



LOGIX

EDITION 03

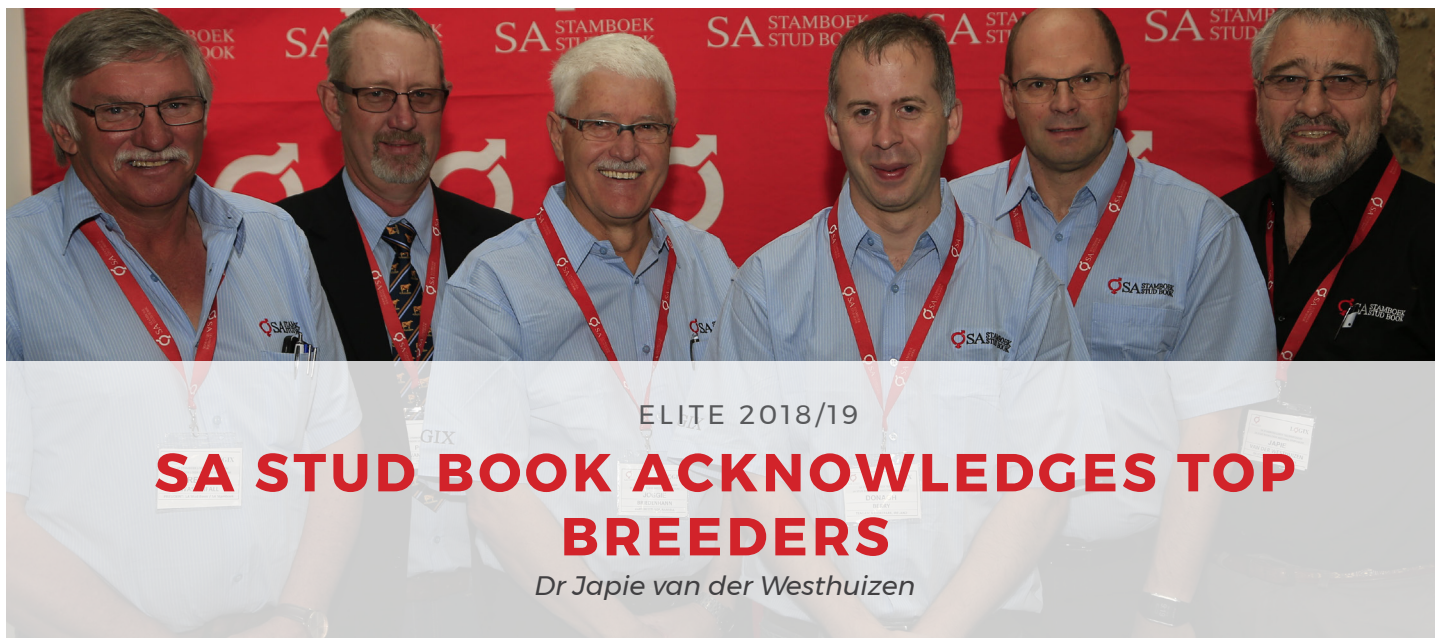
LOGIX
NEWSLETTER

DECEMBER 2018

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THE SPEAKERS AT THE LOGIX ELITE BREEDING SYMPOSIUM

FROM LEFT TO RIGHT: Mr Freddie Wasserfall (President of SA Stud Book), Poena van Niekerk (EDE Dairy Farming), Dr Joggie Briedenhann (Hartebeestloop Bonsmara Stud, Namibia), Prof Donnagh Berry (TEAGASC, Ireland), Dr Andre Eggen (Illumina, Paris, France) and Dr Japie van der Westhuizen (CEO of SA Stud Book). (Photo: Johan Norval)

SA Stud Book has once again recognized top stud breeders who meticulously record economically important traits and then use the information to improve their herds. It also gives breeders an opportunity to compare their herds to those of their fellow breeders. Professor Donagh Berry of Ireland and Dr Andre Eggen of Illumina's talks have dealt with the very latest developments in livestock and genomics worldwide. Local speakers have also informed the audience about important practical aspects of animal breeding.

The highlight was when the necessary recognition was given to breeders. All breeders who record on Stud Book's Logix system are automatically eligible for an ELITE award.

The ELITE Awards held at Alfa in September offered breeders the ideal opportunity to compare their recording, management and breeding practices to those of other breeders.

THE FOLLOWING AWARDS WERE MADE:

- ELITE BRONZE – Top 21% - 30% herds
- ELITE SILVER – Top 11% - 20% herds
- ELITE GOLD – Top 10% herds
- ELITE DOUBLE GOLD – Top 10 herds

THE CRITERIA ARE SET AT:

01.

Completeness of recording and practices followed

02.

Reproductive performance of the herd

03.

Genetic level of the herd



The **ELITE DOUBLE GOLD** herds are eligible to be named as the **ELITE PLATINUM** Herd and eventually the winner of the **ELITE NATIONAL HERD**. The platinum awards will take place at Stud Book's ELITE Gala Awards Event on 29 April 2019 in Bloemfontein.

