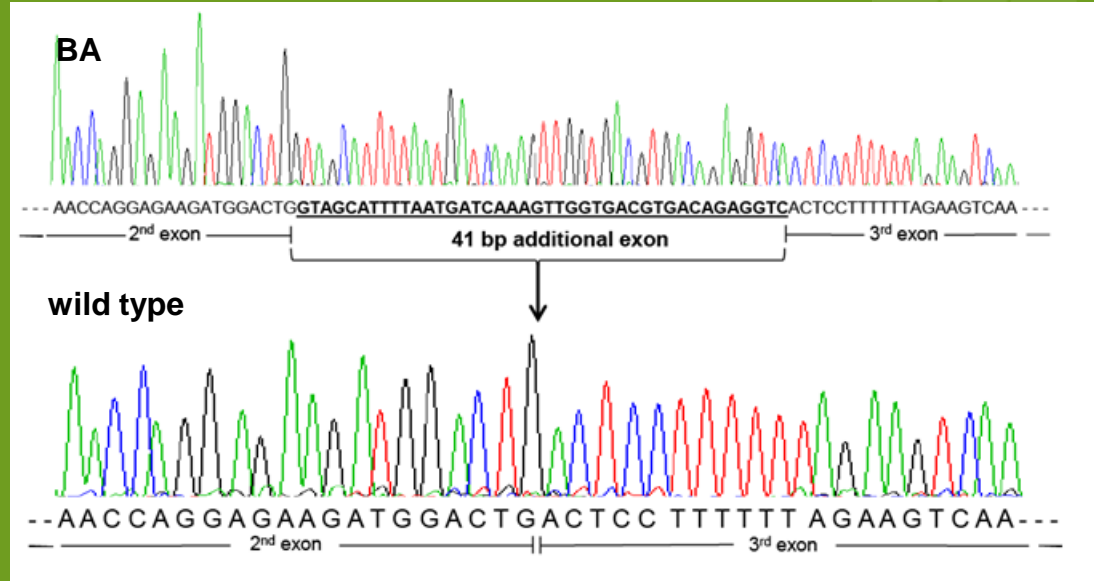
↙ truncated protein

Suspected effects

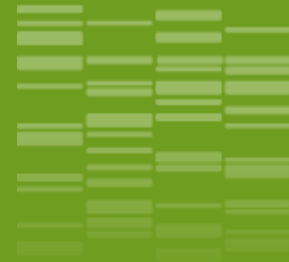
on muscle growth and beef traits



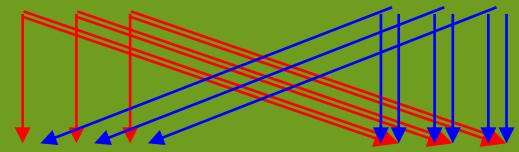
Need of experimental evidence



# The experiment design



3 BA sires      Holstein cows



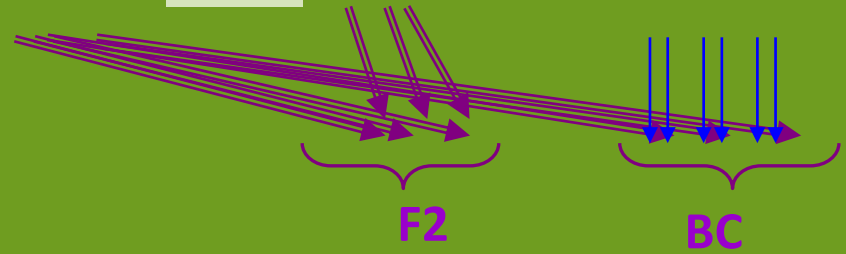
3 F1 sires

G/T

9 F1 cows

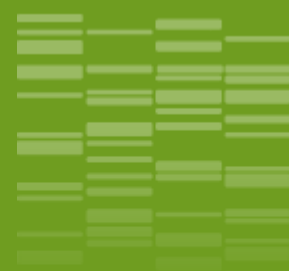


Holstein cows



| genotypes | F2  | BC  |
|-----------|-----|-----|
| G/G       | 1/4 | 0   |
| G/T       | 1/2 | 1/2 |
| T/T       | 1/4 | 1/2 |

