Feeding the **Future**

The role of Growth Enhancing Technologies is ensuring
sustainable red meat production and *maximizing feedlot profitability*

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FOREWORD

The human population only reached the *one billion* mark in the early 1800's . In November 2011, this number reached *8 billion people* and is expected to reach *9 billion by 2050*.

The United Nation's Food and Agriculture Organization (FAO) predicts that this increase in the human population, along with the predicted increase in *per capita* income in regions such as India, China and Africa, with a resultant increased demand for animal protein, will necessitate a *60% increase in food production*. According to Population Matters™, based on calculations done by Vaclav Smil in 2011[1], 10 000 years ago humans compromised only 1% of the vertebrate biomass on earth. Today, humans comprise 32% of the vertebrate biomass, livestock 67% and wildlife only 1%. At this rate we are currently utilizing the renewable resources of 1.7 earths!

It is thus clear that, more than ever, the responsible use of Growth Enhancing Technologies (G.E.T's) are crucial to the sustainable, profitable production of safe, nutritious protein. Foregoing these products in any feedlot enterprise will place far too great a burden on our natural resources.

We can no longer think of G.E.T's simply as "growth promoters", but see them for what they are: *Tools in aiding in the preservation of the planet for future generations and enhancing feedlot profitability.*

MSD Animal Health Tech Team

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INDEX

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SECTION 1

Sustainability

Sustainability can be described as meeting society's present needs without compromising the ability of future generations to meet their own needs.

It is an irrefutable fact that beef cannot be sustainably produced without the application of Growth Enhancing Technologies.

In terms of beef production, one can view sustainability under four categories:

- **Water**
- **Land**
- **Animal Numbers**
- **Green House Gas (GHG) emissions**

FEEDING THE FUTURE

SUSTAINABILITY

To meet the ever-increasing demand for protein by the growing human population, the South African beef industry has to make a significant contribution to food security. The beef yield per hectare from natural pasture alone is not sufficient and cannot supply the increasing local demand for beef. The entire beef industry, and particularly the feedlot industry, needs to be sustainable to all its share holders: from owner to consumer. Environmental and economic pressures require an innovative approach to help ensure food security. One of these approaches is the correct, strategic use of Growth Enhancing Technologies (G.E.T's) to help meet the challenges in this regard for today and tomorrow.

The use of G.E.T's realises a potential of approximately 12% improvement in daily mass gain, which in turn translates to an additional "x" tons of beef per "x" head of cattle fed under current South African feedlot conditions. Furthermore, a 10% improvement in feed conversion efficiency of cattle with a growth implant equates to "x" ton less feed required to produce a ton of beef. Growth implants contribute positively to the efficient utilisation of limited animal feed resources and to increased protein production, thus helping to safeguard the country's national food security without compromising food safety.

The purpose of this booklet is to equip the beef producer with the information required to make an informed decision on the correct use of G.E.T's. In order to gain maximum growth efficiency, the activity of selected G.E.T's must match the envisaged feeding period of cattle in a feedlot. Understanding the latter is the key to sustainable beef production.

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WATER

An estimated 95% of the water used to produce beef comes from growing feed for the animals[2]. Improving the feed conversion ratio (the amount of feed needed to produce 1kg of live mass) thus has a drastic impact on saving water. ***Without Growth Enhancing Technologies, finishing cattle in feedlots would require 17.9% more water***, and finishing cattle on grazing would require 302% more water[3]. The United Nations, after analyzing current water availability and future projections, predict that conflicts over water will become more common. In the past 50 years, one in four water interactions between countries have been hostile. The importance of the role G.E.T's play in preserving water by increasing feed efficiency cannot be overstated.

ANIMAL NUMBERS

According to research based on US production systems, to produce 1 ton of beef requires 12 510 head of cattle under grass-fed conditions, 8 257 in feedlots without G.E.T's and 7 046 when utilizing G.E.T's. Compared to beef produced from G.E.T-treated feedlot cattle, 11.5% more animals are needed if finished in a feedlot without G.E.T's and 54.6% more animals are needed under grass fed conditions to produce the same amount of beef[3]. If this data is extrapolated to South Africa based on slaughter statistics from the Red Meat Industry Services, ***300 000 more head of cattle would be needed in South African feedlots to produce the same amount of beef without G.E.T's.***

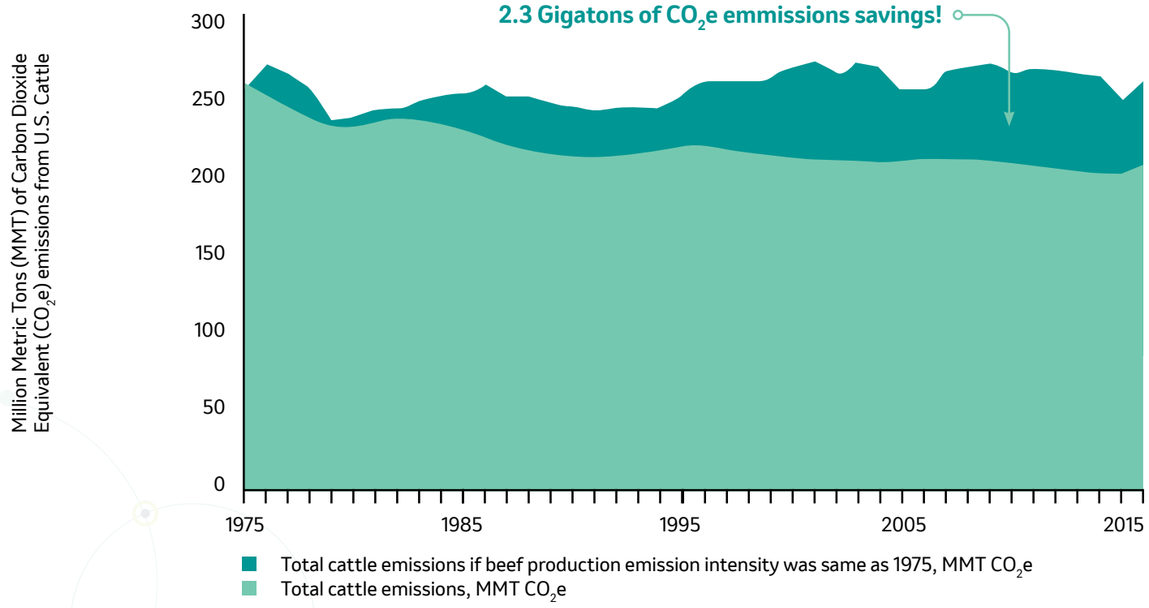
LAND

Compared to finishing cattle in a feedlot with the use of G.E.T's, finishing cattle in a feedlot ***without Growth Enhancing Technologies would require 22.4% more land*** and finishing cattle on grazing would require 80.8% more land for a set quantity of beef. In 2010, the US produced 11.8 x 109 kg's of beef. If all these animals were finished on pasture, 52.2 x 10^6 more ha's of land would be needed to produce the same amount of beef, an equivalent of 75% the land area of Texas.[3]

GREEN HOUSE GAS (GHG) EMISSIONS

The nutrient requirements of these animals can be considered a proxy for resource use and green house gas (GHG) emissions. Removing G.E.T's from feedlots would require considerable increases in land use and methane emissions and place massive strain on habitat conservation efforts. ***Without G.E.T's use in feedlots, carbon emissions would increase by 17.4%[3].***

In the US, if beef production efficiency stayed the same as in 1975 until 2015, cumulatively they would have produced 27% more CO_2. Along with improvements in management and nutrition, growth enhancing technologies play a major role in this reduction of green house gases[4].



