Galloway Cattle Society of New Zealand (Inc.)

Galloway Gazette

Issue No. 3 2017

Christmas Is Just Around

The Corner Folks

Welcome to the Galloway Gazette - Issue 3, 2017

Editors Note: CHRISTMAS IS JUST AROUND THE CORNER!!!! Yikes, this year has been travelling at such a speed it is hard to say what has been gained or achieved. The Winter proved once again that it can be wet, wet and wetter still, with a little bit of ice for us North Islanders and icy cold with snow and lots of road disruptions for the South Islanders, and, true to form, we have all come through it looking forward to Summer and discussing our new plans for family, farm and business.

Earlier in the year the Galloway Gazette advised members of the passing of the late John Cleland. John bred Standard Galloways (Herd Name: Pekanui) and he was one of the first people in New Zealand to breed White Galloways (Herd Name: Ngutunui). You will find in this Gazette an article outlining John's time with the Galloway Society. For those of you who have White Galloway cattle, have a look at their pedigrees. You will more than likely find the herd name of Pekanui or Ngutunui in the ancestry.

In our last Gazette we placed an article in regards to the **DNA testing and inspections**. **We had hoped to receive some feedback, but as yet the mailbox is still empty.**

We are looking for :

1) numbers in favour of,

2) those sitting on the fence and

3) those who are against, and or

We would also like to hear about anything you may think is relevant to this topic.

The council is due for their next meeting at the beginning of November and would like to have some feedback on this subject. **A decision on DNA Testing is to be made by Council, early next year. This is not too far away people, so silence is not an option.**

The more information you can give us the easier it is for Council to make the decision. **So get on your computer and send in a yes, no or neutral for DNA testing, we don't need names to give to Council we just need a yes, or no, or neutral.**

Please also check out our "Stock For Sale" pages.
There is certainly plenty of variety. We personally find it handy to troll the on-line herd book to see if there is stock with different blood lines. An email to the owner usually inherits a response. Try it, you may be surprised.

The email address to communicate with us, is as follows:
gallowaygazette@xtra.co.nz

The postal address is as follows: Galloway Gazette
120 Rawerawe Road East
Ngatea 3597.

Cover Photo: Taken from the 2017 Calendar that has been for sale, this photo brings it home that Christmas is just around the corner.

IN THIS ISSUE

I wouldn't Want to Be Under this Cow

Disclaimer—*"All information in this newsletter is to the best of the author's knowledge true and accurate. No liability is assumed by the authors or publishers for any losses suffered by any person relying directly or indirectly upon the information in this publication."*

A Message from our President

Hello everyone,

Well it seems just like the other day I was sat writing my last report, I couldn't believe it when I saw the email come through from Barbara and Kate, our Gazette co-editors, requesting my next report!!! Good job there is someone out there pushing me along.

The last few months have seen winter pass through, and of course some years the winter months can be cold but lovely and calm if we get those big high pressures settling over the Country. However, this year we have had more than our fair share of rain, rain and more rain, I have not seen paddocks as wet and muddy. We have had new streams running across the paddocks, the quad bike and trailer going sideways and gumboots given the ultimate work out. Feeding out has not been much fun either, the girls have been very glum, just looking for somewhere firm under foot to stand or sit down and a bit of shelter. Long may spring be drier…….but not too dry!

For those of you who have dairy farms or also calve over the recent months I hope all has gone well and your new borns are growing quickly and healthy.

Interestingly the Council was recently contacted by PBB regarding ABRI in Australia. ABRI have written a discussion paper regarding the responsibilities of breed societies for the management of herdbooks in relation to pedigree information and genomics. It advised that with advances in genomic testing this was creating opportunities for closer or different analysis of animal genetics than in the past. This genomic testing could lead to the discovery of animals registered in herdbooks as not qualifying to be registered in a particular class or not qualifying at all to be registered in the herdbook. They feel the custodians of herdbooks breed societies have particular legal responsibilities relating to the integrity of their breed's herdbook. Their brief discussion paper raised some of the issues and legal responsibilities breed societies have concerning the management of their herdbooks against the backdrop of the advances in genomic testing technology.

Council believes that our Herdbook, Rules and Bylaws are in good order with what was laid out in the ABRI discussion paper. However, we will discuss this topic at our next Council meeting and keep Members informed of any outcomes or recommendations that ABRI may make.

On the subject of PBB and in line with our agreement with them, we have extended their services for a further two years from September.

By the time you read this report in the Gazette, I should be in the UK catching up with family. I am reliably informed that it has been a good few years since I last visited, so here I go!!!!!

A short report this period, but I look forward to writing more for the next Gazette.

Take care & best regards

Richard

Councillors

President
Richard Dyson

Secretary & Treasurer
Angela McNaughton

Vice President
Faye Ashmore

Patron
Te Radar

North Island -Northern
(Northland, Auckland, Coromandel)

Barbara Fitchett
Publicity & Promotions (Gazette), Finance & Breed Management Sub Committees
Phone - 021 997 891
Breeder of - White & Standard Galloway
Stud Names - Alclutha/Glenfinnan
Joined Society - 2013

North Island -Central West
(Waikato, Central Pateau, Taranaki)

Richard Dyson
President
Rules & Breed Management Sub Committees
Phone - 06 752 7080
Breeder of - White Galloway
Stud name - Stoney Brook
Joined Society - 2009

North Island -Central West
(Waikato, Central Pateau, Taranaki)

Graeme Turner
Finance Sub-committee, Promotions & Breed Management Sub-committee
Phone - 07 829 8991
Breeder of - White & Belted Galloway
Stud Names - Grange and Grange Polar
Joined Society - 1999

North Island -Central West
(Waikato, Central Pateau, Taranaki)

Roger Brownlee
Rules & Breed Management Sub Committees
Phone -027 605 8494
Breeder of - White Galloway
Stud Name - Bryndlee
Joined Society –2009

North Island -Central West
(Waikato, Central Pateau, Taranaki)

Faye Ashmore
Vice President
Minute Secretary, Publicity & Promotions (Facebook, Website & Merchandise), Breed Management Sub-committee
Phone - 027 280 0067
Breeder of - White Galloway
Stud Name - RyeBred
Joined Society - 2010

North Island -Central West
(Waikato, Central Pateau, Taranaki)

Susan Nicol
Registrar
Membership and Breed Management Sub-committees
Phone - 027 231 7399
Breeder of - Belted Galloway
Stud Names - Forest View
Joined Society - 2012

South Island - Southern
(Otago, Southland, Fiordland)

Angela McNaughton
Secretary & Treasurer,
Finance and Breed Management Sub-committees
Phone - 03 449 3237
Breeder of - White Galloway
Stud Name - Dunderave
Joined Society - 2008-9

North Island - Southern
(Wanganui/Manawatu, Wellington, Wairarapa)

Roger Fraser
Promotion & Marketing
Phone - 06 306 8066
Breeder of - Belted Galloway
Stud Name - Longrun
Joined Society - 2011

TBA - **North Island -Central East**
(Bay of Plenty, East Coast, Hawkes Bay)

South Island - Central
(Canterbury / Westland)

South Island - Northern
(Nelson / Malborough)

Stock for Sale

Bonnydale Kees

HB# 14036 **DOB: 15/08/2009** **Tag #: 93**

Sire: Salisbury Farm Sterling (HB# 13009)
Dam: Tatua Ma Darkie (HB# 6943)

Kees has been a fantastic bull, quiet and easy to handle but I haven't enough females for him now with his daughters coming through.

