# Teagasc National Beef Conference

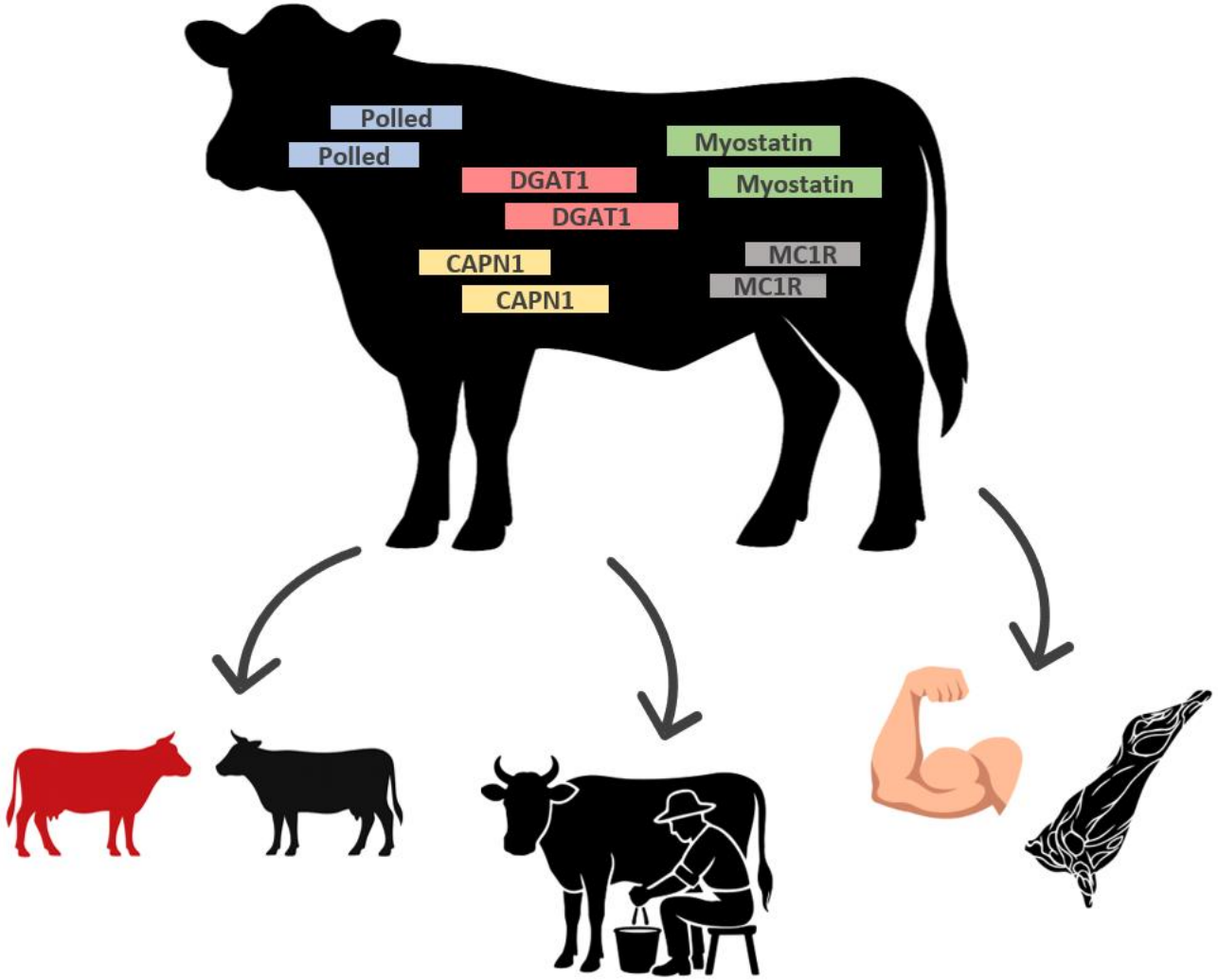
## 18th November 2025

# The myostatin gene in beef breeding: balancing muscling and calving ease

Katie Quigley

AgTech - it's in our DNA

An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine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Polled
DGAT1
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CAPN1
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Myostatin
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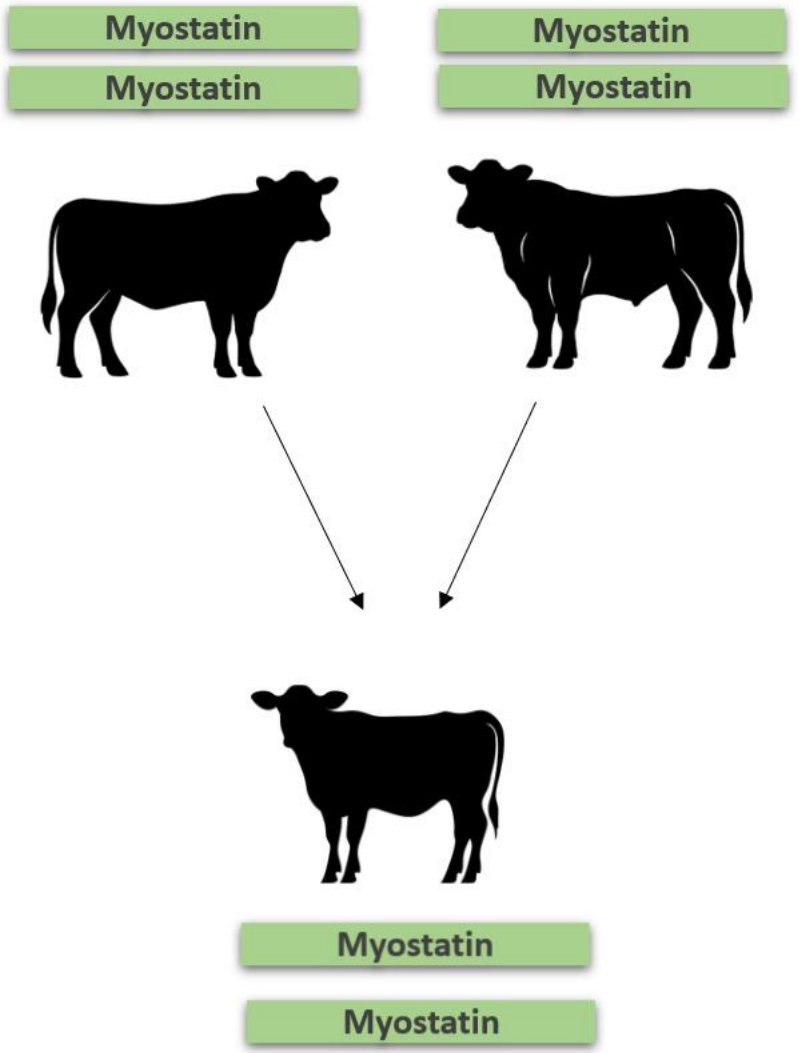

Myostatin
Myostatin
Myostatin
Myostatin
Myostatin
Myostatin

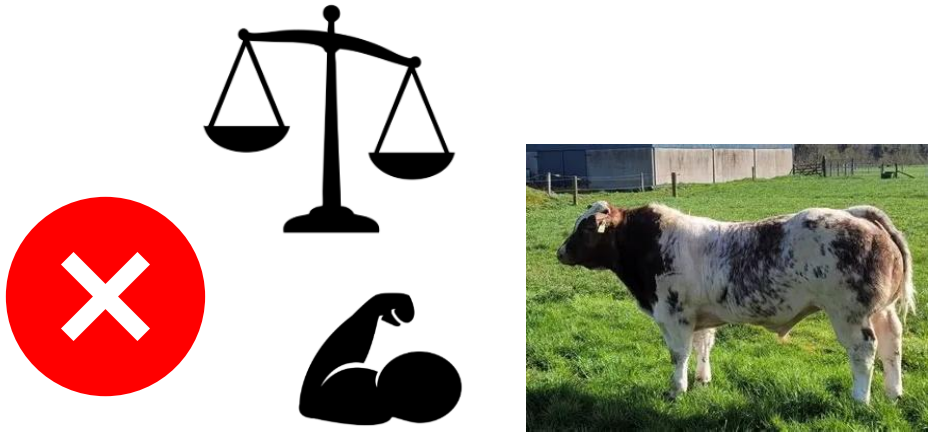
# Normal version

Myostatin Gene

**Muscle growth regulated**

# Mutated version

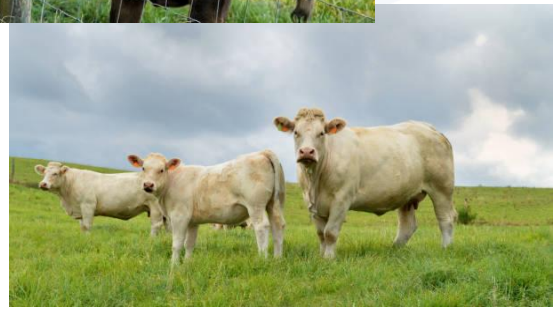