# The experiment design

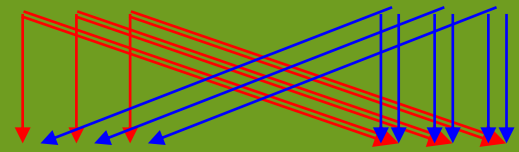


**G/G**

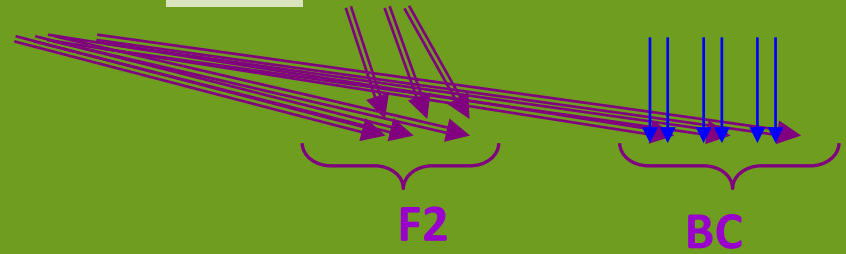


**T/T**

3 BA sires      Holstein cows



3 F1 sires      **G/T**      9 F1 cows      Holstein cows



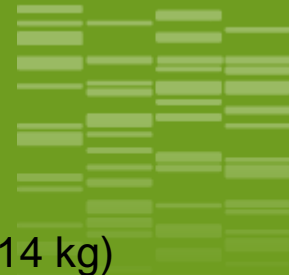
| genotypes  | F2 | BC |
|------------|----|----|
| <b>G/G</b> | 8  | 0  |
| <b>G/T</b> | 25 | 5  |
| <b>T/T</b> | 10 | 8  |

56 calves





# Animals, Traits and Statistical analysis



## Veal calves

Intensively fattened with a complete milk diet

Slaughtered at a fixed age =  $156 \pm 5$  days (average Live Weight =  $207 \pm 14$  kg)

### Live traits

Birth Weight

ADG

Muscularity score

Skin thinness score

### Carcass traits

Dressing %

Muscularity score

Fatness score

Carcass length

Bone thinness

Carcass muscle colour

### LT and TB muscle traits

Myosin HC I

Myosin HC IIa

Myosin HC IIx

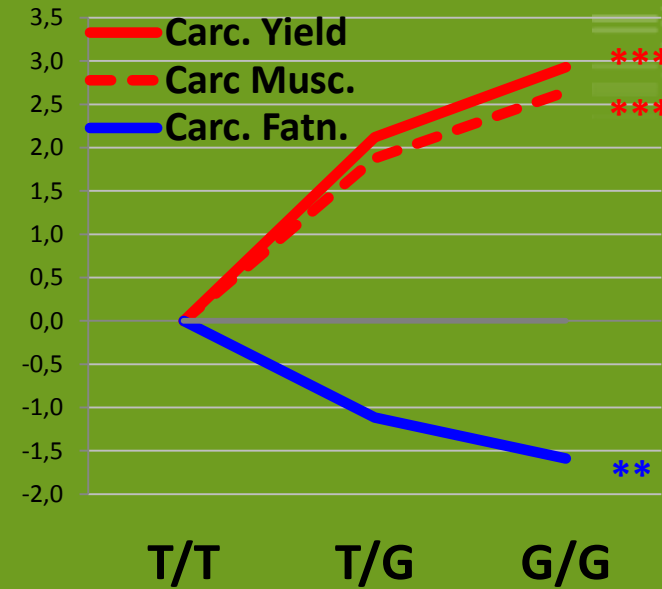
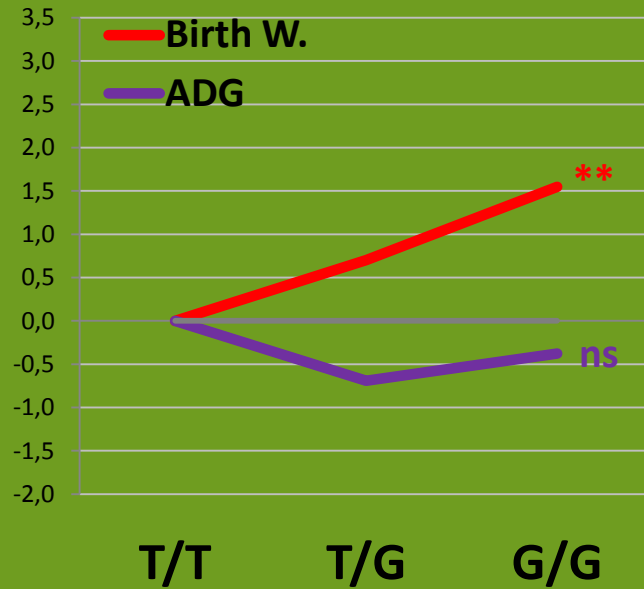
ICDH activity