Price: $2,000 + GST o.n.o.

Further Information:
Phone: Claire (07) 873 6968
Email: clairon@farmside.co.nz

TEKOOA WHITE GALLOWAY STUD

Tekooa Todd

HB# 16604 **DOB: 01/09/2016** **Tag #: 22**

Sire: Drysdale White Dynamite HB# 14118
Dam: Dunderave White Tessa HB# 14950

Tekooa Vanora

HB# 16605 **DOB: 17/08/2016** **Tag #: 20**

Sire: Drysdale White Dynamite HB# 14118
Dam: Dunderave White Violet HB# 14948

Tekooa Lori

HB# 16603 **DOB: 25/08/2016** **Tag #: 21**

Sire: Drysdale White Dynamite HB# 14118
Dam: Moonshine Lucky HB# 15216

These three have all been trained to a hot wire. They have a quiet temperament due to being on a small block. Hay and silage have been part of their diet which has made them more amenable to being approached. All have white wellmarked parents. All have been weaned and are ready to go.

Further Information:
Phone: Lyn Wilkinson A/H (03) 6938144
Email: tekooa@xtra.co.nz

Kahala Mack

HB# 16279 **DOB: 07/03/2016** **Tag #: 1**

Sire: Alclutha Finian (HB# 15401)
Dam: Gilt Edge Eriskay (HB# 14510)

From the 'Kahala Stud', Havelock North, this yearling is a well marked, White Galloway Bull.
TB Status: C10

Further Information:
Michelle MacKay
Phone: (027) 4716812
Email: michellevanhouts@hotmail.com

Rakau Maxi

HB# 16714 **DOB: 30/11/2016** **Tag #: 3**

Sire: Bryndlee Sinaedaraida (HB# 15531)
Dam: Suncrest Arctic Jessica (HB# 15415)

Maxi is from the Rakau Galloway Stud in Karaka. He has a placid nature and is easy to work with when moving paddocks. He now resides at the Alclutha Galloway Stud in Mangatangi, where he can be viewed on request.

Further Information:
Janice & Howard Wood
Phone: (027) 496 8815
Email: fourwood@xtra.co.nz

Stock for Sale

TUIBROOK WHITE GALLOWAYS

Tuibrook Jane **Tuibrook Jennifer**

Tuibrook Jane - HB# 16678 **DOB: 06/02/2016** **Tag: 302**
Sire: Galazy Hansell HB# 13282
Dam: Tuibrook Bindi HB# 13739

Tuibrook Jennifer - HB# 16676 **DOB: 04/04/2016** **Tag: 304**
Sire: Galazy Hansell HB# 13282
Dam: Gilt Edge Erica HB# 15087

Tuibrook Justin

HB# 16677 **DOB: 12/09/2016** **Tag: 308**
Sire: Galazy Hansell HB# 13282
Dam: Tuibrook Annabelle HB# 14517

Further Information:
Bridget Cameron
Phone: (07) 827 9199
Email: tuimorgan@ihug.co.nz

WANTED TO BUY: Belted Galloway Heifers

Longrun Stud in Martinborough is looking to purchase 3 or 4 registered Belted Galloway heifers this year. Should you have some for sale, please contact Roger Fraser on 021 329335 or email roger.j.fraser@gmail.com

Another option could be younger in-calf cows. Longrun is a Belted herd, with both dun and black cattle in it. So, all options are able to be considered.

WANTED TO BUY: White Galloway Steer

If anyone has a 2 / 3 year old Purebred White Galloway Steer for sale please contact Faye Ashmore of Ryebred White Galloway Stud.

Phone: Faye 027 280 0067 or email: fayemarie4@hotmail.com

Stock for Sale

HB# 15028 **DOB: 12/06/2012** **Tag #: 3**

Skean Dhu Angstrom

Sire: Glenelg Park Moss (HB# 9191)
Dam: Salisbury Farm Whitney (HB# 12503)

The Tapuae Belted Galloway Stud in New Plymouth is offering Skean Dhu Angstrom for sale. He is a fantastic bull, quiet and easy to handle. He is being moved on because his daughters are now coming through ready for mating.

Price: $2,200 + GST

Further Information:
Phone: Steve (021) 215 5572
A/H: (06) 7513301
Email: hobson@primowireless.co.nz

HB# 16431 **DOB: 12/02/2016** **Tag #: Jamie / 1202**

Alclutha Jamie

Sire: Pheonix Monty (HB# 15522)
Dam: Alclutha Gemma (HB# 15681)

Jamie is a quiet well mannered 19 month old boy who comes when called and can be hand fed. I have never had a problem moving him from paddock to paddock or bringing him in to the yards. He has been regularly drenched and has also been vaccinated.

Further Information:
Phone: Barbara (021) 997 891
Email: alcluthagalloways@xtra.co.nz

BRYNDLEE WHITE GALLOWAYS

HB# 16537 **DOB: 25/06/2016** **Tag #: 7**

Bryndlee Cardinal

Sire: Bryndlee Gamble (HB# 15535)
Dam: Waitakere White Coral (HB# 13451)

Cardinal is a lightly marked boy, now weaned and ready to go. He is up to date with his vaccinations and drenching, and has a lovely quiet temperament. So, if you are looking for a lightly marked boy to service your appendix white girls, Cardinal is your man.

HB# 16534 **DOB: 29/06/2016** **Tag #: 30**

Bryndlee Rowan

Sire: Bryndlee Gamble (HB# 15535)
Dam: Bryndlee Angelrose (HB# 15532)

Rowan is a well marked boy, now weaned and ready to go. He is also up to date with his vaccinations and drenching and has a lovely quiet temperament.

For all enquiries please contact:
Barbara Fitchett
Phone: (021) 997 891
Email: alcluthagalloways@xtra.co.nz

If you have any stock for sale, please email the details to: gallowaygazette@xtra.co.nz
They will be included in the Galloway Gazette "Stock For Sale" section until sold.

Please remember to advise the Galloway Gazette when your stock has been sold, so the advertisement can be removed.

If you are looking for stock to purchase please check out our website: www.nzgalloway.co.nz for up to date listings of Cattle for Sale.

Stock for Sale

BRYNDLEE WHITE GALLOWAYS

The following is a message from Kate Bradly, of Bryndlee Galloways, and Co-Editor of the Galloway Gazette.

Hi all,

Due to health reasons I need to destock my beautiful White Galloway herd.

I know we are coming into spring, and I did not see this coming so please check out my herd number of 69w, stud name Bryndlee, to see if there is anything that may take your liking.

I have many cows, both whites and app whites, either in calf or running with calves.
There are plenty of bulls to choose from.
There are no registered or registerable heifers available.

Please email me with the age group you might be interested in and I can send you a little info on the animals in that group.

Regards and thanks
Kate

Note from Barbara, Co-editor of the Galloway Gazette: These animals live on the Hauraki Plains a short distance from Thames. Recently Kate passed away and it would be appreciated if all enquiries were now directed to me. My phone number and email are as follows:

Phone: Barbara (021) 997891
Email: alcluthagalloways@xtra.co.nz







The Late John Cleland

Earlier this year the Galloway Gazette advised members via email that a long standing member, John Cleland, had passed away. The following article is a brief history of his association with the Society, compiled by Kate and Barbara with assistance from several other GCSNZ members.