Myostatin Gene



**Muscle growth <u>not</u> regulated**

# Myostatin mutations



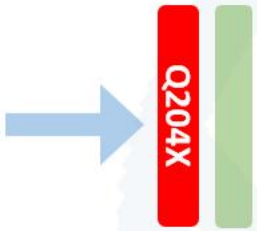




# Copies & versions…

Parent Genotype


*One copy of Q204X Myo*
*One copy of normal Myo*

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*Two copies of normal Myo*

Possible Calf Genotype


**OR**

# Copies & versions…

Parent Genotype


*One copy of Q204X Myo*
*One copy of normal Myo*

Q204X

×

F94L

*One copy of F94L Myo*
*One copy of normal Myo*

Possible Calf Genotype

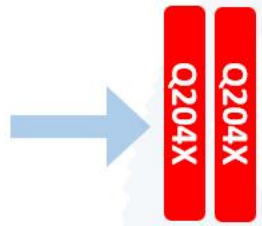
Q204X OR F94L

Q204X F94L

# Copies & versions…

Parent Genotype


*Two copies of Q204X Myo*

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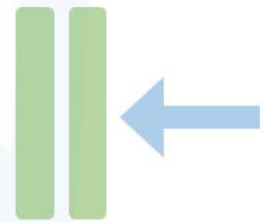