For more information and photos, see: <https://www.agriorbit.com/sa-stamboek-vier-elite-fees-by-alfa-2018/>

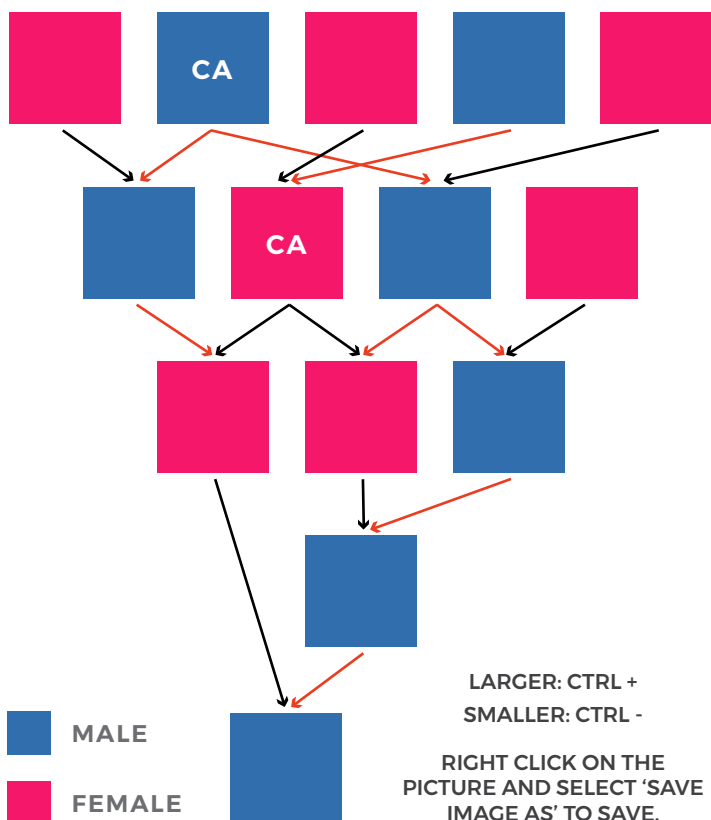
THE ELITE BEEF CATTLE REGIONAL WINNERS

FROM LEFT TO RIGHT: Kerneels van Rensburg, standing in for Willem Pieterse, Mpumalanga-regional winner, Hendrik Meyer, Limpopo-regional winner, Deon Viljoen, East Free State regional winner, Dr Japie van der Westhuizen, CEO of SA Stud Book, Nick Serfontein, West Free State regional winner, and Johan de Jager, standing in for Frik Venter, Gauteng-regional winner.

PEDIGREE AND INBREEDING ON LOGIX



A new function of Logix has been released with which breeders can visually see the pedigrees and inbreeding coefficients of their animals. This is new for most horse and dog breeders, but has been available for cattle and small stock breeders for some time already.



WHAT CAUSES INBREEDING?

Inbreeding is caused by common ancestors in the sire and dam's pedigrees. In this example there are two common ancestors (CA) which results in an animal that is 10% inbred.

METHOD

1. Log in on Logix (www.logix.org.za)
2. Click on Enquiries and then on Animal Information
3. Enter the animal's information and click on Submit. The animal's information will be shown on the screen.
4. Click on the Pedigree tab at the top of the Animal information screen.
5. Press the ↓ arrow on your keyboard to reach the bottom of the screen. Click on Schematic Representation under Pedigree.
6. Select the number of generations and click on Send. (Five generations usually works best)
7. The Pedigree will then be shown.
8. Information in each block:

- Breed
- Animal's Name
- Registration no
- Birth date
- Inbreeding

Breed:SAH
PATRIA
0011631744
BDate: 1997-10-23
Inbrd: 10 %

TAKING OF A HAIR SAMPLE FOR GENOMIC TESTING

Suretha Francis

Hair is the most common form of DNA samples sent to SA Stud Book for genomic analyses. It is very important that the sample is taken correctly to ensure that sufficient DNA is present in the sample and results can therefore be obtained. It is important to note that the DNA is not contained in the hair shaft itself, but in the follicle or root bulb. It is vital that the root bulb is present in the hair sample as this is the part of the sample from which the DNA will be extracted. Collection of hair on extremely young animals can be problematic as the hair follicles are small and still developing. It is recommended that animals are at least 60 days of age (2 months) before hair samples are collected.

Hair has several advantages over other types of DNA samples, including a lower cost of sample collection and easier long-term storage of samples at room temperature. One strategy, becoming increasingly common, is the collection of hair samples on all calves at marking/weaning, whereby the hair sample of each animal is placed in an individual paper envelope and stored in a cool, dry place (filing cabinet) for use when DNA testing is required.

HANDY TIPS WHEN COLLECTING HAIR SAMPLES

1. Hair samples should be collected from the switch of the tail, by selecting at least 40 hairs (approximately the size of a thick pencil) that are dry and free of any foreign matter (e.g. manure, dirt), and pulling the hairs “up and away” from the tail switch, making sure the roots are still attached. Pliers can be used if a better grip is needed.