John joined the Galloway Cattle Society in approximately 1989 when he was first mentioned in the Herd Book with transfers of Standard Galloway stock from the Pohui Herd owned by P D King of Te Pohue, Napier, herd no 47A.

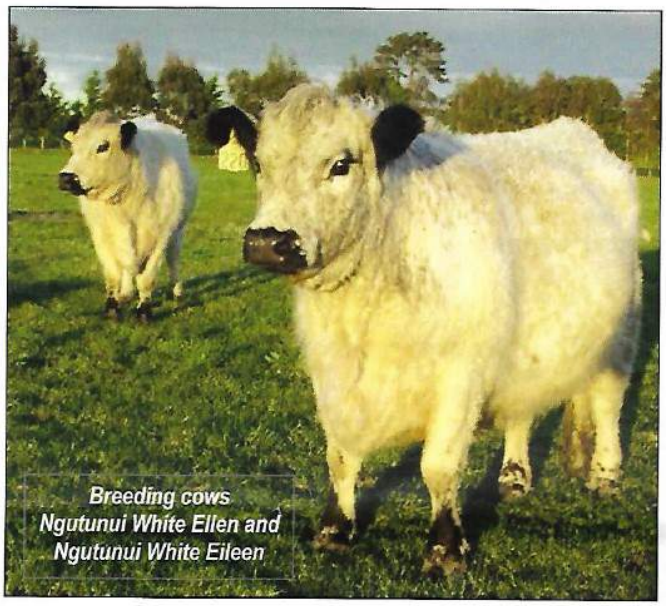
John had dairy farmed for many years before joining the Society so was well versed with breeding of stock.

He had registered a new herd name of Pekanui and was given the herd number of 64A. The inspiration for the herd name that John registered, came from the road that he lived on in Te Awamutu, and that was Pekanui Road.

His first registrations were in 1990 which were calves born in 1989 from the Pohui stock he had purchased. From there he purchased further Pohui stock along with two bulls from the Colvend herd.

These bulls were Colvend Warrior HB# 4885 and Colvend Ben HB# 4910. Colvend Warrior was used to a lesser degree than Colvend Ben whom we should all be familiar with as he features, not only in the Standard Galloway bloodlines and pedigrees, but also stands out in the White Galloway history as well.

John carried on breeding and expanding his Pekanui herd until the early 1990's when he was one of the first breeders to import White Galloway semen in to New Zealand from the Galair stud in Canada.



Breeding cows Ngutunui White Ellen and Ngutunui White Eileen

John registered a new herd name of Ngutunui and was given the herd number of 5W. When he submitted this name for registration John once again took inspiration from the area he lived in, which was Ngutunui; his address was Pekanui Road, Ngutunui, Te Awamutu.

The White Galloway semen John had purchased was from a bull "Galair White Lad 67z". He used this on his Pekanui stock and there are many decendants of this bull here in New Zealand today.

To a lesser degree John also used semen from another bull he had purchased "Galair White Lad 73A", but in saying this, 73A also features in many White Galloway pedigrees.

John bred White Galloways until the early 2000's when he decided he would disperse his herds. By this time John had become a well respected and knowledgeable breeder, of many of our Galloway's today.

The last recorded registration of a White Galloway with the herd name Ngutunui was in 2005. Of John's last 20 registered cow's we have only found 24 registered offspring of which 3 belong to Kate and a very small handful of three or four that are still in the breeding system.

John retained his interest in the Galloways and remained a member of the Society until recently when he became ill with alzheimers.

It was at this time that we, Barbara (Alclutha) and Kate (Bryndlee), had been spending a lot of time researching pedigrees and were finding it frustrating not being able to find the information required on a number of John's animals which had appeared to be bypassed for registration, and / or transfers.

We decided a visit was in order and organised with John's wife Beryl to go to Rotorua to spend some time with them.

The visit was very memorable with John showing us his photos of all his girls. It was obvious he was proud of them and that he loved the breeding. While Barbara was chatting with Beryl and looking over John's remaining records Kate kept John chatting.

During the visit John was asked if he would be willing for us to take the remains of his personal herd records for preservation and he seemed delighted. Unfortunately they both seemed to feel that at some stage the earlier records had been uplifted, and we have been unable to source where they may be!

After spending a lovely afternoon with John and Beryl in May 2years ago, we said our good byes and headed for home .

Southern Galloway Breeders Group – By Jill Maxwell

Our Autumn AGM Meeting was held on the 9th April 2017 at Neil McKerchar's property in the old gold mining area of Roxburgh, Central Otago.
Neil runs Belted Galloways and has over 140 breeding cows, 6 sire bulls and young stock running on the hills and flats of Roxburgh.
We arrived at 1pm and headed out in 4x4 vehicles to visit Neil's cattle on the blocks of land the cattle graze around the district. These cattle were in good working condition on some very tough dry ground at about 150 metres above sea level. It was a beautiful day and we saw Neil's Galloways doing him proud by producing good young stock on hard country. It just goes to show that these wonderful Galloways will do well anywhere.

We then headed inside for afternoon tea, the meetings and then a tasty potluck dinner. At the AGM there were no changes in Office, Chairman - Adam McCall and Secretary/ Treasurer - Jill Maxwell. Another successful year for the Group, the Pilot Scheme will finish its two year trial on 30/06/17, the Group members had a full clearance of bulls for sale and seven members exhibited stock around the show circuit.

Peppercorn Trophy results from exhibiting at the 10 Southern Shows :-

1st	R Hall (Hall Genetics)
2nd	E Taylor
3rd	B Lowry

The Winter Meeting and a Buffet Meal was held in Eastern Southland at the Croydon Lodge in Gore on Sunday 30th July. Eleven members attended and had an enjoyable evening. Angela McNaughton gave a report on the NZ AGM held in Martinborough, the Pilot Scheme was discussed and a report will be written up, more advertising for our Galloways was talked about, the site for the Southern Field Days at Waimumu in February 2018 has been booked. Neil McKerchar and his partner Taieri Hore were presented with a Galloway Hand Towel as a house warming gift as Neil has moved to Kurow, North Otago recently.

The Late Kate Bradly - Bryndlee Galloways

Bryndlee Galloways

Bryndlee Galloways

The passing of a wonderful friend and colleague; Kate loved her Galloways. She was a vibrant member of our Northern Galloway Breeders Group and a number of us attended her service in Ngatea to pay our respects.