LDH activity

### Model (*proc GLM*)

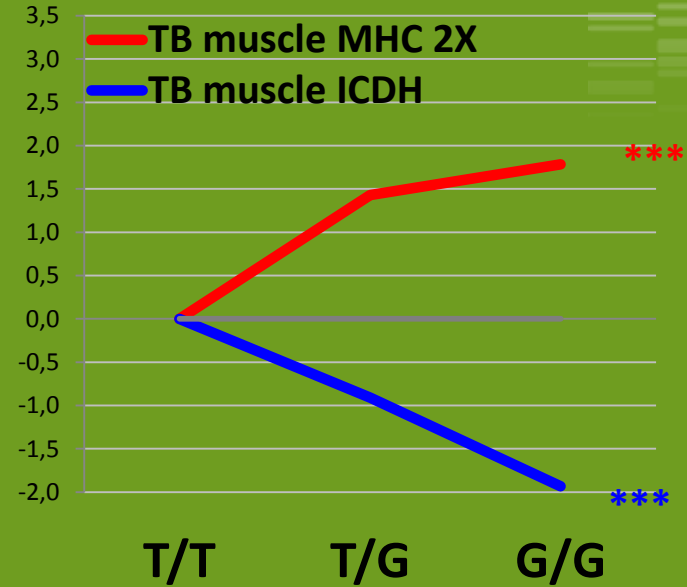
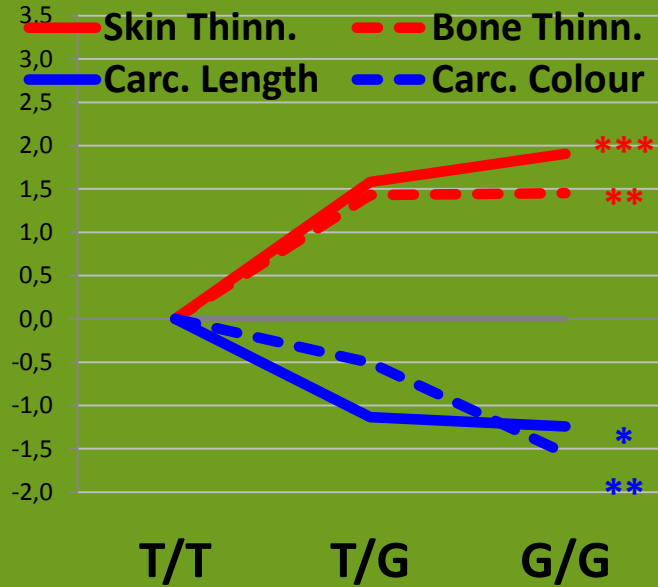
$y = \text{Sex} + \text{Crossbreeding} + \text{Sire} + \text{Genotype} + \text{error}$

# Results



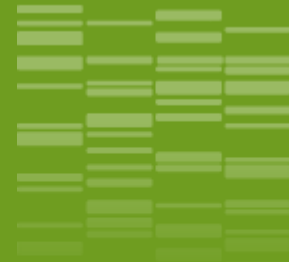
*Results are presented in deviation to the T/T genotype standardized by the phenotypic standard deviation*

# Results



*Results are presented in deviation to the T/T genotype standardized by the phenotypic standard deviation*

# Conclusion (1)



The mutation has highly significant effects on carcass traits :

- ☞ positive on dressing percentage and muscularity
- ☞ negative on carcass fatness

The mutation has no effect on the characteristics of *Longissimus thoracis* muscle

The mutation has highly significant effects on the characteristics of the *Triceps brachii* muscle:

- ☞ lower oxidative activity
- ☞ higher proportion of myosin heavy chain IIx
  - ↳ higher proportion of fast glycolytic fibers.

# Conclusion (2)

T/G 3811 polymorphism in *myostatin* intron 2 of Blonde d'Aquitaine



aberrant cDNA



premature termination codon



truncated protein



significant effect on muscle growth and carcass traits



[www.levaufermierdulauragais.fr](http://www.levaufermierdulauragais.fr)

THANK  
YOU



[www.blog.laroutedesgourmets.fr](http://www.blog.laroutedesgourmets.fr)