2. When collecting hair samples, place the hair sample in a paper envelope. Use a separate paper envelope for each animal. Check the identification number of the animal and record the number on the envelope. Also record the full registration number. The envelopes can be prepared beforehand but ensure that the hair of the animal goes into the correct envelope.



3. Take care during the collection process to prevent cross-contamination of samples. Wash hands between the collections of each hair sample to ensure that hands are clean. Also ensure that the work bench is clean and do not cause cross-contamination. Also ensure that the work-bench is clean from any hair before taking the next sample.



4. Place samples and completed paperwork in a sturdy postage bag or box. Send samples by registered mail or courier to SA Stud Book. **Please send to: For Attention: Elsa van den Berg, SA Stud Book, PO Box 270, Bloemfontein, 9300.**





THE WILD TYPE COAT COLOUR ALLELE

Dr Helena Theron & Dr Bobbie van der Westhuizen

Coat colour has fascinated breeders for many years, but the underlying genes have only been discovered fairly recently, and many are yet unknown. The gene causing red and black is the Melanocortin 1 Receptor gene (MC1R). This gene has four alleles: ED (dominant black), Ebr (black/red or Telstar); E+ (wild type; also known as the extension or neutral gene) and e (recessive red). The wild type is thought to represent the ancestral Aurochs colouration, from which modern *Bos taurus* breeds have descended. Breeders that have recently genomically tested their animals at Stud Book have received the MC1R colour gene results as well. It is reported as two different SNPs at the black locus (ED/ED; ED/E+ or E+/E+) and the red locus (e/e; e/e+ and e+/e+).

COAT COLOUR ALLELES OF THE MC1R GENE ARE AS FOLLOWS:

1. ED (Black): When ED is present in an animal, it is typically black. This is a dominant allele. (If the animal has one or two ED alleles, it will be black).
2. e (Red): Cattle that are e/e are red. This is the recessive allele.
3. E+ (Black wild) and e+ (red wild): These alleles act as “neutral” alleles. E+/E+ e+/e+ homozygotes can be almost any colour, since other genes dictate what pigments are produced. They range in colour from yellow to red/black; usually determined by other genes that are breed specific.
4. ED/E+ cattle are typically black, although may produce various degrees of red pigmentation on a black background.
5. e/e+ cattle are typically red, but could have darker hair on the extremities (head, muzzle, neck, ear tufts, feet or tail switch) and they often have a black nose.
6. The wild type (E+/E+ e+/e+) is found in breeds with shaded body colour like the Brown Swiss, Braunvieh and Jersey, where their typical colouration is caused by another gene, the Agouti colour gene.
7. Ebr (Black/red or Telstar): red colour at birth which changes to black at a young age. It has been found in some Holstein families.



FIGURE 1: The wild type gene sometimes causes colour changes as the calf ages. This e/e+ calf was typically red at birth, but had black markings on its nose. At about 3 months of age she was darker with a nearly completely black nose. At about 5 months old, she had a dark red colour with darker areas on her neck, hindquarters and tail.

GENETIC TERMINOLOGY EXPLAINED



Here follows a summary of genetic and genomic terms, some of which are used in other articles.

QUANTITATIVE TRAITS

Quantitative traits are determined by many unknown genes with a small effect each, while the environment also influences the expression of the trait. Examples of these traits are most production traits such as growth, milk and fertility. They are selected for by using breeding values (EBVs) or with genomically enhanced breeding values (GEBVs), which are a combination of SNP markers and EBVs.

GENE

A piece of DNA that produces proteins that causes / influences / affects trait(s) in the animal.

ALLELE

The DNA in a gene can mutate in different places, resulting in different forms of the same gene. The MSTN (Myostatin) gene has different alleles, for example, the normal allele, as well as 9 different mutations that cause double muscling (DM). Although many different mutations exist in cattle, each animal can only have TWO alleles in its DNA, one allele received from its father and one from its mother

DOMINANT / RECESSIVE

Sometimes alleles display dominance, for example, if an animal carries the normal MSTN allele and one of the mutations, the normal allele will dominate the other and the animal will present as normal. The MSTN mutations are recessive, so to show double muscling, the animal must carry both affected alleles (homozygous for alleles).

CARRIER

An animal is a carrier of, for example double muscling, if he has one of the 9 mutation alleles (heterozygote). If the animal received one of the mutations from one of its parents, it can transfer the mutation to its descendants.

CARRIER ON CLEAR BREEDS 50% CARRIERS AND 50% CLEAR		CLEAR	
		A	A
CARRIER	A	AA Clear	AA Clear
	a	Aa Carrier	Aa Carrier

FIGURE 1: Heritability of MSTN: (A is normal allele; a is a MSTN mutation). If carriers are mated to clear animals, no double muscled calves will be born, but 50% of the progeny will be carriers as well.

SINGLE-GENE TRAITS

Single-gene traits are determined by (mostly) single genes with a large effect, for examples MSTN which produce Myostatin protein and MC1R which causes coat colour in cattle. DNA markers are available for some of these genes, which make it possible to determine the genetic status of the animal.

MUTATION

A gene that has undergone a change which influences the trait; for example a gene that causes animals to be black, mutates and now animals carrying the mutation is red.