Website Links

New Zealand Breeders Websites

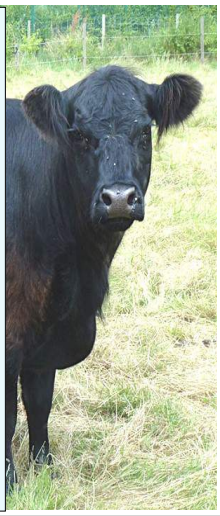
Bob & Karen Curry	www.suncreststud.co.nz
Tracy Wood	www.whitegallowaysofwayby.co.nz
Rob Hall	www.lilliesleaf.co.nz
Barbara Fitchett	www.alcluthagalloways.co.nz
Faye Ashmore & Peter Mans	www.mansland.co.nz
Linda van Eyk	www.linwoodbelted.co.nz

General Websites

Te Radar (Patron GCSNZ Inc)	www.radarswebsite.com
New Zealand Rare Breeds	www.rarebreeds.co.nz
Beef NZ	www.beef.org.nz/
Control BVD	www.controlbvd.org.nz
Lifestyle Block	www.lifestyleblock.co.nz/
Rural Web Design	www.ruralwebs.co.nz
Stackyard	www.stackyard.com
The Royal Agricultural Society of NZ	www.ras.org.nz/

Overseas Breed Societies Websites

American Galloway Breeders Assn	www.americangalloway.com
Australian Galloway Association	www.galloway.asn.au
Australian Belted Galloway Association	www.beltedgalloway.org.au/
Belted Galloway Society, Inc.	www.beltie.org
Belted Galloway Society of Germany	www.beltie-deutschland.de
Canadian Galloway Association	www.galloway.ca/
The Galloway Cattle Society - UK & Ireland	www.gallowaycattlesociety.co.uk
The Belted Galloway Cattle Society	www.beltedgalloways.co.uk
Western Belted Galloway Org	www.beltedgalloway.org/



Please Note: If you would like to access the above websites from this publication, you are able to do so by clicking on the website address. However, in doing so, you may receive a 'security' pop up advising this document is trying to connect to: (website). Once you have 'Allowed' access, this message should not reappear again for the same website at a later date.

Galloway Merchandise

Galloway A5 Pads with Society Logo

$5.00 + Postage

Monogrammed Hand Towels

$22.00 each + Postage

Hand Towels available in 4 colours.
To purchase contact Faye Ashmore.

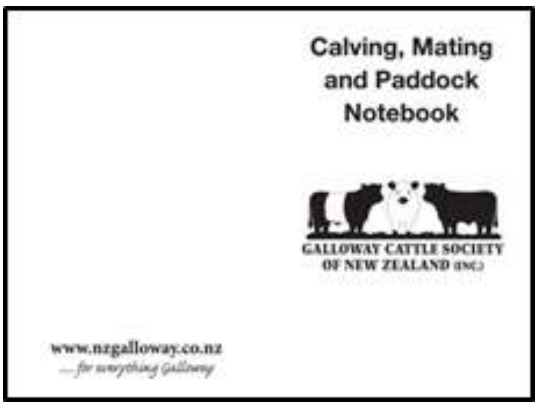
Monogramming is also available.
To have your own towel, hand towel or tea towel monogrammed please contact Angela McNaughton at: **mcnaughton@xtra.co.nz**

Porcelain Tea / Coffee Mug

$12.00 + Postage

Calving Book

$4.00 + Postage



Galloway Gazette

Free

Herd Book - Updated Paper Format

$12.00

(Please Contact the Registrar) Postage Included

Herd Book - On Disc in PDF Format

Disc 1 - Volumes 1 > 4	$25.00
Disc 2 - Volume 5	$25.00
Disc 3 - Volume 6	$25.00

Galloway Badge

$8.00 + Postage

GALLOWAY CATTLE SOCIETY
OF NEW ZEALAND (INC.)

Bumper Sticker

$3.00 + Postage

12cm in diameter
Stick on the outside of car window or surface.

Please contact Faye Ashmore to purchase any of the above
email: fayemarie4@hotmail.com or Ph 027 2800067
An invoice will be sent for you to pay online.
It's that easy!!!!!

"Another Winner?"

DNA Testing & Inspections of Breeding Bulls.

As part of the ongoing discussion regarding DNA testing and inspections, Ray Cursons, breeder of Belted Galloway, has provided a second article "Marker Assisted Selection—Tenderness & Marbling". The article follows this page in the Gazette; it is an article from the USA but is still relevant to our current discussions, and may help with any feedback members may wish to submit. Any feedback received by the Galloway Gazette will be taken to Council for discussion but will not be published unless you give your permission to do so. We are looking for numbers in favour, numbers sitting on the fence, and, of course, numbers against DNA testing. There will be another article in the next Gazette, also supplied by Ray Cursons, entitled "Marker Assisted Selection – Tenderness and Marbling". Another thought with DNA testing is that we could do an email vote for yes or no, or, undecided, but we would prefer to have full and frank discussions first.

FEED BACK IS REQUIRED FROM BREEDERS ON THIS. COUNCIL IS PROPOSING TO COMMENCE THE REQUIREMENT FOR DNA TESTING IN 2018. THE DISCUSSION OF INSPECTIONS IS ON GOING AND ALSO REQUIRES FEEDBACK.

Marker Assisted Selection - Tenderness & Marbling

- Article Supplied by Ray Cursons

Marker Assisted Selection-Tenderness and Marbling

Robert L. (Bob) Weaber, Ph.D.
Assistant Professor
State Extension Specialist-Beef Genetics
University of Missouri-Columbia

Introduction:

Marker assisted selection (MAS) is a process that enables the accurate selection of specific segments of DNA that are associated with a measurable difference or effect on a complex trait, like weaning weight or marbling score. MAS can be an effective way to increase or decrease the frequency of specific DNA sequences in a population. It is important to note that many genes control complex traits, like marbling or tenderness; they are polygenic in nature. Markers for specific variations in DNA sequences are available for only a few genes that contribute to marbling or tenderness. There are many other 'unmarked' and unknown genes, as well as the production environment, that affect the observed phenotypes for these traits. Therefore, MAS selection will only account for a portion of the genetic variation. Measures of net genetic merit for a trait, such as Expected Progeny Differences (EPD) should be considered when making selection decisions even when marker information is available. EPD provide an estimate of the overall (net) merit of the genes an animal has for a trait including the 'marked' and 'unmarked' genes. MAS should be seen as an additional method of selection, but not a replacement of proven selection tools like EPD.

Several of the following sections provide background information on DNA and DNA markers. If you are already familiar with these concepts you may skip ahead to the section labeled 'Benefits of Marker Assisted Selection.'

What is a DNA marker?

All living organisms are made up of cells. Within most cells, there is a nucleus that contains several large molecules called **deoxyribonucleic acid (DNA).** DNA is the material that carries genetic instructions, is transmitted from one generation to the next, and determines the differences in many of the physical characteristics of individuals and species. Each large DNA molecule, which is sometimes packaged in a tightly wound coil, is called a **chromosome**. Chromosomes come in pairs, one inherited from each parent. Cattle have 30 pairs of chromosomes. Collectively, all the pairs of chromosomes are called the **genome**. Every cell nucleus contains a copy of all the chromosomes. Therefore, each nucleated cell contains the complete genome of the animal.

DNA is a large double helix molecule that looks like a twisted ladder (see figure below). Each rung of this ladder is composed of a pair of **nucleotides**. The pairs are 'A' with 'C', and 'G' with 'T'. These pairs are strung together in a long sequence that codes for specific **amino acids**. Amino acids are linked together to form larger molecules called **proteins**. A sequence of DNA that codes for all the amino acids that makes up a single

Marker Assisted Selection - Tenderness & Marbling

- Article Supplied by Ray Cursons

protein is called a **gene**. There are thousands of proteins in the body, which are coded for by thousands of genes. It is the interaction and structure of these proteins that determines the appearance or **phenotype** of individual. The term **genotype** refers to the genetic sequence of an individual for a particular marker or gene.