Source: UN Food and Agriculture FAOSTAT database

CONCLUSION

It is thus clear that sustainable beef production cannot happen without G.E.T's. One can only look to Brazil, where G.E.T's are not used and animals are finished on grassland, to see the environmental impact these technologies have:

- If this country were to utilize G.E.T's in a feedlot system, they would require 4% less animals, 11% less feed, 12% less water, 11% less land and 13% less GHG emissions.
- This would be akin to removing 62 million cars from the road or planting 11.3 billion trees.
- In South Africa, in order to preserve our biodiversity in the midst of feeding a growing population with limited resources, it would be irresponsible NOT to use growth enhancing technologies.

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4. Source: UN Food and Agriculture FAOSTAT Database

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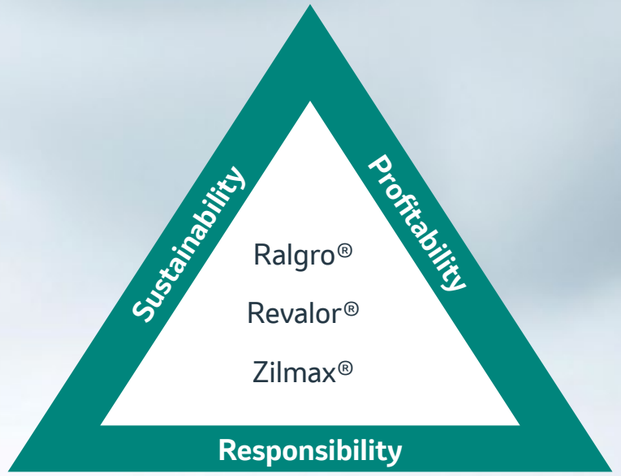
SECTION 2

Profitability



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THE ADVANTAGES OF G.E.T's

Over the last 30 years data has proven the advantages of G.E.Ts are that they, under appropriate nutrition and nutritional management systems, improve the average daily body mass gain as well as the conversion efficiency of the ingested diet (feed conversion rate). The ultimate benefit is not only that beef yield is increased, but that the net cost of gain is lowered.

There are

2 MAIN GROUPS

of growth enhancing technologies:
growth stimulants and
beta-agonists

1

2

GROWTH STIMULANTS

Growth stimulants or growth promotants have been used in the beef cattle and feedlot industry for the last 50 years as ear implants to increase growth performance and profitability.

Considering all purchased inputs used by feedlots, implants give the greatest return on investment. These products improve feed efficiency by 5-10 % and daily gains by 5-15 %.

BETA-AGONISTS

(e.g. zilpaterol hydrochloride, Zilmax® Reg. No. G 2180 Act 36/1947)

Zilmax® is a beta-agonist and a repartitioning agent. A repartitioning agent acts directly on the metabolism of muscle and fat tissues cells to modify the normal utilization of nutrients and energy in the synthesis of more muscle and less fat - ultimately resulting in a higher dressing percentage.Many other factors play a role to achieve a higher dressing percentage.

Some of these are:
Genetics, nutrition, implant program planning and the even dispersion of zilpaterol into an appropriate finishing ration.

APPROPRIATE USE OF G.E.T's

Depending on frame size, breed (maturity type) and sex, G.E.T's will help to achieve a higher dressing percentage. Apart from these factors, proper implant technique, cleanliness of implant procedure and correct delivery of zilpaterol is critical.

Growth implants and zilpaterol do not make up for bad management. High quality feed and the correct percentage of nutrients is essential before implants and beta-agonists can positively influence feed efficiency and gain.

THE ADVANTAGES OF G.E.T's

To understand the workings of G.E.T's, it is important to be familiar with the terminology associated with these products:

HORMONES

A hormone is a chemical product that is excreted from specific cells that has an effect on other cells in a different part of the body via receptors on these cells. Only a small amount of a hormone is needed to change the metabolism of the target cell. There are only a limited number of receptors on each target cell and when these receptors are bound or occupied with hormone, no more hormone molecules can bind, and the excessive hormone will be excreted - usually via the urine.

Endogenous hormones are those produced by the body itself. The human and animal body cannot function without these chemical messengers that carry information from one cell to another to regulate the target cell's function.

Exogenous hormones, on the other hand, are widely used in human (contraception and therapy of some cancers) and veterinary medicine (growth stimulants).

Too much exogenous hormone will lead to receptors on the cell being overloaded, beyond which there will not be an additional or perceived superior effect. It is therefore not advantageous to exceed the recommended dose or to increase the frequency of administration. 'Stacking' is the term that refers to the event where all available receptors are occupied, and no additional exogenous hormone will have an effect.

Hormones are classified as either androgens/androgenic (male) or oestrogens/oestrogenic (female).

The following hormones or hormone-like preparations are currently used as growth promotants in the South African beef industry. They should only be used after the basic nutrient requirements of cattle have been met. There is no substitute for inadequate nutrient intake.