*Two copies of normal Myo*

Possible Calf Genotype

# Carcass traits




***Normal Myostatin***
***i.e. no copy of Myostatin variant***

Myostatin Gene

Myostatin Gene

***Heterozygous***
***i.e. 1 copy of a Myostatin variant***

Myostatin Gene ✕

Myostatin Gene

***Homozygous***
***i.e. 2 copies of a Myostatin variant***

Myostatin Gene ✕

Myostatin Gene ✕

**Plainer type weanling** → **More muscle mass**

# Mart prices

| Myostatin variant | Copies | Year | Count (n) | Median Age (days) | Median Price (€) | Median Weight (kg) | CBV |
|---|---|---|---|---|---|---|---|
| *nt821* | 0 | 2023 | 3393 | 243 | 900 | 320 | 379 |
| *nt821* | 1 | 2023 | 561 | 256 | 1000 | 340 | 435 |
| *nt821* | 2 | 2023 | 51 | 251 | 1270 | 320 | 483 |
| *nt821* | 0 | 2024 | 5717 | 242 | 1000 | 322 | 383 |
| *nt821* | 1 | 2024 | 907 | 255 | 1090 | 340 | 419 |
| *nt821* | 2 | 2024 | 95 | 268 | 1330 | 336 | 468 |
| *nt821* | 0 | 2025 | 5789 | 253 | 1570 | 330 | 377 |
| *nt821* | 1 | 2025 | 1086 | 261 | 1750 | 350 | 420 |
| *nt821* | 2 | 2025 | 87 | 294 | 2060 | 348 | 474 |

- On average, animals carrying one copy of **nt821** make **€92** more than those not carrying any myostatin variant.
- Animals carrying two copies of **nt821** make **€325** more than those carrying no copy of **nt821**.
- More profitable animals have a higher commercial beef value.

# Mart prices

| Myostatin variant | Copies | Year | Count (n) | Median Age (days) | Median Price (€) | Median Weight (kg) | CBV |
|---|---|---|---|---|---|---|---|
| *Q204X* | 0 | 2023 | 3393 | 243 | 900 | 320 | 379 |
| *Q204X* | 1 | 2023 | 830 | 239 | 1000 | 328 | 451 |
| *Q204X* | 2 | 2023 | 17 | 262 | 1090 | 294 | 515 |
| *Q204X* | 0 | 2024 | 5717 | 242 | 1000 | 322 | 383 |
| *Q204X* | 1 | 2024 | 1467 | 237 | 1110 | 330 | 451 |
| *Q204X* | 2 | 2024 | 31 | 260 | 1250 | 310 | 519 |
| Q204X | 0 | 2025 | 5789 | 253 | 1570 | 330 | 377 |
| Q204X | 1 | 2025 | 1445 | 247 | 1780 | 340 | 447 |
| Q204X | 2 | 2025 | 24 | 272 | 1845 | 301.5 | 507 |

- On average, animals carrying one copy of **Q204X** make **€113** more than those not carrying any myostatin variant.
- Animals carrying two copies of **Q204X** make **€246** more than those carrying no copy of **Q204X**.
- More profitable animals have a higher commercial beef value.

# Mart prices

| Myostatin variant | Copies | Year | Count (n) | Median Age (days) | Median Price (€) | Median Weight (kg) | CBV |
|---|---|---|---|---|---|---|---|
| *F94L* | 0 | 2023 | 3393 | 243 | 900 | 320 | 379 |
| *F94L* | 1 | 2023 | 3706 | 248 | 920 | 318 | 409 |
| *F94L* | 2 | 2023 | 1225 | 249 | 980 | 310 | 441 |
| *F94L* | 0 | 2024 | 5717 | 242 | 1000 | 322 | 383 |
| *F94L* | 1 | 2024 | 6555 | 241 | 1010 | 318 | 409 |
| *F94L* | 2 | 2024 | 2307 | 242 | 1080 | 310 | 445 |
| *F94L* | 0 | 2025 | 5789 | 253 | 1570 | 330 | 377 |
| *F94L* | 1 | 2025 | 7217 | 254 | 1630 | 328 | 410 |
| *F94L* | 2 | 2025 | 2799 | 257 | 1750 | 325 | 444 |

- On average, animals carrying one copy of **F94L** make **€20** more than those not carrying any myostatin variant.
- Animals carrying two copies of **F94L** make **€85** more than those carrying no copy of **F94L**.
- More profitable animals have a higher commercial beef value.