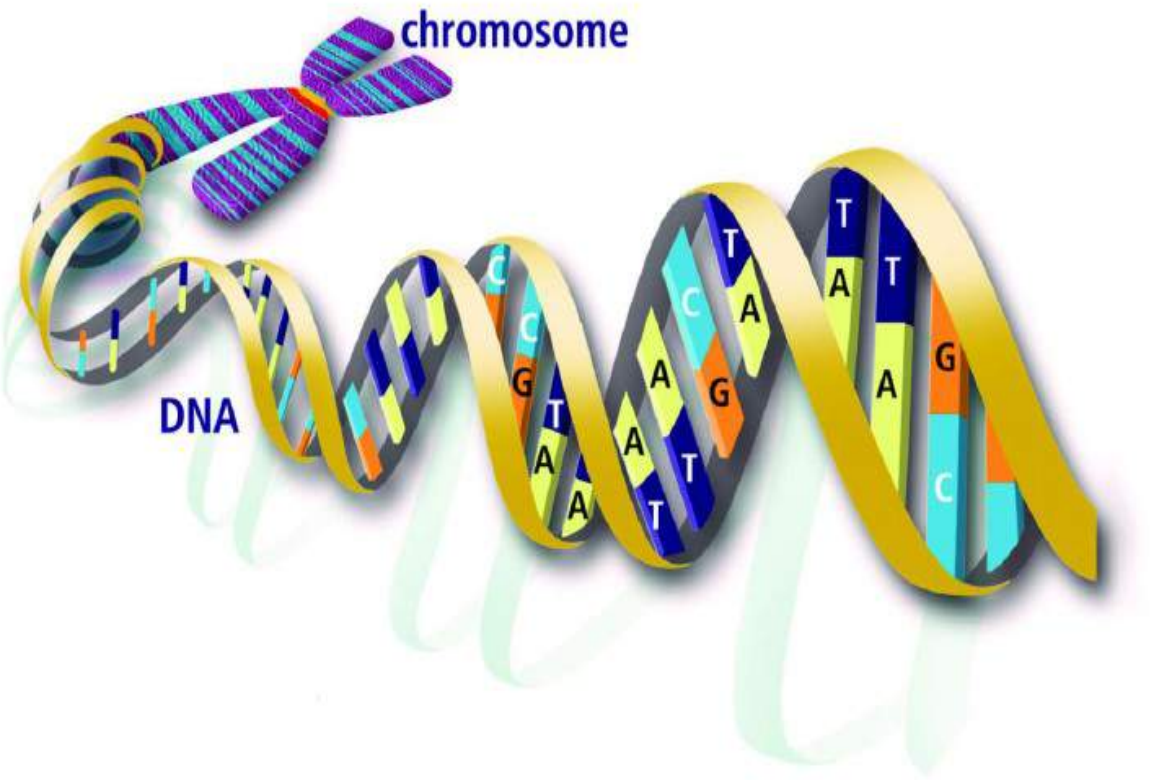


Image Credit: U.S. Department of Energy Human Genome Program, http://www.ornl.gov/hgmis.

The sequence of DNA can vary from one individual to another. In fact, the sequence of DNA for a gene on one chromosome can be different than the sequence for the gene on the other chromosome in the pair. These genetic variants of a gene are called **alleles**. The variation in their sequence may change the amino acid sequence for which they code and can result in a change in the structure of the protein they encode. Alternately, the variation may result in production of different quantities of the protein (**expression**). Differences in either the protein structure or the level of expression can have an effect on phenotype.

Each individual receives one-half of its genetic make up from their father (sire) and one-half from their mother (dam). So, one-half of the chromosomes in a cell are from the sire and one-half from the dam. If the DNA sequence for a specific gene is the same on each chromosome in the pair, then the individual is said to be **homozygous**. If the DNA sequences are different for the gene, that is, there is a variation, then the individual is said to be **heterozygous**.

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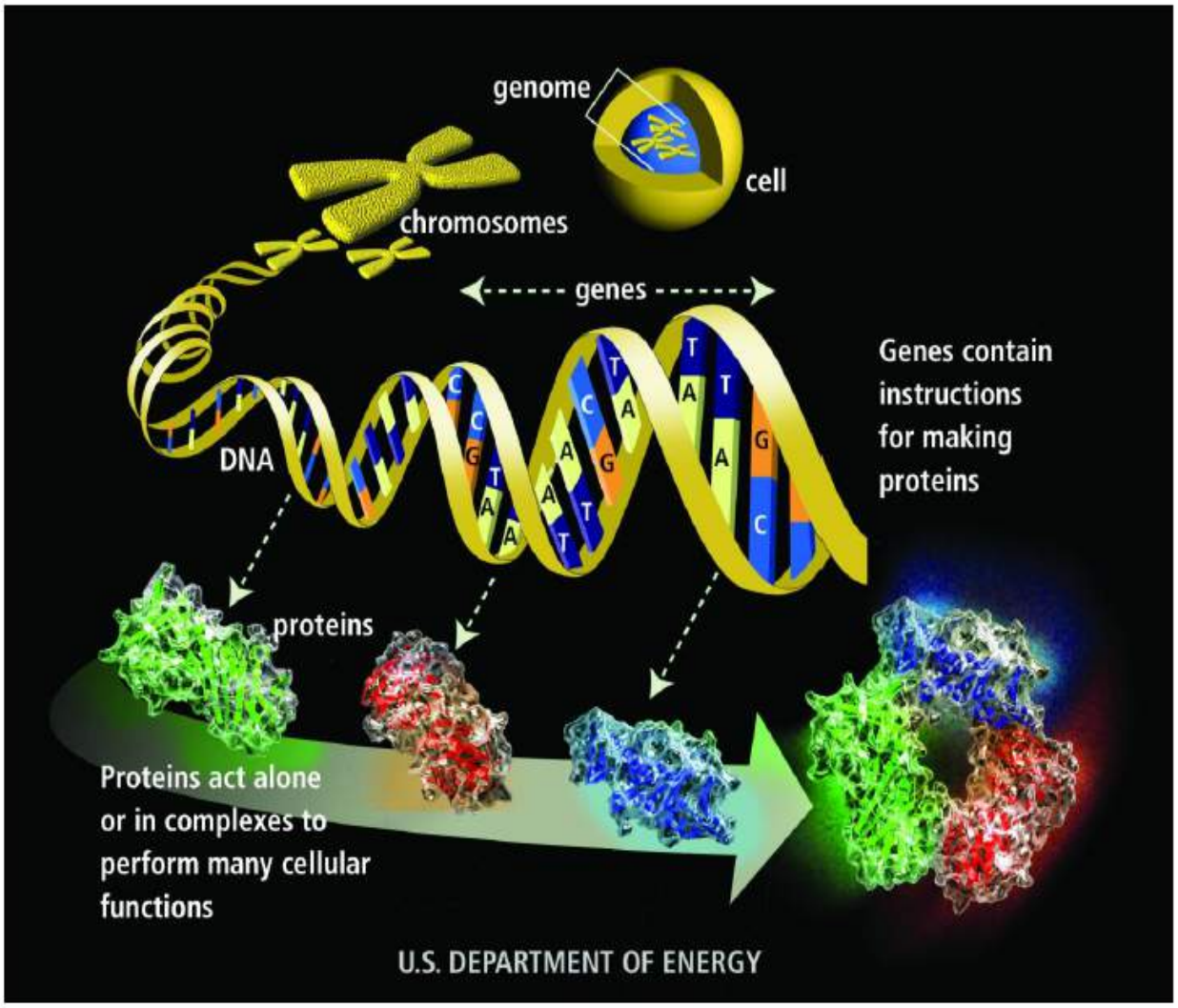

Image Credit: U.S. Department of Energy Human Genome Program, http://www.ornl.gov/hgmis.