HOMOZYGOUS / HETEROZYGOUS

If the animal received two identical alleles of both parents, he is homozygous and if the alleles differ, he is heterozygous and also a carrier for the specific trait.

DOUBLE MUSCLED

If the animal has received two alleles for a specific mutation from both parents, it will show the double muscling syndrome.

CLEAR

If the animal received two normal alleles from both parents, he is normal and can't breed DM progeny for the specific mutation. To be classified as clear for double muscling, he must not have any of the MSTN alleles.

CARRIER ON CARRIER BREEDS 50% CARRIERS, 25% DM AND 25% CLEAR		CARRIER	
		A	a
CARRIER	A	AA Clear	Aa Carrier
	a	Aa Carrier	aa DM Calf

FIGURE 2: If carriers are mated, there is a 25% chance that a double muscled calf will be born. 50% of progeny will be carriers and 25% will be clear.



DOUBLE MUSCLING IN BEEF CATTLE

Dr Helena Theron

One of the selection goals in specialized beef cattle breeds is to improve carcass quality. Consumers prefer meat with less fat because it is perceived to be healthier with regard to coronary heart diseases. Producers and butchers require a higher meat yield and a smaller fifth quarter, which result in more edible meat cuts. Double-muscled (DM) animals provide this type of meat. Myostatin is a protein that stops muscle growth in young animals. Mutations of the myostatin gene (MSTN) causes myostatin to be partially or completely inactive, which then causes muscles to keep on growing, resulting in certain identifiable characteristics known as the double muscling syndrome. It is present in many mammalian species, from mice to dogs and horses and even in humans.

WHAT CAUSES DOUBLE MUSCLING?

The Myostatin (MSTN) gene mutates reasonably easy and around 20 mutations of the cattle Myostatin gene have already been identified. Most of these mutations don't have any visible effect, as parts of the gene are inactive. However, some mutations have a large effect and are therefore economically important. Nine mutations are currently active in bovine populations and are included in routine DNA testing. Some of these mutations are very breed specific, while others are common across species. Some breeds have only one mutation, but more than one of the mutations are present in many breeds.

CHARACTERISTICS OF THE DOUBLE MUSCLING (DM) SYNDROME

1. THE MEAT IS VERY LEAN WITH AN ALMOST TOTAL ABSENCE OF MARBLING

DM animals have very lean carcasses. Due to a higher lean meat content in the carcass combined with a lower fat and bone content, DM animals have a very high dressing percentage, with an average of 67% in bulls. Muscle enlargement varies and ranges between 8 to 51% in the forequarters and 9 to 34% in the hindquarters. The meat is perceived to be healthier due to reduced saturated fatty acids, although the low marbling may reduce meat flavour.



ABOVE: Meat of a double muscled animals which contains very little fat

A lower collagen content makes it mostly more tender, although meat tenderness, colour and juiciness are not always improved, due to a more glycolytic metabolism. Due to the low concentration of myoglobin, meat of DM cattle tends to have a lighter colour. Special slaughter conditions are also necessary to maintain a high meat quality and to prevent cold shortening and meat toughening. The maturation rate of the meat is also faster.

2. FINE THIN BONE STRUCTURE AND MOBILITY PROBLEMS

DM animals have smaller limb bones and a decrease in bone weight of about 3 - 10%. This causes poor rear leg structure and difficulty of movement.

3. SMALL INTERNAL ORGANS

Vital organs like the heart, liver, lungs, digestive tract and skin of DM animals are smaller than those of normal animals. Their lungs are 20 - 25% smaller, making them more prone to respiratory diseases.

4. LOWER MALE FERTILITY

DM males have smaller testes and significantly poorer semen quality.

ADVANTAGES

1. Mainly the production of lean red meat.
2. Very high dressing percentages due to more meat, less bone and fat and smaller internal organs.
3. In Europe there is a market for DM meat.

DISADVANTAGES

1. Double-musled animals are generally dysfunctional in most environments.
2. Many health issues require specialized care.
3. Lack of performance on feed make them unsuitable for finishing in feedlots.
4. Males and females have many fertility issues as well as calving difficulties and a low survival rate.
5. Meat needs special treatment and may also be too lean for the local market. (Not suitable for a braai!)

INHERITANCE OF DOUBLE MUSCLING

These mutations are mostly recessive, meaning an animal needs 2 copies of the defective gene to show the syndrome. It seems that the expression of the MSTN mutation genes differ between breeds, due to the influence of other genes already present, probably there due to breeder selection. For example, Belgian Blue cattle share the same myostatin mutation (nt821) with many other breeds, but only Belgian Blues show extreme double muscling due to breeders actively selecting for it.