# Calving traits

- Females carrying Myostatin mutations (i.e. DM females) have a **reduced** pelvic opening area.
- Giving birth to bigger calves
- Higher incidences of dystocia and perinatal mortality in these cattle

**Myostatin status of dam**
What mutation?
How many copies?

**Myostatin status of calf**
What mutation?
How many copies?

# Calving traits



*Impact of nt821 on calving difficulty - Herd of 25 cows*

| Calving Score | Cows: +/+<br>Bull: +/+ | Cows: +/+<br>Bull: nt821/+ | Cows: +/+<br>Bull: nt821/nt821 | Cows: nt821/+<br>Bull: nt821/+ |
|---|---|---|---|---|
| 1 | 23 | 21 | 19 | 14 |
| 2 | 2 | 3 | 5 | 9 |
| 3 or 4 | 0 | 1 | 1 | 2 |
| **Possible Myostatin genotype of calf** | 100% +/+ | 25% nt821/+<br>75% +/+ | 100% nt821/+ | 25% +/+<br>50% nt821/+<br>**25% nt821/nt821** |

# Not all bulls are the same..

*AI sires >=90% reliable on beef cow calving difficulty*

| No. Bulls | Myostatin status | Calving difficulty % (beef cow) | | | Carcass weight (kgs) | | |
|---|---|---|---|---|---|---|---|
| | | Median | Min | Max | Median | Min | Max |
| 14 | F94L 2 copies | 4.6 | 2.1 | 9.7 | 29.3 | 14.2 | 37.4 |
| 13 | nt821 2 copies | 10.0 | 5.2 | 15.8 | 34.5 | 19.6 | 44.8 |
| 5 | Q204X 1 copy | 6.2 | 4.8 | 11.5 | 40.1 | 30.5 | 46.2 |
| 4 | Q204X, F94L 1 copy each | 7.7 | 4.1 | 11.1 | 33.1 | 23.1 | 44.8 |
| 2 | F94L 1 copy | 6.8 | 6.0 | 7.7 | 43.8 | 43.5 | 44.0 |
| 12 | 0 copies | 3.2 | 1.7 | 5.8 | 10.8 | 6.0 | 41.0 |