Not all DNA is made up of genes. There are large pieces of DNA whose purpose is unknown. Some DNA helps regulate the expression of other genes. A genes coding sequence may be broken into several sections. The term **locus** can be used to describe a specific sequence of DNA within or outside of gene coding sequence.

Marker Basics:

A DNA marker is simply a sequence of nucleotides that uniquely identifies a location of in the genome. This location can be in a gene or nearby a gene and used to identify a specific allele. Mutations, or changes in the coding sequence of a gene, can be used as DNA markers. These mutations may or may not cause a change in the protein product. Variation nearby a gene can also be used as a DNA marker.

The two main classes of markers used to identify different alleles in beef cattle are **microsatellite markers** and **single nucleotide polymorphisms** (SNPs, pronounced *snips*). Microsatellite markers are di-nucleotide repeats where the count of the number of pairs of nucleotides varies. Microsatellites are in the non-coding sequences of DNA and are used to identify alleles of a **quantitative trait loci (QTL)** via association

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between the markers and phenotype. A QTL is simply an area of the genome that is likely to harbor a gene that influences a quantitative trait and for which a set of markers can be used to track inheritance of the various alleles of the gene. SNPs are single base pair variations in the DNA coding sequence. SNPs used as DNA markers may be the causative mutation that results in an alternate form of the protein, it may be in the coding sequence but not cause a change in amino acid sequence, or may be nearby a gene in the non-coding sequence of DNA. Microsattelites or SNP marker panels may be used to identify or validate parentage of individuals.

DNA markers can be used to track the inheritance of simple traits controlled by a single gene or complex traits controlled by many genes. Examples of simple traits include coat color, horn status, and some genetic diseases; complex traits include traits like weaning weight, tenderness and marbling which are controlled by many genes. DNA markers simply identify a sequence of DNA just as ear tags identify individual calves.

Benefits of Marker Assisted Selection:

Marker assisted selection can be used to increase the frequency of desirable forms of a gene within a population by selection of parent stock that carry the gene. Selection of parents that are homozygotes for the desired allele ensures that all gametes (sperm or egg cells) produced by that parent have the desired allele. Of course, to use MAS, markers must be available for the trait and alleles of interest. The potential benefits of MAS are greatest for traits that (Van Eenennaam, 2005; Dekkers, 2003):

1. have low heritability (traits with observed or measured values that are poor indicators of breeding value),
2. are difficult and/or expensive to measure (disease resistance),
3. cannot be measured until later in life potentially after the animal has reproduced (carcass or maternal traits),
4. are not routinely measured or selected for currently (tenderness), and
5. are genetically correlated with another trait you do not want to change. (e.g. At the polygenic level the traits may be positively correlated, but selection for a marker of a gene for marbling that is not associated with increases carcass fatness might be desirable. This would entail selection for marbling genes without pleitropic effects on fatness.)

The expected benefits of changing allele frequencies and the resulting changes in phenotype vary depending on the type of trait. The following categories are ordered from greatest to least expected benefit from MAS (Van Eenennaam, 2005):

1. simply inherited traits (coat color, horn status, genetic defects),
2. carcass quality and palatability attributes,
3. fertility and reproductive efficiency,
4. carcass quantity and yield,
5. milk production and maternal ability, and
6. growth trait performance.

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The ranking above follows from a number of considerations including the relative difficulty of measuring and recording performance data, the amount of genetic and phenotypic variation in trait and their proportion (heritability), the age at which performance records are collected on the animal, and how much performance data is currently available.

The traits of carcass marbling and tenderness are likely to benefit from MAS due to a number of reasons. Although both traits have moderate levels of heritability, data collection of both measures is relatively difficult to obtain. In fact, collection of Warner-Bratzler Shear force data is especially challenging due to the costs of obtaining large numbers of steak samples from sire identified animals and then obtaining shear force values from qualified labs. Obviously, the animals from which these observations are obtained are not able to reproduce, thus, selection focuses on the sires of animals with desirable characteristics. Bulls with carcass trait and tenderness evaluations are typically 4-5 years of age and have sired a number of progeny. The ability to select young sires with desirable genetics would minimize progeny test costs and focus data collection efforts on bulls with desirable genotypes.

Limitations/Challenges of Marker Assisted Selection for Marbling and Tenderness:

Selection based on marker information for a single gene with the exclusion of other sources of genetic information such as EPD will yield poor results for overall improvement in a trait. Ignoring information about the net merit of an animal's genotype via phenotypicly derived genetic predictors such as EPD is discouraged. Both marbling and tenderness are complex traits controlled by many genes, with only a few genes that have useful markers associated with them. More response to selection will be obtained if both MAS and EPD are used. EPD should, however, be the primary driver in selection decisions, with marker data playing a secondary role for selection of specific known alleles.

To date, markers for only a few genes affecting marbling and tenderness are available. These markers account for a relative small amount of the genetic variation and a smaller portion of phenotypic variation for the traits. It remains to be seen if the realized gain in performance due to MAS for marbling and tenderness is of sufficient economic value to justify its use. The cost:benefit ratio may be a challenge for the use of MAS today. Many of the tests are relatively expensive ($30-50). Testing large numbers of animals may not be feasible.

Researchers continue to investigate the bovine genome and find DNA markers associated with a wide variety of traits. Interpretation of genotyping results is already fairly complicated with just a few genes on the market. Introduction of a large number of DNA marker tests will quickly generate an overwhelming amount of data. The challenge will be to make these genotypes into useful information. One way this may happen is with the inclusion of the genotype data into the computation of EPD. The augmentation of EPD with DNA marker data will reduce data overload and continue to

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focus selection decisions on measures of net merit. The markers will allow for improved accuracy of prediction of the EPD at an earlier age.

Marbling Markers:

As of January 1, 2006 only one commercially available marker panel for marbling score has been validated by the National Beef Cattle Evaluation Consortium (NBCEC). This test is marketed by Bovigen Solutions LLC (http://www.bovigensolutoins.com) and is name GeneSTAR® Quality. The panel is comprised of two markers (TG5 and M2) that have been reported to be associated with increased quality grade in company trials. The increase in marbling score due to the favorable forms of TG5 and M2 was found to be insignificant in the Charolais x Angus reference population used by the NBCEC for validation (NBCEC, 2005). However, it was estimated that the addition of a favorable TG5 allele or 'star' was associated with a significant increase (p=0.06) of 8.6% in the number of animals grading USDA Choice or Prime, and the addition of a M2 favorable allele or 'star' was associated with 2.9% increase in the number of animals grading USDA Choice or Prime (NBCEC, 2005). Complete results from the NBCEC website are given below.