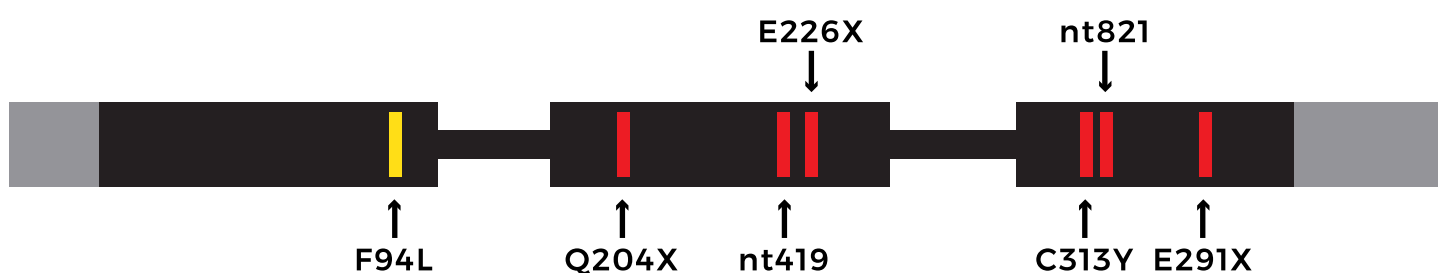


FIGURE 3: Positions of the mutations on the Myostatin gene.

Sometimes the heterozygote or carrier animal shows absolutely no sign of the gene, and sometimes some effects are present in the carrier animal, to different degrees. The most common mutations are nt821, Q204X and F94L. nt821 and Q204X are detrimental genes, as symptoms tend to be more severe. F94L is not so severe and is known as the 'profit gene', as animals carrying two alleles of this mutation have higher meat quality and no negative effects like dystocia, lowered fertility and longevity. F94L is common in the Limousin breed.

5. CALVING DIFFICULTIES (DYSTOCIA):

Due to under-development of the hip bone, pelvic openings of DM dams are smaller, and in addition calves are larger and heavier at birth due to the double muscling. This combination increases the incidence of dystocia and calf mortality in DM cows carrying certain mutations, which is why these breeders do planned caesarean sections. DM cows have numerous other fertility issues as well.

7. LACK OF PERFORMANCE ON FEED

A consequence of the smaller digestive tract is reduced feed intake capacity, necessitating a high energy diet with a high nutrient density. The reduced feed intake capacity also means that DM animals are incapable of efficiently using low quality feeds.

8. HEALTH ISSUES AND LOWER ROBUSTNESS

DM animals are more susceptible to respiratory disease, lameness, nutritional stress, heat stress and dystocia.

6. WELFARE ISSUES

DM animals need special care, such as appropriate nutrition to reduce nutritional stress, proper confinement to reduce respiratory disease and locomotion problems, shade during summer grazing to reduce heat stress, or elective use of caesarean section to reduce calf loss as a consequence of dystocia.



FIGURE 4: Belgian Blue cow with c-section scar.

WHERE DID IT ORIGINATE AND WHY IS IT SO WIDE-SPREAD?

Double muscling was first reported in Shorthorn cattle in the early 1800's. It is currently thought that the founder mutation (nt821) spread from an epicentre localised in the Friesian or Black Pied breed, long before the Friesian's specialisation into milk production. The frequency of DM animals has increased especially in European countries. Some breeds in Europe (especially France, Belgium and UK) are actively selecting for double muscling in their cattle, as Europe has a suckler industry and Europeans prefer meat with less marbling and more unsaturated fatty acids for health reasons. There is therefore a market in Europe for meat of double muscled animals. As cattle in Europe are farmed intensively, dystocia of double muscled cows can be prevented by scheduled caesarean sections. With smaller herds, the required specialized husbandry and feeding practices are also possible.

This is generally not feasible in larger extensively farmed beef cattle herds in South Africa, as in the US, Canada and Australia, and as a result double muscled animals are unwanted in these countries. However, selection for increased meatiness in beef cattle has probably resulted in an increase of carrier double-muscled (DM) animals in these countries. If breeders select for well-muscled animals, they might inadvertently select for carrier DM. There are scientific indications that heterozygotes might have an advantage in meat quality and quantity, and therefore have a selection advantage. However, breeders should not over-react and regard every well-muscled animal as double muscled. Animals need to be tested to determine their DM status.

CONCLUSION

Double muscled animals may have a high meat production, but has a myriad of other problems making them highly unsuitable for South African conditions. Despite this, DM calves are being born in many beef cattle breeds and herds across the world and in South Africa as well, which may indicate that the heterozygote or carrier animal has some advantage. However, breeding animals can be tested for their DM status and the birth of DM animals can thus be prevented.



DOUBLE-MUSCLING IN SOUTH AFRICAN BEEF CATTLE HERDS: PRACTICAL ISSUES

Dr Helena Theron

"The market will dictate that clean bulls will sell for a premium or that only clean bulls will be sold in the near future"

Double muscling (DM) are present in some South African breeds and herds, with many double muscled calves being born to the surprise of the breeder. The extent of the gene in South Africa is currently being investigated by the University of Pretoria with funding from the BGP (Beef Genomics Project). As breed differences seems to influence the expression of the different mutations, especially in carrier animals, more information and research are needed.

Double muscling may be identified by observation, but it is not always clear-cut, especially with regards to identifying carriers. The only sure way to determine an animal's Myostatin status, as well as the mutation involved, is with a DNA test, which is available from SA Stud Book.