- **Oestradiol**
- **Trenbolone Acetate**
- **Zeranol**

OESTRADIOL

It has both direct and indirect effects on the muscle cell

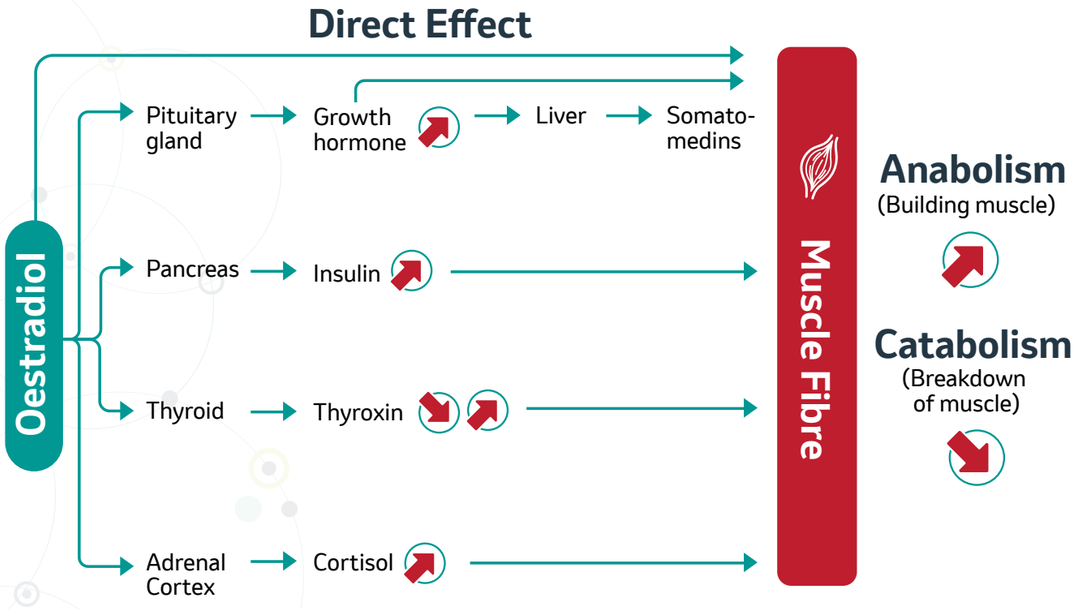
Has a direct effect on the muscle, binds with muscle cell receptors that are:

- oestrogen-specific,
- or to male hormone receptors but with less strength, where they stimulate the processes of building protein (protein synthesis)

Has indirect effects via the endocrine glands that are involved with normal growth:

- It helps to increase the production of growth hormone
- Increases the production of insulin by the pancreas
- Decreases thyroxin by the thyroid gland initially and then it returns to normal levels again
- Decreases the release of cortisol by the adrenal cortex

Growth hormone, insulin and thyroxin all have a building effect on the muscle (anabolic), and lower cortisol levels decrease the natural breakdown effect of muscle (catabolism). Decreased breakdown and increased growth all lead to increased muscle growth.



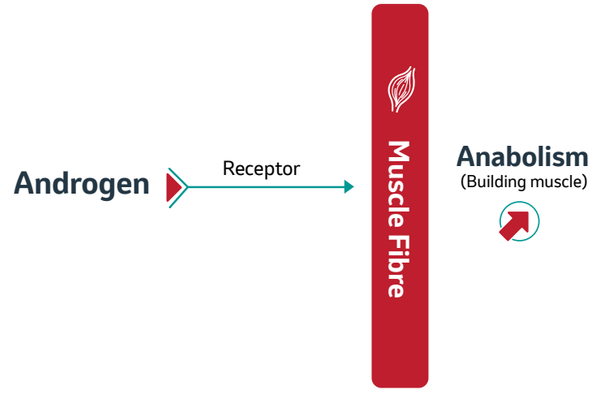
After implantation, oestradiol quickly reaches high, effective blood plasma levels and these levels are maintained for the entirety of the “Duration of Action” (DOA) period of the implant.

TESTOSTERONE
(MALE HORMONE)

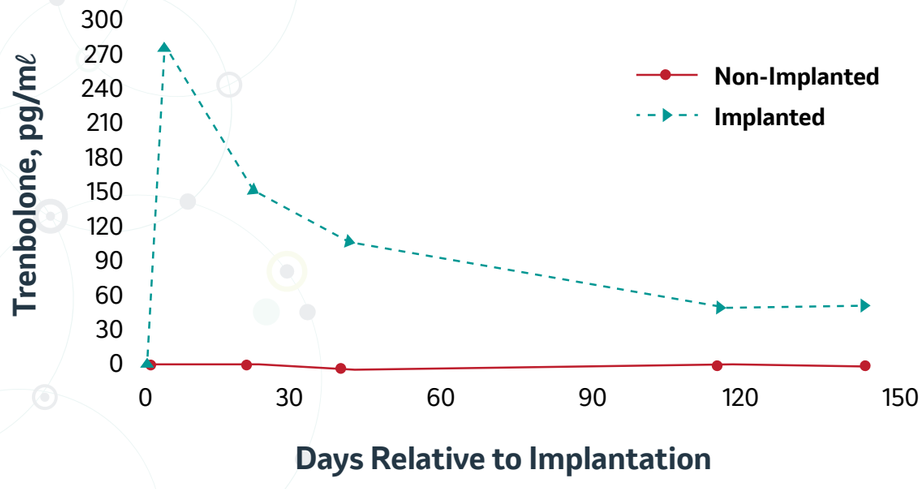
Androgens have a direct action on the muscle fibers, which have specific receptors for the androgen hormone. Treating an animal with this hormone doubles the number of receptors on the muscle which increases the action on the muscle. This increases protein “building” in the muscle. The outcome is muscle growth.

TRENBOLONE ACETATE (TBA)

This is a synthetic anabolic hormone which mimics the action of testosterone but with much better results compared to testosterone, but with none of the associated sexual behaviour characteristics caused by testosterone. After implantation, TBA quickly reach high circulating plasma levels but start dropping off by Day 70 post implantation.



CIRCULATING TRENBOLONE



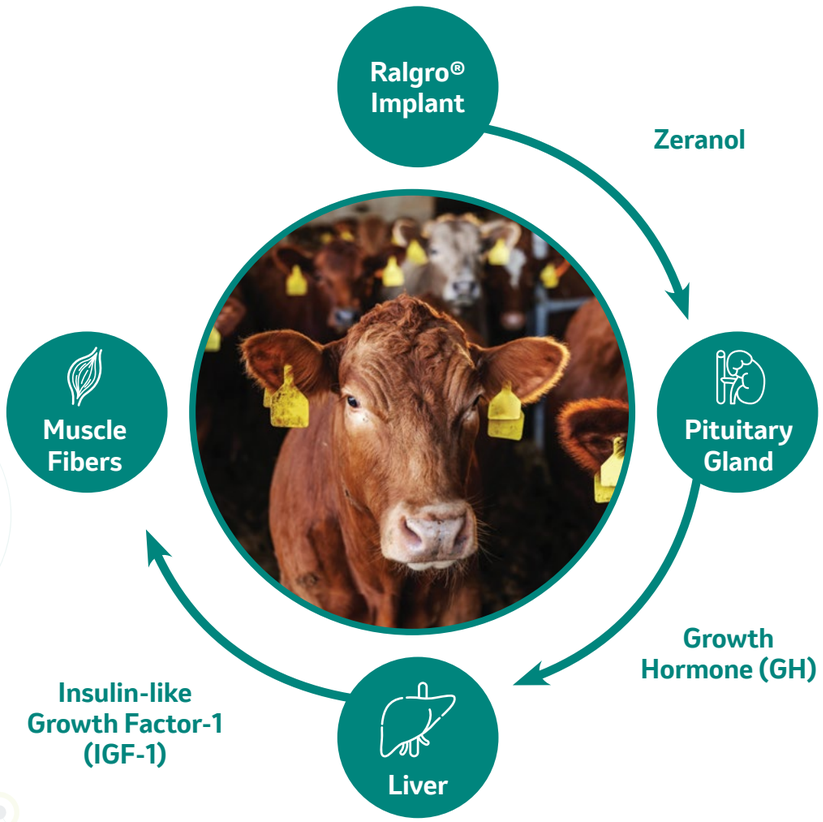
Johnson et al, 1996

ZERANOL

A synthetic female hormone-like product.
Not a hormone.