**Significant variation in calving difficulty % for bulls with the same Myostatin status**

**Never look at Myostatin status in isolation**

# Myostatin status

Charolais

## CORBAUN RORY

Code: CH8334

DOB: 12/06/2020 **Ped Status:** PED

**Myostatin:** Q204X/+ (1 Copy), Profit gene: F94L/+ (1 Copy)


Bred by: Liam Keogh, Dring, Co. Longford

Progressive Ataxia: Non-Carrier

## GRANGWOOD ROYAL OAK ET

Code: CH8262

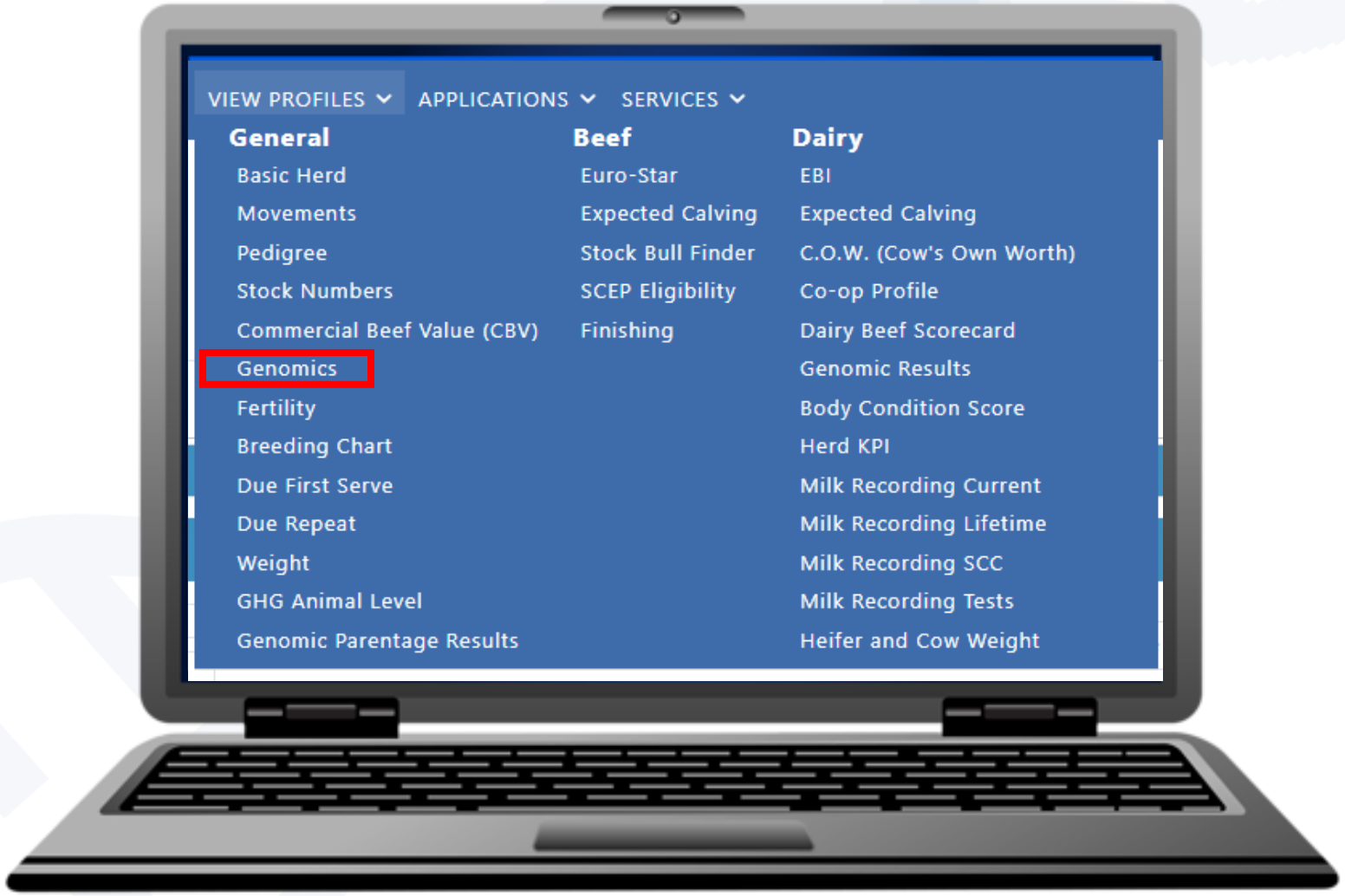
DOB: 22/10/2020 **Ped Status:** PED

**Myostatin:** Q204X/+ (1 Copy)

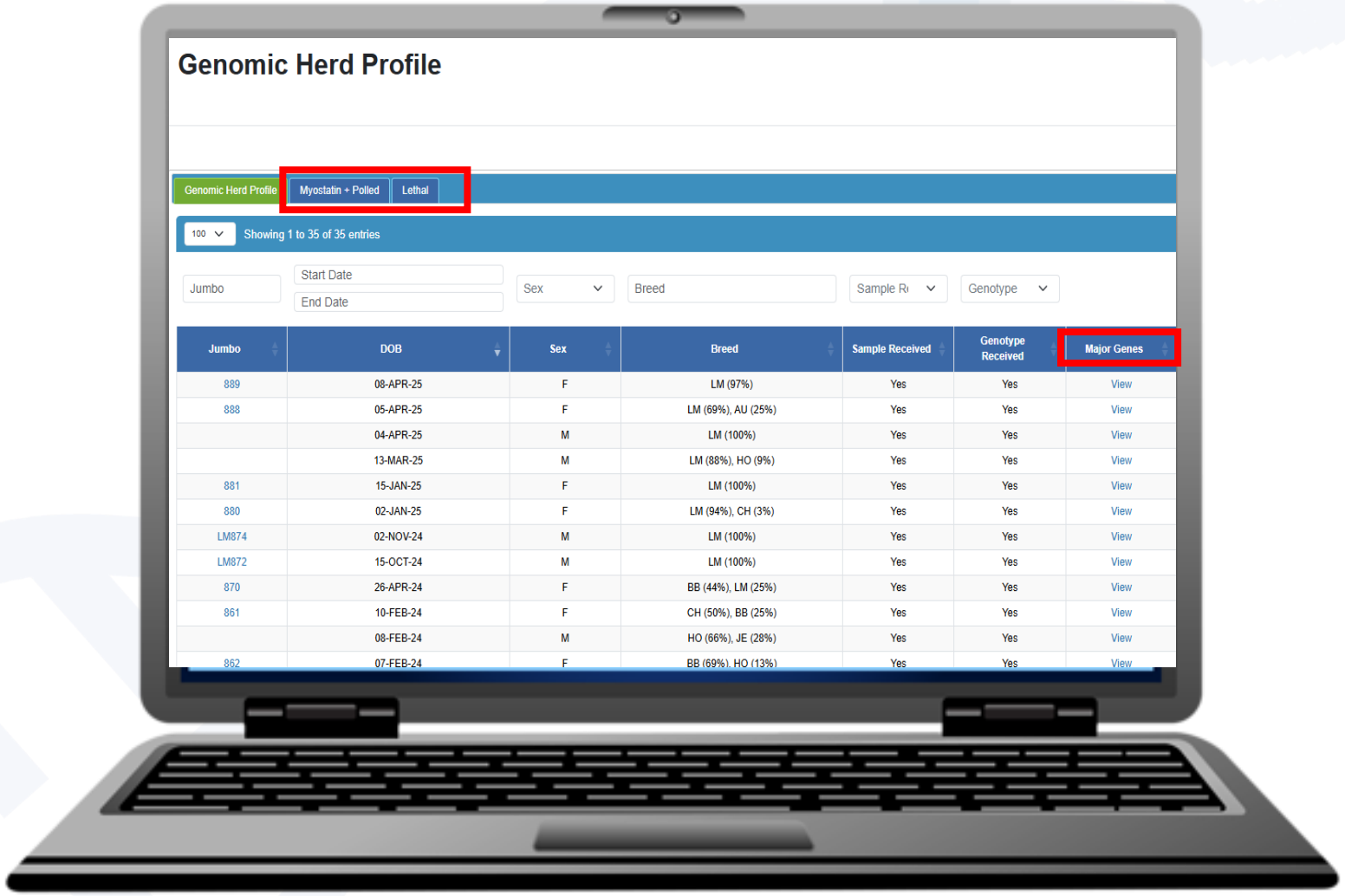

Bred by: Jeremiah O'Keeffe, Co. Limerick.