Results

A. Significance of gene effects under an additive model (regression on number of alleles)

Reference Population	Trait	Number Head	Contrast				
			Effect (s)	Coefficient (= 1 star)	DF	F	p
Charolais x Angus	Marbling Score	387	GSQ** (TG5 & M2)	5.7	3	1.80	0.18
			TG5*	9.7	1	2.65	0.10
			M2*	0.1	1	0.00	0.99

Reference Population	Trait	Number Head	Contrast				
			Effect (s)	Coefficient (= 1 star)	DF	F	p
Charolais x Angus	% Choice and Prime	387	GSQ** (TG5 & M2)	6.2	3	3.7	0.06
			TG5*	8.6	1	3.6	0.06
			M2*	2.9	1	0.3	0.58

** GSQ = GeneSTAR® Quality combined marker panel = total number of favorable TG5 and M2 alleles; value of an average star.
*effect of TG5 and M2 estimated separately; TG5 has a larger effect than M2.
The frequency of one of the alleles was too low in the Hereford population to detect marker effects and so this group was not included in the analysis.

Source: NBCEC GeneSTAR® Quality Grade Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/GeneSTARQualityGrade/geneSTAR_quality_grade_test_results.htm

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B1. Combined Two-marker Genotype Effects (contrasted to TG5 "0 stars", M2 "0 stars"), Standard Errors and Frequencies in Reference Samples

Reference Population	Trait	No. Head	Allele		Sample Frequency	Estimated Effect	Standard Error
			TG5	M2			
Charolais x Angus	Marbling Score	387	2	2	0.01	19.5	33.2
				1	0.02	19.4	26.3
				0	0.02	19.3	19.3
			1	2	0.01	9.9	23.6
				1	0.12	9.8	16.6
				0	0.21	9.7	9.7
			0	2	0.03	0.2	13.9
				1	0.20	0.1	7.0
				0	0.38	0.0	0.0

Reference Population	Trait	No. Head	Allele		Sample Frequency	Estimated Effect	Standard Error
			TG5	M2			
Charolais x Angus	% Choice and Prime	387	2	2	0.01	22.9	19.6
				1	0.02	20.0	14.3
				0	0.02	17.1	9.1
			1	2	0.01	14.4	15.0
				1	0.12	11.5	9.8
				0	0.21	8.6	4.5
			0	2	0.03	5.8	10.5
				1	0.20	2.9	5.2
				0	0.38	0	0.0

The frequency of one of the alleles was too low in the Hereford population to detect marker effects and so this group was not included in the analysis.

Source: NBCEC GeneSTAR® Quality Grade Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/GeneSTARQualityGrade/geneSTAR_quality_grade_test_results.htm

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B2. Effect of One Star on the Target Trait

Reference Population	Trait	No. Head	No.of Stars	Estimate	SE	N	%
Charolais x Angus	Marbling Score	387	4	**22.7**	16.9	4	1.0
			3	**17.0**	12.7	10	2.6
			2	**11.4**	8.5	67	17.3
			1	**5.7**	4.2	159	41.1
			0	**0**		147	38.0

Reference Population	Trait	No. Head	No.of Stars	Estimate	SE	N	%
Charolais x Angus	% Choice and Prime	387	4	**24.7**	12.9	4	1.0
			3	**18.6**	9.7	10	2.6
			2	**12.4**	6.5	67	17.3
			1	**6.2**	3.2	159	41.1
			0	**0**		147	38.0

Source: NBCEC GeneSTAR® Quality Grade Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/GeneSTARQualityGrade/geneSTAR_quality_grade_test_results.htm

Tenderness Markers:

As of January 1, 2006, two commercially available marker panels have been validated by the NBCEC. Tenderness of beef carcasses has been identified as area of improvement for the beef industry. Improvement in beef tenderness improves the value of beef products, which in turn should improve consumer demand of beef products. Research has suggested that a 10% improvement in beef tenderness would result in a 1% improvement in industry revenues (Moser et al, 204). The NBCEC validation results of the two commercially available marker panels are listed below.

Igenity *Tender*GENE™ (http://www.igenity.com) is a DNA marker panel test that consists of three markers (UofGCAST1, Calpain 4751, and Calpain 316). UofGCAST1 tests for a single nucleotide substitution in Calpastatin. Calpastatin inhibits the post-mortem tenderizing activity of the enzyme, Calpain. Calpain 4751 and 316 are nucleotide substitutions in the gene μ-calpain, which codes for an enzyme involved, in post-mortem tenderization of beef. The markers Calpain 4751 and 316 are nearby each other and are consider jointly or as a haplotype. A haplotype is a set of alleles inherited together. The NBCEC has validated an association between these markers and tenderness measured as Warner-Bratzler shear force and observed in commercial cattle. Each substituition with a "C" allele in calpastatin was associated with a 0.42 lb. decrease in Warner-Bratzler Shear force. Additionally, replacement of the Calpain 4751

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"T"-316 "G" with the Calpain 4751 "C"- 316 "C" was related to a 0.72 lb decrease in Warner-Bratzler Shear force (NBCEC, 2005). Complete results from the NBCEC website are given below.

Results

A. Significance of gene effects under an additive model (regression on number of alleles and/or haplotypes)

Reference Population	Trait	Number Head	Contrast			
			Gene(s)	DF	F	p
Combined	Warner-Bratzler Shear Force (lb)	**1209**	**ITG** (UofG-Cast1 & CAPN1)**	**4**	**10.6**	**1.9E-08**
			UofG-Cast1*	**1**	**14.1**	**1.8E-04**
			CAPN1 (4751 & 316 haplotype)*	**3**	**9.3**	**4.7E-06**
Brangus		181	ITG** (UofG-Cast1 & CAPN1)	4	1.7	0.16
			UofG-Cast1*	1	0.04	0.84
			CAPN1 (4751 & 316 haplotype)*	3	2.2	0.09
Charolais x Angus		400	ITG** (UofG-Cast1 & CAPN1)	4	8.0	3.1E-06
			UofG-Cast1*	1	8.2	4.4E-03
			CAPN1 (4751 & 316 haplotype)*	3	8.2	2.8E-05
Red Angus		310	ITG** (UofG-Cast1 & CAPN1)	4	2.9	0.02
			UofG-Cast1*	1	1.2	0.27
			CAPN1 (4751 & 316 haplotype)*	3	3.1	0.03
Brahman		318	ITG** (UofG-Cast1 & CAPN1)	3	4.3	0.01
			UofG-Cast1*	1	5.8	0.02
			CAPN1 (4751 & 316 haplotype)*	2	3.7	0.03

** ITG = Igenity *Tender*GENE™ combined marker panel = total number of favorable UofG-Cast1 alleles & CAPN1 haplotypes.

*effect of UofG-Cast1 and CAPN1 haplotype estimated separately; CAPN1 haplotype has a larger effect than UofG-Cast1.