Zeranol mimics all the effects of oestrogen and has an indirect effect on the pituitary gland in the brain to stimulate growth hormone (somatotropin) production. It does not bind to receptors like testosterone, oestrogen and TBA and can strictly therefore not be classified as a hormone.

Zeranol increases the size of the pituitary gland of the brain. The result is an increase in endogenous growth hormone.



Cascade effect of Zeranol on the endogenous growth regulating system of an animal:
No receptors are involved – so no risk of 'stacking'

WHY USE IMPLANTS?

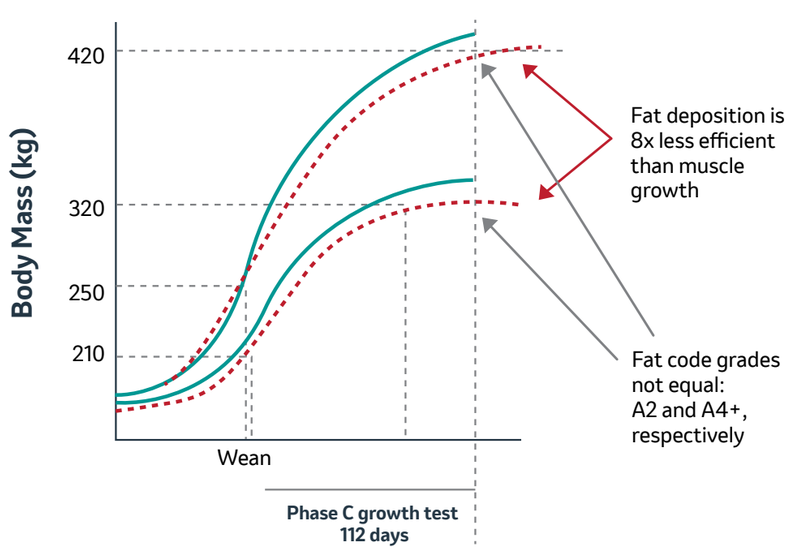
A 5-15% increase in ADG and a 5-10% improvement in FCR can be expected - only if nutrition is of a high quality in healthy cattle with acceptable growth potential.

Implants do not make up for poor dietary management.

Implant strategy is dictated by the expected days on feed until slaughter. Frame size (maturity type), breed, sex and energy density of the ration all must be taken into account.

Factors influencing choice of implant

Heifers and smaller framed cattle accumulate fat faster and need more aggressive implants to delay premature fat accumulation, lengthening the time for muscle growth. Results from Phase C and D growth performance tests cannot be used to compare breeds or types with different types because composition of body mass gain over time differs.



Feed Conversion Rate (FCR) comparison between cattle maturity types

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RALGRO® CATTLE

Ralgro® Cattle
(36 mg Zeranol)

Each pellet contains:
Zeranol 12 mg (73,8 % m/m)
Each implant (dose) contains:
Zeranol 36 mg (3 pellets)
Reg. No. G1406 (Act 36/1947)

- 3 pellets each containing 12 mg Zeranol
- For calves from ages 3-4 months
- Replacement heifers AFTER selection for future breeding at weaning age (7 months)
- Can be used as first implant in lightweight feedlot calves
- Used in cull cows (non pregnant) entering the feedlot in winter after their calves have been weaned
- NOT to be used in mature bulls intended for breeding
- Approximately 90 days activity

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REVALOR®

REVALOR® S

Each pellet contains: 20 mg trenbolone acetate and 4 mg 17 ß-oestradiol.
Each implant (dose) contains:140 mg of trenbolone acetate and 28 mg 17 ß-oestradiol (7 pellets).

Reg. No. G2024 (Act 36/1947)

- REVALOR® S is a slow release anabolic growth promoter which induces the increased laying down of lean meat without increasing fat deposition in cattle (bulls, steers and heifers)
- It increases mass gain and improves feed conversion rate
- Developed to be used as a terminal implant for steers in a feedlot for optimal fat grading
- May be used in bulls, steers and heifers in a feedlot
- Delivers activity for approximately 120 days
- Do not use in animals intended for breeding purposes
- One implant containing 140 mg trenbolone acetate and 28 mg 17 ß-oestradiol is administered to each animal. The implant is administered by using the REVALOR® Automatic Implanter

REVALOR® H

Each pellet contains: 20 mg trenbolone acetate and 2 mg 17 ß-oestradiol.
Each implant (dose) contains: 200 mg of trenbolone acetate and 20 mg 17 ß-oestradiol (10 pellets).

Reg. No. G2023 (Act 36/1947)

- REVALOR® H is a slow release anabolic growth promoter which induces the increased laying down of lean meat without increasing fat deposition in cattle (bulls, steers and heifers)
- It increases mass gain and improves feed conversion rate
- Developed to be used as a terminal implant for heifers in a feedlot for optimal fat grading
- May be used in bulls, steers and heifers in a feedlot
- Strategically used in re-implantation programs as the terminal implant
- Delivers activity for approximately 120 days
- Do not use in animals intended for breeding purposes
- One implant containing 200 mg trenbolone acetate and 20 mg 17 ß-oestradiol is administered to each animal. The implant is administered by using the REVALOR® Automatic Implanter

REVALOR®

REVALOR®-XS

Each pellet contains: 20 mg trenbolone acetate and 4 mg 17 ß-oestradiol.
Each implant (dose) contains: 200 mg of trenbolone acetate and 40 mg 17 ß-oestradiol (10 pellets).

Reg. No. G3925 (Act 36/1947)

- REVALOR® XS is a combination anabolic growth promoter that uses a patented coating technology to provide extended and delayed release of the active ingredients
- For implantation of cattle in the backgrounding phase and on an extended feeding period
- Used strategically to minimize the handling of cattle
- Delivers activity for up to 200 days
- Do not use in animals intended for breeding purposes
- One implant containing 200 mg trenbolone acetate and 40 mg 17 ß-oestradiol is administered to each animal. The implant is administered by using the REVALOR® Automatic Implanter

REVALOR®-XR

Each implant (10 pellets) contains: 200 mg Trenbolone Acetate and 20 mg 17 ß Oestradiol and each pellet is coated with a polymer for delayed and extended release of hormones.