Progressive Ataxia: Non-Carrier

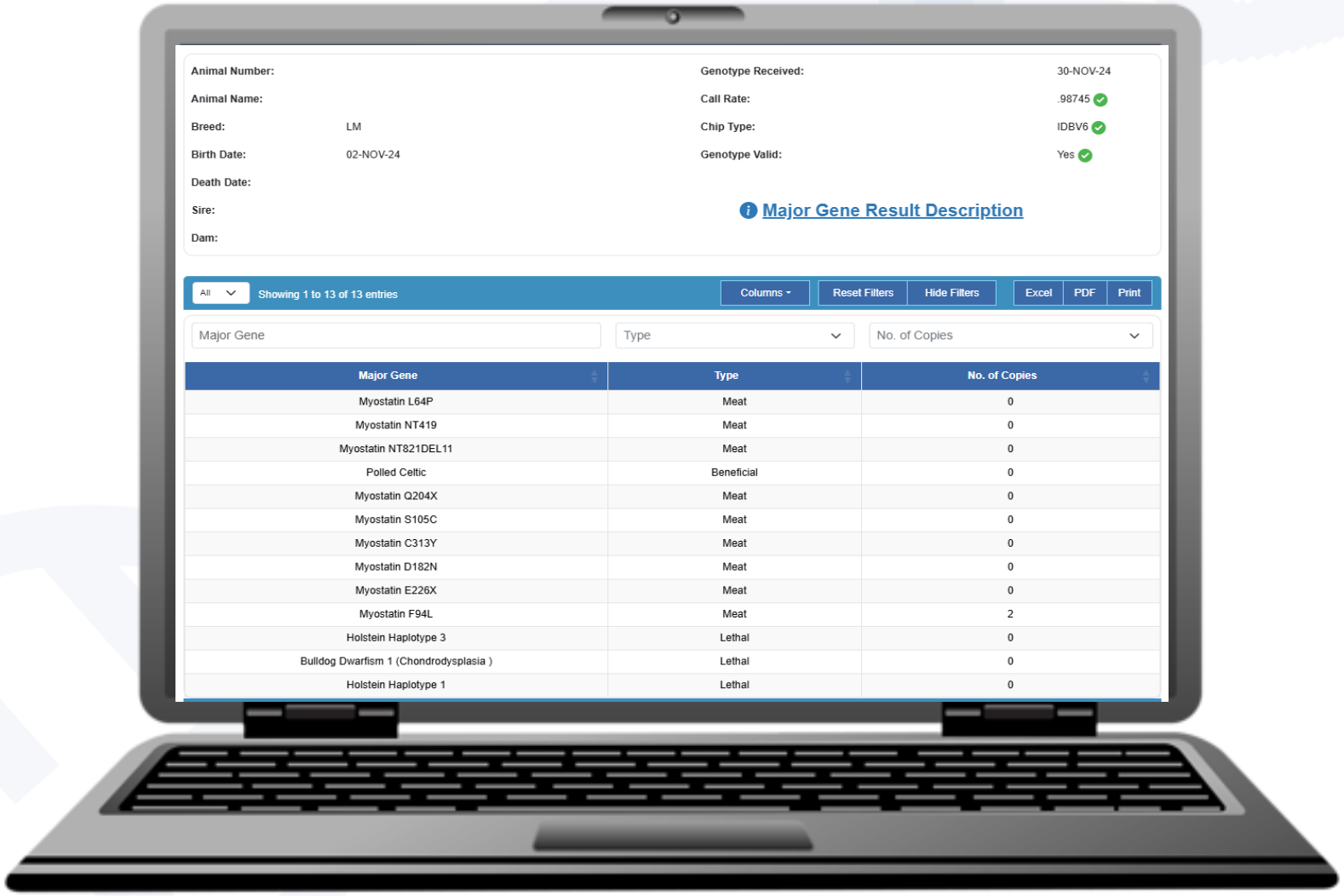
# Myostatin status



# Myostatin status

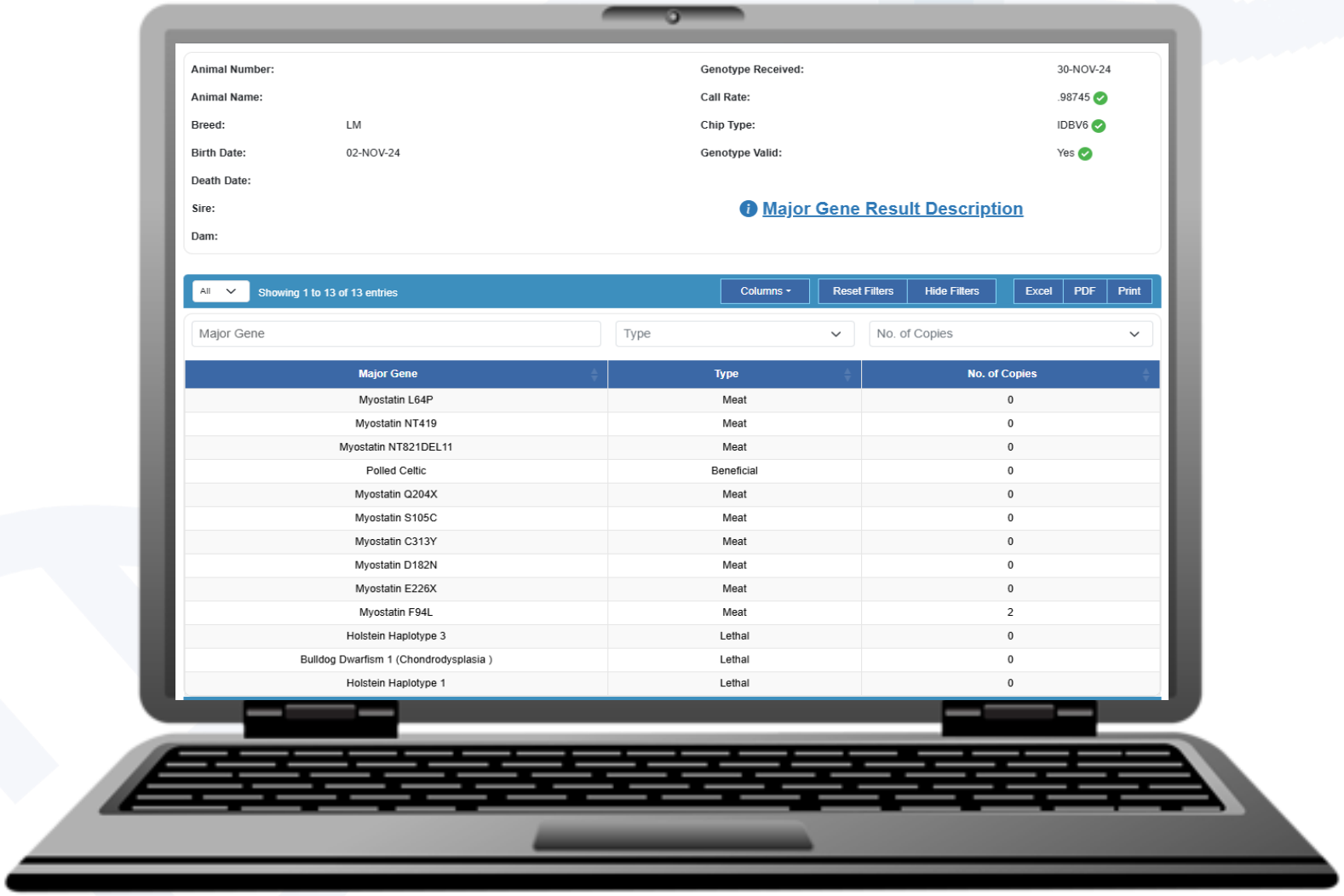


# Myostatin status




| Major Gene | Type | No. of Copies |
|---|---|---|
| Myostatin L64P | Meat | 0 |
| Myostatin NT419 | Meat | 0 |
| Myostatin NT821DEL11 | Meat | 0 |
| Polled Celtic | Beneficial | 0 |
| Myostatin Q204X | Meat | 0 |
| Myostatin S105C | Meat | 0 |
| Myostatin C313Y | Meat | 0 |
| Myostatin D182N | Meat | 0 |
| Myostatin E226X | Meat | 0 |
| Myostatin F94L | Meat | 2 |
| Holstein Haplotype 3 | Lethal | 0 |
| Bulldog Dwarfism 1 (Chondrodysplasia ) | Lethal | 0 |
| Holstein Haplotype 1 | Lethal | 0 |

# Myostatin status




| Major Gene | Type | No. of Copies |
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| Myostatin NT821DEL11 | Meat | 0 |
| Polled Celtic | Beneficial | 0 |
| Myostatin Q204X | Meat | 0 |
| Myostatin S105C | Meat | 0 |
| Myostatin C313Y | Meat | 0 |
| Myostatin D182N | Meat | 0 |
| Myostatin E226X | Meat | 0 |
| Myostatin F94L | Meat | 2 |
| Holstein Haplotype 3 | Lethal | 0 |
| Bulldog Dwarfism 1 (Chondrodysplasia ) | Lethal | 0 |
| Holstein Haplotype 1 | Lethal | 0 |