SOME DOUBLE MUSCLED (DM) CALVES HAVE BEEN BORN IN MY HERD:

What does it mean?

You have carrier cows of at least one of the DM genes (See Table 1) in your herd, and the sire of the DM calf is a carrier as well. Even if you have not had any DM calves born in your herd to date (yet), it does not mean that you don't have carriers, or that you inadvertently might breed some in future.

How did the DM gene(s) get into my herd?

You have most probably inadvertently been using carrier bull(s). Half of a carrier bull's calves will be carriers as well therefore approximately half of his daughters kept as replacement cows will also be carriers. The gene is as a result now hidden in your herd. If you now use another carrier bull on one of your carrier cows, you only have a 25% chance of having an affected calf, so the gene can stay hidden for a long time. The more carrier cows you have, the more likely that DM calves will be born if you use a carrier bull. Furthermore, using a carrier bull on a carrier cow also has a 50% chance of breeding some more carrier animals. Any of the carrier sons that you sell to other stud herds, will cause the DM gene to spread to that herd as well. There is also the chance that you may breed cows carrying more than one DM gene by inadvertently using bulls carrying different Myostatin mutations (See Table 1).

Myostatin gene mutations

Three mutations are most frequently found in tested animals across all breeds. However, the Stud Book genomics tests through the Weatherby's Lab in Ireland currently tests for nine mutations. The results are presented to breeders as a 0, 1 or 2.

0: The mutation is not present in the animal. If it is 0 for all 9 mutations, it is regarded as Clean.

1: Carrier of the specific mutation, received from either the sire or the dam.

2: Double muscled animal. Both parents are carriers.

What do I do now? Do I have to test my whole herd?

Not necessarily. As a start, you should only use clean bulls, i.e. bulls that have been proven by a DNA test to not carry any DM genes. In fact, the Myostatin status of all breeding bulls should be known: he should have a valid DNA test or both parents should have tested clear. Using a clean bull on a carrier cow will not result in a DM calf, but has a 50% chance of a carrier calf. All breeding stock, especially bull calves that are sold as breeding animals, will therefore also have to be tested, unless the cow is proven clean.

Where and how can I test for Myostatin status?

The Myostatin test can be done on hair samples together with the genomics test. Contact Elsa at Stud Book (elsa@studbook.co.za) in this regard. Samples should be clearly marked for "Myostatin" or "Double Muscling" testing. The results will be kept confidential and will only be published if the breeder gives written permission to SA Stud Book. It is in the interest of all to record the test results on Logix.

PHENOTYPIC TRAITS OF DM ANIMALS

- Extreme muscle definition (a single muscle line in the rump does not mean DM!).
- Large round "bubble butt" well above the hock; extreme sloping pelvis and high tail set. They often have a dirty rump (which is probably why Belgian Blues are shaved).
- Fine, thin bones; straight legs in profile; reversed or slipped knee-joint; stiff restricted rear movement.
- 'Pencil gut' (small internal organs)
- Under-developed scrotum.

TABLE 1: Characteristics of the Myostatin mutations that Weatherby's Lab is currently testing.

MUTATION	DOUBLE MUSCLED ANIMALS (2 ALLELES)	CARRIER ANIMALS (1 ALLELE)
nt821 'nt Gene'	Animals are extremely heavily muscled in appearance, including abnormally large, wide and rounded rump and thighs with prominent creases between muscle groups. There is usually little covering fat, and bones are thin. Birth weights are heavier.	Recessive gene: Carrier looks normal.
Q204X 'Q Gene'	Animals have a larger loin depth, reduced fat cover and greater meat tenderness. Heavier birth weights increases the risk of difficult calving. Females have slightly reduced milking ability.	Partially dominant: Carriers may show some symptoms.
F94L 'F Gene'	Animals show increased muscle mass without increased calving difficulties, lowered fertility or longevity. Meat is more tender with reduced fat and higher proportions of polyunsaturated fats. Very common in Limousin cattle.	Partially dominant: Carriers may show some symptoms.
Other	E226X E291X C313Y nt419: Rare, causes double muscling, heavy birth weights, increased calving problems and tender meat.	Recessive
Other	S105C D182N: Rare, causes increase in muscularity and reduce fat and marbling, with no change in birth weight.	Recessive

PRODUCTION RECORDING FOR DAIRY GOATS IN SOUTH AFRICA

Suretha Francis, Schalk Greyling & Dr Bernice Mostert

Production recording is an invaluable tool for dairy goat farmers to make informed decisions that make economic sense.

1. The most popular dairy goat in SA is the white Saanen goat, imported from Switzerland, England and Germany.
2. The light to dark brown Toggenburg was imported from Switzerland.
3. The British Alpine from England is a black goat with white markings on the face and ears, as well as on its legs and tail.
4. The German BDE (Bunte Deutsche Edelziege) has colour that varies from light, pale or grey to dark brown. It also has a distinctive dark line on its back.