Reg. No. G4490 (Act 36/1947)

- REVALOR® XR is to be used in steers and heifers only and do not use in heifers that are producing or may in future produce milk that may be used or processed for human consumption.
- Do not use in cattle under 6 months of age and cattle intended for breeding
- REVALOR® XR gives you the benefits of a performance-based terminal implant without the hassle of re-handling.
- No need to re-handle cattle through the crush and re-implant at Day 70
- Reduces risk of injuries to cattle or workers
- Less stress on animals
- No reduction in feed intake
- Improved labour efficiency
- Growth responses for Revalor® XR (implanted on Day 0) are similar to that of a typical implant program when cattle are re-implanted with Revalor® H on Day 70

ZILMAX®

ZILMAX®

Contains: Zilpaterol Hydrochloride 48 g/kg.

Reg. No. G2180 (Act 36/1947)

- Non-steroidal growth stimulant for improved body mass gain and feed conversion in feedlot cattle. It improves the beef to fat ratio in the carcass by reducing fat deposition and increasing carcass mass
- Use only in feedlot cattle during the last 30 days in the final finishing stage prior to slaughter
- ZILMAX® is not to be used in the feeding of weaners or steers in the growing phase prior to introduction into a feedlot.
- The dosage of ZILMAX® is 3,125 mg ZILMAX®/ kgBW/day. (BW = body weight)
- ZILMAX® should be mixed into feed at a level of 125 g per metric ton, to provide 6 g of zilpaterol per metric ton of total ration, so each animal consumes approximately 60 mg zilpaterol/head/ day. Rations containing silage or other wet feeds should be corrected to a 90 % dry matter basis

WHAT MAKES ZILMAX® UNIQUE?

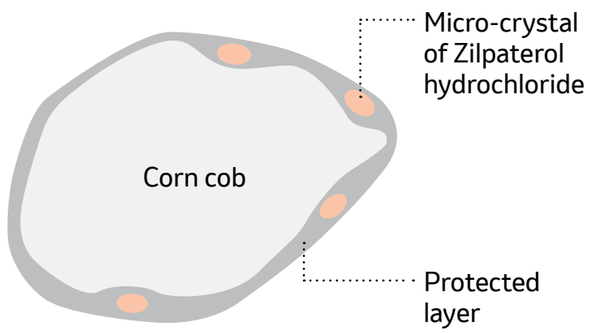
Zilmax® is formulated as a unique patented structure called a BMP (Bi-Modally Protected) granule

This process entails grounding up of corn husks, and then passing these crushed husks through a sieve to ensure uniform particulate size. These particles are then coated with a glue and dusted with zilpaterol hydrochloride micro-crystals and finally a coating layer is applied to ensure adherence of these micro-crystals to the crushed corn particles.

The end result is a zilpaterol formulation that is consistent in concentration and ensures even distribution into feed, is water soluble and less likely to cause accidental human exposure.

Diagram of a BMP granule*

*Process patented



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BETA-AGONISTS (ZILPATEROL, ZILMAX®)

Zilpaterol is a repartitioning agent. It has a direct action on the metabolism of **muscle cells** and **fat cells**

EFFECT ON FAT METABOLISM

Mechanisms involved:

Increased blood flow through the vasodilatory action of the beta-agonists on the vascular receptors.

In the fat cell, there is an **increase** in lipolysis (fat break down) and a **reduction** in lipogenesis (fat building):

Stimulation of the receptors causes an increase in the intracellular concentration of cAMP, which activates a hormone, which is responsible for transforming reserve triglycerides into free fatty acids.

Beta-agonists interact with insulin by reducing the membrane transfer of glucose and hence reducing insulin - driven lipogenesis. It also reduces free fatty acid synthesis.

EFFECT ON MUSCULAR TISSUE

Mechanisms involved:

An increase in blood flow: this is due to the action of beta-agonists on beta receptors on blood vessels.

Stimulation of proteosynthesis: this has been demonstrated through an increased incorporation of labelled amino acids into muscle protein.

A reduction in proteolysis (break down of protein): this reduction in protein catabolism accounts for muscular hyper-trophy and the level of protein synthesis remaining constant.

Beta-agonists stimulate insulin binding to receptors on **the muscle**, increasing its effects at muscle level (glycogenolysis). The difference in insulin receptor structures in the different muscle fibres explains the variety of response to beta-agonists between different muscle groups.

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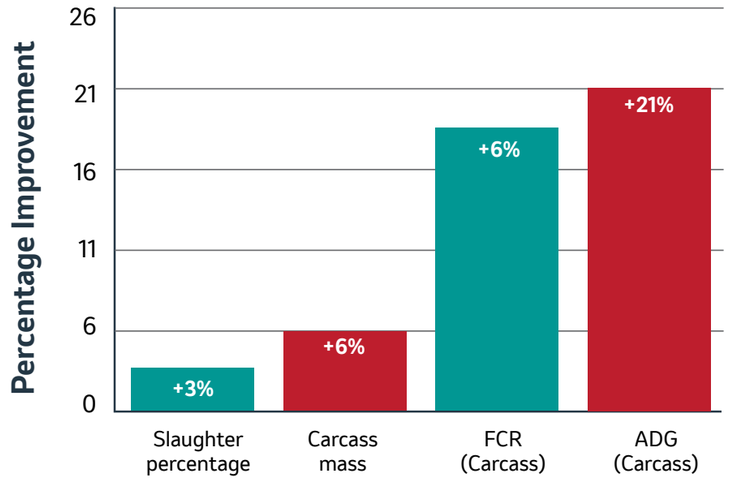
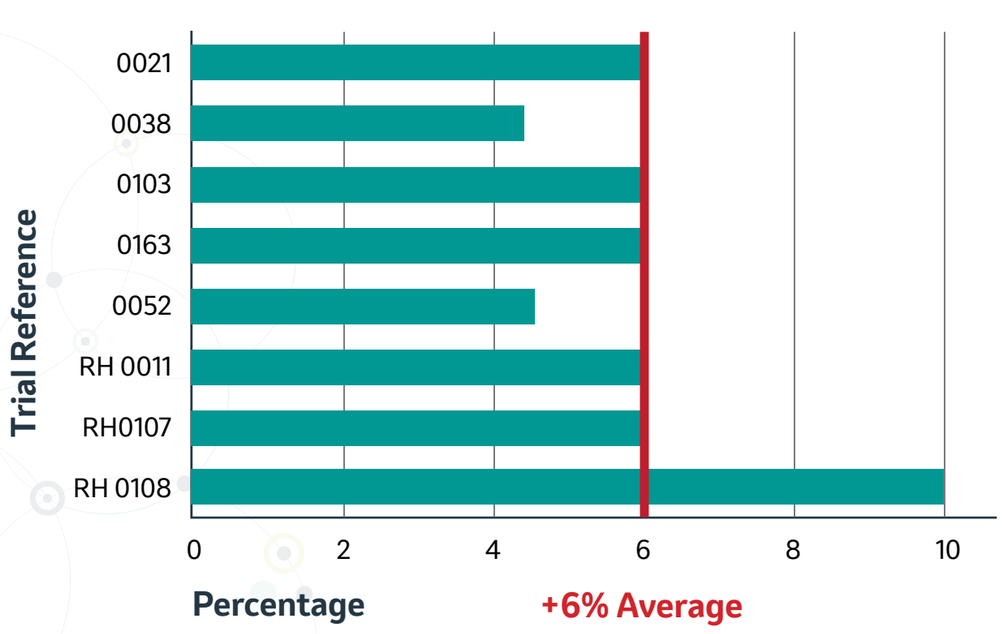
IMPROVED GROWTH PERFORMANCE[1]