* Genotype effects constructed from effects estimated in the haplotype analysis (Table B2)

Source: NBCEC Igenity *Tender*GENE™ Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/IGENITYTenderGene/IGENITY_tenderGENE_test_results.htm

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B1. Combined Three-marker Genotype Effects (contrasted to UoG-Cast1 "GG", Capn4751 "TT", Capn316 "GG"), Standard Errors and Frequencies* in Reference Samples

GENOTYPE			Estimate	Standard	Number	%
UoG-Cast1	Capain 4751	Capain 316	(lbs.)	Error	Obs.	
CC	CC	CC	-2.3	0.4	18	1.5
		CG	-1.9	0.3	60	5.0
		GG	-1.6	0.3	33	2.7
	CT	CC	-1.1	0.6	8	0.7
		CG	-1.5	1.0	123	10.2
		GG	-1.2	0.5	181	15.0
	TT	CC	0.1	1.0	0	0.0
		CG	-0.4	0.5	9	0.7
		GG	-0.8	0.2	212	17.5
CG	CC	CC	-1.9	0.3	9	0.7
		CG	-1.5	0.2	42	3.5
		GG	-1.2	0.3	23	1.9
	CT	CC	-0.7	0.5	1	0.1
		CG	-1.1	0.2	74	6.1
		GG	-0.8	0.2	91	7.5
	TT	CC	0.5	1.0	0	0.0
		CG	0.1	0.5	4	0.3
		GG	-0.4	0.1	204	16.9
GG	CC	CC	-1.4	0.3	2	0.2
		CG	-1.1	0.2	7	0.6
		GG	-1.1	0.2	5	0.4
	CT	CC	-0.2	0.5	1	0.1
		CG	-0.7	0.1	9	0.7
		GG	-0.4	0.1	30	2.5
	TT	CC	1.0	1.0	0	0.0
		CG	0.5	0.5	0	0.0
		GG	0	.	63	5.2

The yellow shaded genotypes involve the rare "T-C" haplotype. The low number of animals with this genotype in the data set made it difficult to accurately estimate the size of its effect.

Source: NBCEC Igenity *Tender*GENE™ Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/IGENITYTenderGene/IGENITY_tenderGENE_test_results.htm

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B2. Effect of One Copy of a UoGCAST1 Allele or CAPN1 Haplotype on the Target Trait

Population	Trait	No. Head	Gene	Allele/ Haplotype	Sample Frequency	Estimated Effect	Standard Error
Combined	Warner-Bratzler Shear Force (Tenderness)	1209	UoGCAST	C	0.72	-0.42	0.11
				T	0.28	0.00	0.00
			CAPN1 4751 & 316	C-C	0.16	-0.72	0.15
				C-G	0.22	-0.40	0.13
				T-C	0.01	0.48	0.50
				T-G	0.61	0	0.00
Brangus	Warner-Bratzler Shear Force (Tenderness)	181	UoGCAST	C	0.79	-0.05	0.26
				T	0.21	0.00	0.00
			CAPN1 4751 & 316	C-C	0.17	-0.72	0.28
				C-G	0.37	-0.12	0.23
				T-C	0.00	-0.23	1.78
				T-G	0.45	0	0.00
Charolais x Angus	Warner-Bratzler Shear Force (Tenderness)	400	UoGCAST	C	0.79	-0.40	0.14
				T	0.21	0.00	0.00
			CAPN1 4751 & 316	C-C	0.20	-0.76	0.16
				C-G	0.26	-0.37	0.16
				T-C	0.03	0.55	0.41
				T-G	0.51	0	0.00
Red Angus	Warner-Bratzler Shear Force (Tenderness)	310	UoGCAST	C	0.74	-0.19	0.17
				T	0.26	0.00	0.00
			CAPN1 4751 & 316	C-C	0.23	-0.55	0.19
				C-G	0.25	-0.24	0.20
				T-C	0.01	0.86	0.85
				T-G	0.51	0	0.00
Brahman	Warner-Bratzler Shear Force (Tenderness)	318	UoGCAST	C	0.43	-0.73	0.30
				T	0.57	0.00	0.00
			CAPN1 4751 & 316	C-C	0.02	-1.27	1.19
				C-G	0.07	-1.36	0.56
				T-C	0		
				T-G	0.92	0	0.00

The yellow shaded genotypes involve the rare "T-C" haplotype. The low number of animals with this genotype in the data set made it difficult to accurately estimate the size of its effect.

Source: NBCEC Igenity *Tender*GENE™ Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/IGENITYTenderGene/IGENITY_tenderGENE_test_results.htm

GeneSTAR® Tenderness (www.bovigensolutions.com) is a marker panel test consisting of the markers CAST-T1 and Calpain 316-T2. Increased beef tenderness is associated with substitution of the "C" allele at CAST-T1 (calpastatin) and the "C" allele at Calpain 316-T2 (μ-calpain). Favorable alleles of these genes are designated as 'star' in company reporting and have been related to enhanced tenderness in corporate

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research. These results were successfully validated by the NBCEC. The favorable "C" form of calpastatin was associated with a 0.3 lb. decrease in Warner-Bratzler Shear force while the favorable form of μ-calpain (Calpain 316-T2) "C" was related to a decrease in Warner-Bratzler Shear force ranging from 0.4-0.5 (NBCEC, 2005). Complete results from the NBCEC website are given below.

Results

A. Significance of gene effects under an additive model (regression on number of alleles)

Reference Population	Trait	Number Head	Contrast				
			Marker (s)	Coefficient (= 1 star)	DF	F	p
Combined	Warner-Braztler Shear Force (lb)	**662**	**GST** (T1 & T2)**	**-0.39**	**3**	**21.07**	**5.3E-06**
			CAST-T1*	**-0.31**	**1**	**5.63**	**1.8E-02**
			Calpain316 - T2*	**-0.46**	**1**	**15.73**	**8.1E-05**
Charolais x Angus		387	GST** (T1 & T2)	-0.39	3	11.88	6.0E-04
			CAST-T1*	-0.27	1	1.63	0.20
			Calpain316 - T2*	-0.44	1	11.07	1.0E-03
Hereford		285	GST** (T1 & T2)	-0.40	3	8.94	3.1E-03
			CAST-T1*	-0.33	1	3.27	0.07
			Calpain316 - T2*	-0.50	1	5.28	0.02

** GST = GeneSTAR® Tenderness combined marker panel = total number of favorable CAST-T1 and Calpain316 alleles; value of an average star.

*effect of CAST-T1 and Calpain316 estimated separately; Calpain316 has a larger effect than CAST-T1.

B1. Combined Reference Sample Two-marker Genotype Effects (contrasted to CAST-T1 "GG", Calpain316 "GG"), Standard Errors and Frequencies

Reference Population	Trait	No. Head	Allele		Estimated Effect	Standard Error	No.	%
			CAST-T1	Calpain-316				
Combined	Warner-Bratzler Shear Force (lb)	662	2 (CC)	2 (CC)	**-1.5**	0.5	20	3.0
				1 (CG)	**-1.1**	0.4	158	23.9
				0 (GG)	**-0.6**	0.3	250	37.8
			1 (CG)	2 (CC)	**-1.2**	0.4	8	1.2
				1 (CG)	**-0.8**	0.2	64	9.7
				0 (GG)	**-0.3**	0.1	109	16.5
			0 (GG)	2 (CC)	**-0.9**	0.2	1	0.2
				1 (CG)	**-0.5**	0.1	19	2.9
				0 (GG)	**0**	0.0	33	5.0

Source: NBCEC GeneSTAR® Tenderness Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/GeneSTARtenderness/GeneSTAR_tenderness_test_results.htm

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B2. Effect of One Star on the Target Trait

Reference Population	Trait	No. Head	No.of Stars	Estimate	SE	N	%
Combined	Warner-Bratzler Shear Force (lb)	662	4	-1.6	0.3	20	3.0
			3	-1.2	0.3	166	25.1
			2	-0.8	0.2	315	47.6
			1	-0.4	0.1	128	19.3
			0	0.0		33	5.0

Source: NBCEC GeneSTAR® Tenderness Validation Study Results
http://animalscience.ucdavis.edu/animalbiotech/ValidationStudies/GeneSTARtenderness/GeneSTAR_tenderness_test_results.htm

Additional Reading:

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