The 'Milch Goat Breeders Society' was founded in South Africa on May 16, 1958, and is a member of SA Stud Book. Animals are classified, selected in terms of breed standards and breed authenticity, and then registered. Producers measure each ewe's milk weight and take a milk sample every 5 weeks, which is used to determine Butter Fat and Protein Percentages, Somatic Cell Count, Milk Urea Nitrogen (MUN) and Lactose at an accredited laboratory. The milk weights, lambing and dry-off dates are also submitted by the producer to SA Stud Book, which records all information on Logix Milk. This data is immediately used for management information, which is valuable for reactive and pro-active action by producers.

MANAGEMENT INFORMATION

UDDER HEALTH: Animals with high somatic cell counts can be identified and treated quickly. Higher somatic cell counts do not necessarily indicate infection, but could also indicate faulty milk machines, over milking or nutritional stress. Dairy goats have a slightly higher somatic cell count than dairy cattle because a milk secretion in goats is apocrine, which means that epithelial as well as cytoplasmic cells are secreted with the milk, while cattle have mecrine secretion, which means that only milk is secreted. The somatic cell count can affect milk production as well as milk quality.

NUTRITIONAL MANAGEMENT: Butter Fat and Protein% are used to evaluate the effective fibre and the energy content of the ration.

BREEDING VALUES help the farmer to select the best genetics as parents of the next generation. Breeding values are currently estimated only for the Saanen breed, as the numbers in the other breeds are not yet enough. New breeding values will be introduced early next year, which will include breeding values for production (Milk, Butter Fat and Protein production and percentage), udder health (somatic cell count), fertility (lambing interval) and conformation. Indices are compiled for Udder, Body and Feet & Legs, as well as a combined index, namely the Logix Type Index.







SELECTION FOR LONGEVITY IN DAIRY CATTLE

Dr Bernice Mostert

Selection on Functional Herd Life (FHL) breeding values will improve longevity of cows due to improved functionality, better disease resistance and better fertility, rendering the breeder the opportunity to apply stricter culling on poor production. This will result in a permanent improvement in herd economics, not only because of genetic improvement of production traits due to the opportunity for increased selection intensity on these traits, but also due to decreased costs for raising or purchasing replacement heifers, as well as an increase in the proportion of mature cows in the herd which will result in improving the level of production of the herd. Longevity is easy to determine from Milk Recording records, because as long as the cow is being milked, she is still alive. This, however, renders a statistical difficulty for analyses of this trait, because as long as a cow is being milked, only the lower bound of her longevity is known. Her record will only be complete when she is culled or dies and for some cows this may take quite some time. For this reason, a cut-off point is usually defined and the survival of cows over a specified period monitored. For the Logix Genetic Evaluation of FHL, the survival of a sire's daughters are monitored over five periods: Survival to 120 days in milk in 1st lactation, survival to 240 days in milk in 1st lactation, survival to 2nd calving, survival to 3rd calving and survival to 4th calving. This is based on the methodology developed by the Canadian Dairy Network for the FHL Genetic Evaluation of cows in Canada. Heritabilities for these five survival traits are low, but in line with estimates for longevity published in the literature. More importantly, ample genetic variation exists between sires which make it possible to select for improved functional herd life of the SA dairy breed populations.

CONCLUSION

FHL EBVs are an excellent tool for improvement of the underlying genetic potential of longevity in a herd, giving the breeder more control to cull breeding stock that will produce less profitable progeny. The Genetic Evaluation for FHL provides an easy way to identify superior sires, has been internationally validated by INTERBULL and results in medium to high genetic correlations with other countries, especially those whose Longevity Evaluation is based on similar methodology.

What does a FHL EBV of 110 really mean? In the following table different levels of survival and average number of lactations are linked to FHL EBVs for sires of the SA Holstein breed, as an example. A sire with a FHL EBV of 136 is expected to breed daughters of which 41% will survive to the fourth parity. His daughters will have an average number of lactations of 2.85. Compare this to a sire with a FHL EBV of 64 : 19% of his daughters are expected to survive to the fourth calving, with an average number of lactations of 2.09.

IMPORTANT ASPECTS FOR RELIABLE ESTIMATION OF FHL EBVS

1. Cancel culled/dead cows as soon as possible on Logix.
2. Do NOT cancel and re-instate cows unnecessarily – this causes instability of EBVs and influence participation in international evaluations, due to the strict requirements that the participating bulls' EBVs should conform to between runs.

TABLE 1: Link between survival traits and FHL EBVs of SA Holstein sires.

FHL EBVS	AVG NR OF LACTATIONS	% SURVIVAL TO 4 TH PARITY
136	2.85	40.6
130	2.81	38.3
124	2.78	37.1
118	2.67	36.4
112	2.58	35.5
106	2.54	35.1
100	2.41	33.6
94	2.39	27.9
88	2.37	27.1
82	2.35	26.8
76	2.32	26.2
70	2.29	25.4
64	2.09	19.3

TARGETED HERD IMPROVEMENT

Schalk Greyling

Throughout South Africa, the question is frequently asked: 'What are the steps that will improve my herd?' Although many answers can usually be given, the best method is the proven one used, tested and refined by many successful breeders. The end goal is to establish a herd that can reproduce and multiply successfully in the environment on the farm. The traits which will ensure that the herd will remain successful needs to be identified and superior animals selected as the parents of the next generation and then successfully mated. To be successful, targeted decisions must be made and systematically implemented. This can be done using the next three steps.