[1] Improves FCR by an average of 18%



IMPROVED CARCASS MASS WITH ZILMAX®[2]



[2] Increased carcass mass by 13.5 kg of which 36,3% (4.89 kg) is from live mass gain and 63,7% is from improved dressing percentage

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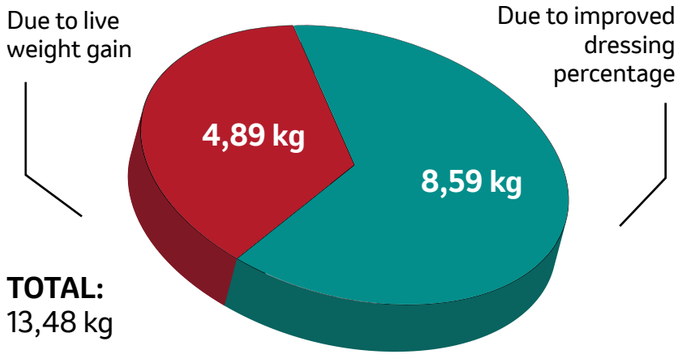
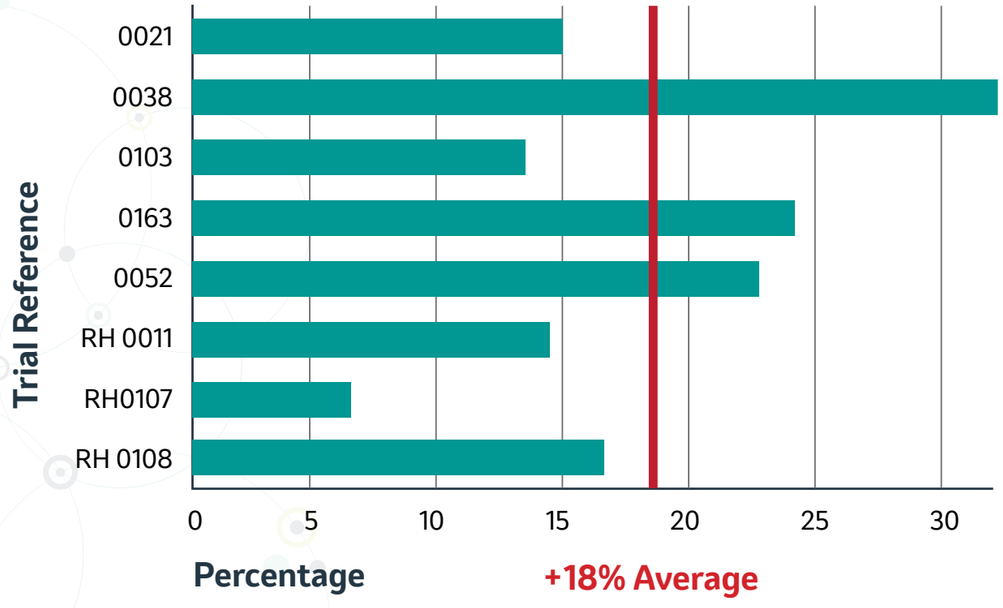
ADDITIONAL CARCASS MASS[3]

[3] Improved average daily carcass gain by as much as 21%



IMPROVED FEED CONVERSION WITH ZILMAX®[2]



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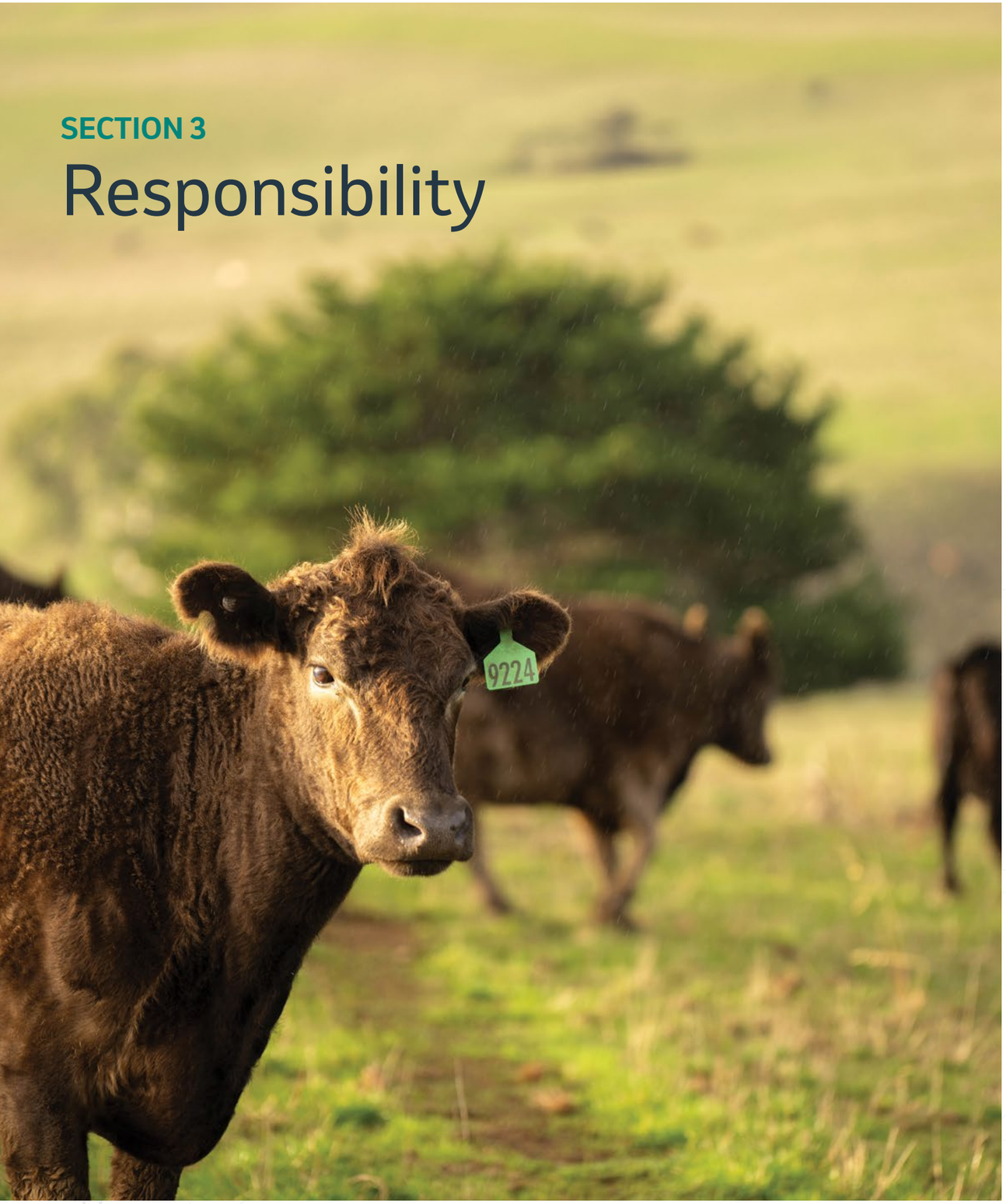
SECTION 3