**Lot 1**

**Breed:** Limousin
**DOB:** 04-Jan-2024

GENOMIC EVALUATION

Evaluation Date: Sep 2025 Next Evaluation Date: 25-Nov-2025

| Within Breed | Economic Indexes | €uro Value | Reliability | Across Breed |
|---|---|---|---|---|
| ★★ | Replacement | €82 | 50% | ★★ |
| ★★★ | Terminal | €127 | 50% | ★★★★ |
| ★ | Dairy Beef | €76 | 49% | ★★ |
| ★★★★ | *Beef Sub-Index* | *€183* | *46%* | ★★★★★ |

| When Mated With: | Value | Rel | When Mated With: | Value | Rel |
|---|---|---|---|---|---|
| Beef heifers Breed avg: 7.84% | +11% | 58% | Risk (High) Dairy heifers Breed avg: 12.46% | +16.4% | 40% |
| Beef cows Breed avg: 3.71% | +5.3% | 67% | Dairy cows Breed avg: 4.93% | +6.6% | 50% |

| Within Breed | Key Replacement Profit Traits | Value | Reliability | Across Breed |
|---|---|---|---|---|
| ★ | Gestation Length Breed avg: 3.62,All breeds avg: 2.44 | +4.9 Days | 60% | ★ |
| ★★★★ | Docility (1-5 scale) Breed avg: -0.04,All breeds avg: 0.02 | -0.03 scale | 47% | ★★ |
| ★★★ | Age at Finish (days) Breed avg: 1.22,All breeds avg: -1.53 | +1.56 Days | 66% | ★ |
| ★★★★ | Carcass weight (kg) Breed avg: 24.18kg,All breeds avg: 18.53kg | +25.5kg | 47% | ★★★★★ |
| ★★★★★ | Carcass conformation (1-15 scale) Breed avg: 2.22,All breeds avg: 1.51 | +2.41 scale | 45% | ★★★★★ |
| | **Expected Daughter Breeding Performance** | | | |
| | Daughter Calving Ability (diff 3 & 4%) Breed avg: 4.52%,All breeds avg: 4.98% | +4.3% | 63% | |
| ★★ | Daughter Milk (kg) Breed avg: -0.01kg,All breeds avg: 2.49kg | -1.7kg | 45% | ★ |
| ★★ | Daughter calving interval - Fertility Breed avg: 1.47days,All breeds avg: -0.73days | +2.11 days | 39% | ★ |

Additional Information:
Myostatin Non Carrier: (C313Y, D182N, E226X, L64P, NT419, NT821, S105C). Myostatin Single Carrier: (F94L, Q204X). HH1F HH3F (Non Carrier Polled-Celtic).

| Linear composites | Value | Reliability |
|---|---|---|
| Muscle | | |
| Skeletal | | |
| Function | | |

**Zootechnical certificate, in accordance with Regulation (EU) 2016/1012, for trade in purebred breeding animals of the following species: (a) Bovine species (Bos taurus, Bos indicus, Bubalus bubalis)**

1. Name of issuing breed society/competent authority: **THE IRISH ABERDEEN ANGUS ASSOC.**
**THE LOFT,UNIT 16/17, N17 BUSINESS PARK, GALWAY RD, TUAM, CO GALWAY**
**Tel: 071 9632099**

Certificate No: **N/A**

2. Name of breeding book: [redacted]

3. Name of breed of purebred breeding animal: **Angus**

4. Class within the main section of the breeding book where animal is entered: **CLASS 1 - Pedigree**

5. Sex of animal: **Male** **100% Angus**

6. Breeding book number of animal [redacted]

7. Identification of purebred breeding animal

7.1. System: **Eartag**

7.2. Individual identification number: **3722** [redacted]

7.3. Animal health identification number: **AANIRL** [redacted]

7.4. Animal name [redacted]

8. Identity verification:

8.1. Method: **SNP**

8.2. Result: **Sire and Dam verified G3062142**

All EU official languages of the zootechnical certificates, including footnotes and notes, are available in EUR-Lex

**GENOTYPED**

9. Date and country of birth of animal: **25.01.2020 IRL**

10. Name, address and email address of breeder:

11. Name, address and email address of owner: [redacted]

12. The pedigree of the purebred breeding animal:

13. Additional information

13.1. Results of performance testing:
**http://www.cattle.ie/app/bull-search/view** [redacted]

13.2. Up-to-date results of the genetic evaluation carried out last on: **24.05.2022**

13.3 Genetic defects and genetic peculiarities of the animal in relation to the breeding programme
**Myostatin Non Carrier: C313Y, D182N, E226X, E291X, F94L, NT419, NT821, Q204X, S105C.**

13.4 Other relevant information on purebred breeding animal
**N/A**

13.5. Other relevant information, including results of performance testing or genetic evaluation, on parents and grandparents, if not indicated in point 12
**http://www.cattle.ie/app/bull-s** [redacted]

14. Insemination/mating

14.1. Date: **N/A**

14.2. Identification of the fertilising male(s)

14.2.1. Breeding book number(s) and section(s): **N/A**

14.2.2. Individual identification number(s): **N/A**

14.2.3. Animal health Identification number(s): **N/A**

14.2.4. Name(s): **N/A**

14.2.5. System(s) of identity verification and result(s): **N/A**

15. Validation

15.2. On: **27.07.2022**

# Summary

- ✓ Every animal has **two** copies of the Myostatin gene
- ✓ Most common Myostatin variants are **F94L**, **Q204X** and **nt821**.
- ✓ **F94L**, **nt821** and **Q204X** are associated with improved carcass merit
- ✓ **Nt821** and **Q204X** are associated with impacts on calving difficulty
- ✓ **Useful piece of information** but **not** the full picture.
- ✓ Know the **myostatin status** of the **dam**, the **sire** and know what you, the breeder wants to achieve.