1. DETERMINE THE HERD'S GENETIC LEVEL

Genetic herd improvement can be done for many traits. However, it is important to know at what level your own herd is for those specific traits. Information to determine the genetic level of the herd is obtained from two different sources.

1. The first source of genetic information is obtained from the pedigrees of the animals. The family tree determines the relationships of the animal with other animals in the herd as well as genetic ties to the national herd for the specific breed.

2. The second source of genetic information is performance measurement. All relatives who also have performance measurements are taken into account to ensure that the estimated breeding values are as accurate as possible.

The information of all the animals in the herd is therefore combined in the Logix Genetic Evaluations conducted by SA Stud Book and breeding values are released which are used to determine the genetic level of the herd within the population. This information is extremely important, because it serves as the starting point for herd improvement. All male animals selected to improve the herd must therefore be at a higher genetic level than the current average of the herd for the applicable traits.

2. DETERMINE A BREEDING GOAL

The next very important step in targeted herd improvement is the determination of a permanent breeding policy. Measurable traits of economic importance must be part of this. It is also important to again look at the genetic level of the different traits in the breeding policy. For faster genetic progress, do not try to improve too many traits at the same time. By selecting for too many traits at once, the progress per trait is slower from generation to generation. Positive and negative correlations between attributes can also speed up or slow down progress. An advantageous genetic correlation will mean that if the one trait is selected, the other trait will also improve. An example of this is butter fat and protein percentage in dairy cattle and pre- and post-wean growth in beef cattle and sheep breeds. Adverse genetic correlations have the opposite effect, for example selection for milk solid percentages results in a reduction in milk production in the long-run or selection for larger cows may have an adverse effect on fertility in the herd.

It is also important that the basic breeding policy should remain the same in the long-term, to ensure that progress is made over generations. By making short-term changes in a breeding policy, genetic progress over time will be limited.

After determining the different traits that should be selected for, weights according to importance must be assigned. This is the breeding policy that will be used to select the most ideal male animals for the herd. It should be borne in mind that even low-heritable traits such as fertility can be used as long as there is variation available within the breed.

Economically important traits may, among others, include the following:

BEEF CATTLE: Pre-wean growth, post-wean growth and feed conversion ratio.

DAIRY CATTLE: Milk production, solids production and somatic cell count

SMALL STOCK: Pre-wean growth, post-wean growth, total weight weaned and wool quality and clean fleece weight in wool sheep.

It is very important that herd life and fertility always form part of the selection goal.

The selected animals must also be visually evaluated to ensure that they are functionally efficient. A bull with the best genetics, but not functionally efficient and therefore not able to successfully serve females, will be a disaster.

3. DO THE MATINGS

Once male animals are selected, the most ideal matings to ensure the best genetic progress possible can be made using a computer breeding programme, e.g. **SADairybulls.com** (www.SADairyBulls.com) and **SABeefbulls.com** (www.SABeefBulls.com). By doing this, the potential inbreeding coefficient of the offspring will also be determined for each mating giving the breeder control. The breeder can decide the maximum allowable level of inbreeding to be allowed, but SA Stud Book recommends that it should not exceed 6.25%. With the above exercise, the breeder also gets a summary of the female animals' breeding values and the predicted breeding values of the offspring. To make it even easier, more than one potential bull can also be chosen and a restriction on the number of mating per male animal

can also be imposed. It will therefore reduce the guess work when planning matings in especially in very large herds and ensure that the best mating for the most genetic progress is made. Please take note that SA Stud Book's breeding programs take the complete pedigree of the animals in consideration for calculation of inbreeding coefficients.

By doing the same exercise before each breeding season, the guesswork is removed from targeted herd improvement, especially as the best male animals can be identified according to the particular breeding policy. SA Stud Book has nine advisors available nationwide that can assist breeders in making efficient and cost effective decisions during the breeding season.

NEWS FROM THE REGIONS

RIGHT: In June the Angus Society held a workshop on Angus Beef for Woolworths. Dr Japie van der Westhuizen gave a talk on the breeding process, breeding values and the economy there-of. The next day SA Stud Book gave an RTU scanning demonstration. (Gerdus de Klerk).



ABOVE: Rams at the Merino Sale, Graaff-Reinette



ABOVE: Overgrown claws with cracks shown by a bull in a growth test. These bulls should be culled and not used for breeding (Dolf Cloete).



A group of breeders (Efficient Genes) tested about 80 rams in an intake growth test at Carel Greyling's farm (Carmar Suffolks). This is the 5th year that rams were tested here. (Gerdus de Klerk)



ADDRESS

SA Studbook, Henry str 18,
Bloemfontein, Freestate

POSTAL ADDRESS

PO Box 270,
Bloemfontein, 9300

OFFICE

051 410 0900

SOCIAL MEDIA

 @SASTudbook
 @SASTudbook

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