Responsibility



RESPONSIBILITY

Corporate Social Responsibility at MSD Animal Health looks like this: Sustainability is the balance of environmental responsibility, social acceptability and economic viability.

In the past when people thought about sustainability, they used to think simply about economics. A business and/or an industry cannot survive without economic viability and economic sustainability is still a critical piece of sustainability. However, two other factors that we must balance are environmental sustainability (looking after the land, managing water resources, and air pollution), and social acceptability (people and community). Animal health plays a big role in the sustainability of cattle production by balancing the economic viability, environmental responsibility and social acceptability. MSD Animal Health is supporting its cattle farmers with the animal health products, technologies, training and advocacy they need to make continuous improvement in the economic, environmental and social aspects of sustainable beef production.

MSD is committed to the health and welfare of the animals in our care and the safety of workers who handle these animals.

Even though humane treatment of feedlot animals is the moral responsibility of everyone who works with them, there is scientific merit to low-stress animal handling and proven financial incentives to do so.

A study by Hagenmaier et al examined the effects of high-vs low stress handled animals at the time of shipping on physiological response, blood parameters and carcass quality[1].

- Baseline blood samples were taken to measure stress parameters, then again post-handling and finally during exsanguination at the abattoir.
- Heart rate and respiratory rate were examined prior to and after handling.
- Blood pH, lactate, bicarbonate and base excess were all decreased post-handling in the High Stress Handling cattle, indicating metabolic acidosis.
- Cortisol and adrenaline (stress hormones) were significantly higher in the High Stress group, as well as heart rate.

These factors all adversely affect carcass quality at slaughter. Increased cortisol levels also lowers an animal's immunity, increasing the risk of disease.

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CREATING CONNECTONS

Considering these findings, MSD Animal Health has developed an educational program called Creating Connections, that teaches low-stress animal handling to feedlot workers.

This program helps feedlots add value to their business by adopting techniques that directly improve cattle health and performance and ensure worker safety. Creating Connections also aids the cattle industry in general by improving the public perception of feedlots.

Creating Connections is also an MSD initiative that honours our commitment to taking responsibility for the optimal functioning of our product range. *Thus, supporting animal welfare.*

For more information, visit **www.creatingconnections.info**, or contact your MSD representative to request training by one of our technical veterinarians.

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BIOSECURITY

MSD Animal Health South Africa is acutely aware of the devastating economic effects contagious diseases such as Foot-and-Mouth Disease can have on a feedlot and takes stringent precautionary measures when visiting feedlots.

All MSD personnel who visit farms and feedlots are equipped with overalls, gumboots, a backpack sprayer and disinfectant. Our vehicles are preferably left at the feedlot gate, but if the feedlot is entered the vehicle is sprayed with a disinfect solution that is proven to kill all pathogens, including the FMD virus. As part of MSD Animal Health value added services, we perform Bi-annual biosecurity audits.

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Your Partner in Bio-Security
Standing Together

CHECKLIST

Visitors Entry	Y	N	N/A
Security			
Access control			
Visitors register			
Visitor PPC			
Foot bath			
Vehicle disinfection			
Wheel bath			
Automatic spray course			
Disinfection spray			
Designated biosecurity parking			

Employee Entry	Y	N	N/A
Access control			
Employee access register			
Clean PPC			
Disinfection booth			
Awareness poster			

Disinfectant	Y	N	N/A
Correct disinfectant			
Regime of disinfectants preparation correct			
Contamination noted			
Verification of expiration dates			

Staff	Y	N	N/A
Positive attitude			
Biosecurity training received (Relevant theme)			

Animal Receiving	Y	N	N/A
Veterinarian statement			
Quarantine area			
New animals checked for FMD			
Health assessment done			
Processing audit in place			
Awareness poster			

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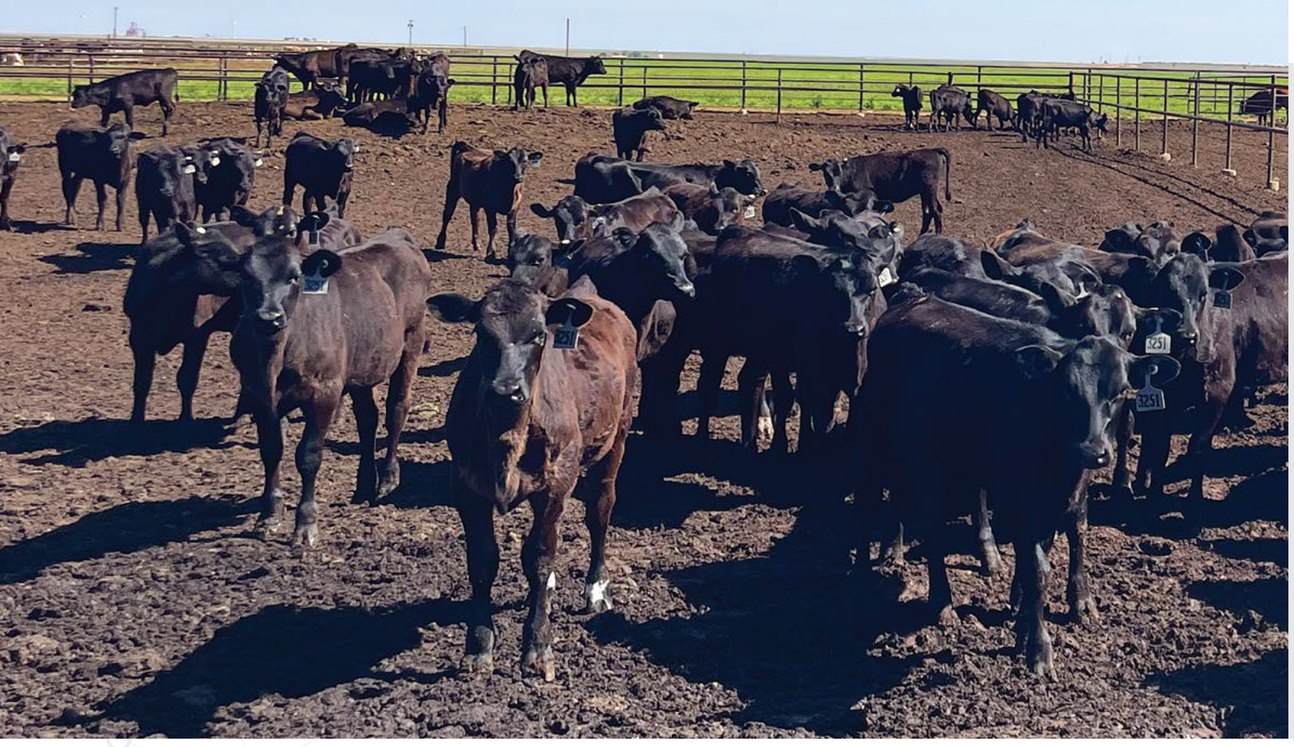
PHARMACOVIGILANCE

As a responsible animal health company, we continue to monitor the quality, safety and efficacy of our products through extensive post-marketing surveillance, despite the approved clinical trials that are performed on all our products prior to them entering the market.

We take every product complaint seriously and report all cases to governing regulatory agencies around the world according to applicable legislation, whether they are linked to the product or not. Whenever possible, we work with animal owners, nutritionist and veterinarians to assemble as much clinical information as possible to try and determine the cause of an animal's health issue, and whether or not the product may have been involved.

Based on analysis of these reports, fully informed scientific assessments about the safety of the product can be made and product safety data can be changed should a trend in adverse event reporting become apparent.

Product complaints can be reported directly to the pharmacovigilance department: **pvahza@msd.com.**



SAFETY

ADDRESSING CONCERNS WITH REGARDS TO GROWTH PROMOTANTS

Studies done by the following institutions support the fact that prudent use of registered growth promotants poses no harm to the consumer:

- FDA (Food and drug administration) – based on strong scientific tests and procedures that are based on the same procedures used in human medication
- Food and Agriculture Organisation/ World Health Organisation
- European Commission, Agriculture Division
- Codex Committee on Veterinary Residue

Studies show that the rise of natural hormone above its natural levels in implanted cattle is not significant and that one can not differentiate natural hormone from implanted hormone in meat residues.

Oestrogen occurs naturally in a variety of food stuffs that people eat every day.

Product	Oestrogen per 500g
Meat: non-implanted	9 ng
Meat: implanted	11 ng
Milk	65 ng
Ice cream	3 000 ng
Eggs	7 500 ng
Peas	2 000 ng
Wheat germ	2 000 ng
Cabbage	12 000 ng
Soya bean oil	1 000 000 ng

Dr. Harlan Ritchie, Michigan state University, 1995

Oestrogen concentration in healthy humans can be compared to that found in implanted meat.

Product	Oestrogen per 500g
Meat: implanted	**11 ng**
Pre-pubertal child	40 000 ng
Grown man	100 000 ng
Non pregnant female	5 000 000 ng
Pregnant female	900 000 000 ng

1ng = 1 billionth of a gram.
Source: Preston, 1997. Rationale for the Safety of Implants. OSU Implant Symposium - Dr. Harlan Ritchie, Michigan state University, 1990

Androgen Content Meat.

Food	Androgen (ng / 113g)
Bull	1,560
Steer implanted w/TBA	34
Heifer implanted w/TBA	6

1ng = 1 billionth of a gram.
Source: Busingy and Grandadam, 1975. Heitzman and Harwood, 1977.

Above: The concentration of androgens in meat of a non-implanted bull and implanted steers and heifers

The use of oestrogen as contraceptive in females has been approved and accepted by the world.

The following is an example of one of the best contraceptives on the market, and no health issues have been raised about this issue:

- Ethinylestradiol (an oestrogen) 30 000 ng
- Drospirenone (an progestagen) 3 000 000 ng

If growth stimulants are used according to the labelinstructions, the possibility of any health risks is minimal. One birth control pill taken in daily by a woman contains the same amount of oestrogen as 56,700 kg of beef from implanted steers.

SAFETY OF GROWTH IMPLANTS

"There is absolutely no evidence of any adverse effects in humans from eating meat treated with legitimately approved products of growth promotion."

- Dr. Phillipe Shubik, Cancer Expert – WHO

- Low oral activity - only 10% absorbed when administered orally.
- Administered in a slow release matrix.
- Implant placed in an IN-edible portion of the animal that does not enter the human or animal food chain.
- Under-utilized hormones are excreted rapidly by the animal.
- Compounds have been proven safe over the last 30 years.

HUMAN OESTRADIOL PRODUCTION

"A man's body produces 15,000 times the oestradiol in a day than he would get from a pound of meat from treated cattle, while a woman produces several million times that. Similar situations apply to testosterone and progesterone"

- United States Food and Drug Administration (FDA)

References:
1. Hagenmaier JA., Bartle S.J., Reinhardt CD., Thomson DU., Ritter MJ., Vogel GJ., Guthrie CA., Starkey R., Siemens MG., The Effects of High-stressverses Low-stress Cattle Handling at the Time of Shipping to Slaughter on Physiological Responses in Cattle fed Ractopamine Hydrochloride
2. Source: Preston, 1997. Rationale for the Safety of Implants. OSU Implant Symposium
3. Dr. Harlan Ritchie, Michigan state University, 1990
4. Busingny and Grandadam, 1975. Heitzman and Harwood, 1977

A PARTING THOUGHT

"Sex hormones are carcinogenic. This is why women get breast- and uterine cancer and men get prostate cancer. The endocrine system of animals and humans would have to be "outlawed" to avoid the effects of these hormones. Oestrogens are carcinogenic in general. It is simply a matter of dose!"
- Dr. R.L. Preston

There is no such thing as hormone free food. There would have been no life on earth if there were no hormones.

NOTES

FEEDING THE FUTURE

NOTES

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