BULL SELECTION AND MANAGEMENT UNDER TROPICAL CONDITIONS RESULTS FROM STUDIES IN NORTHERN AUSTRALIA

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ABSTRACT

The key messages from our research working with bulls in multiple-sire herds in semi-extensive and extensive herds in the northern Australian pastoral industry are as follows:

- Veterinarians have reported that up to 20% of bulls fail a Bull Breeding Soundness Examination (BBSE).
- A BBSE will identify sub-fertile and infertile bulls.
- 2.5% bulls are adequate in multiple-sire matings providing these bulls have passed a BBSE.
- Sperm morphology is an important indicator of calf getting ability.
- Providing bulls are transported and given adequate nutrition post-relocation, the effects of relocation on bull fertility are minimal.

INTRODUCTION

Our work has been directed towards the management of *Bos indicus* or *Bos indicus* infused bulls that are mainly multiple-sire mated under pastoral conditions in northern Australia. Multiple joining of herd bulls represents in excess of 95% of all matings that occur in northern Australia. The objective of our work has been twofold. Firstly it looked at identifying premating predictors of bull fertility. In other words, what are the traits that can be measured in bulls prior to mating that are important for high calf output by individual bulls? Secondly it assessed management strategies that would maximise the calf output of bulls of desired genetics in northern Australian herds.

This paper focuses on the examination, selection and management of bulls for soundness in physical and reproductive traits. Obviously the selection of sires for herd genetic improvement for growth, carcase and other traits is important but is beyond the scope of this presentation.

THE DEFINITION OF FERTILITY IN BULLS

Historically, fertility means capable of producing offspring. Bulls are required to produce many offspring over a short period of time. Therefore the Australian Cattle Veterinarians (ACV) has adopted a definition more appropriate for cattle and **is *"an animal is fertile when it is able to reproduce prolifically"***.

Fertility of bulls is a continuum ranging from very high to very low. Bulls can be classified as:

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- **Fertile** bulls. As a guide, these bulls can impregnate, when joined to 50 cycling, disease-free females, at least 30 of these in the first 3 weeks of mating or at least 45 of these in the first 9 weeks of mating.
- **Sub-fertile** bulls. These bulls can achieve pregnancies by natural mating but not at the same rate as fertile bulls.
- **Infertile** bulls cannot achieve pregnancies.

Sub-fertility in bulls is a major issue as it is often difficult to detect in bulls in beef herds unless there is some detailed performance recording system. Cattle veterinarians regularly note that 10-20% of bulls fail a routine Bull Breeding Soundness Examination (BBSE). There have been cases where up to 50% of bulls fail a BBSE 3 months post-sale (Holroyd *et al.* 2005 p11). Very few bulls are infertile.

CALF OUTPUT OF BULLS IN MULTIPLE-SIRE HERDS

DNA typing for paternity confirmed what we believed, i.e. that the majority of calves are sired by the minority of bulls and that there is a large number of bulls in multiple-sire herds that contribute little. In a study of 235 bulls in multiple-sire matings, resolution of paternity averaged 97.7% across all sites and the non-resolution occurred in herds where closely related bulls were mated (Holroyd *et al*. 2002). However 11% of all calves were sired by unknown sires for reasons such as mixing groups of calves, not bleeding all potential sires and in a small number of cases, precocious bull calves. In this study, 14% of bulls sired over 30% of calves, 58% sired 10% or less and 6% of bulls did not sire any calves at all. The calf output of a bull is repeatable providing the bull keeps passing a BBSE and that there are no major changes in bulls in the mating group (Holroyd *et al*. 2002).

PRE-MATING PREDICTORS OF FERTILITY OF BULLS IN MULTIPLE-SIRE HERDS

These broadly fit into the following categories:
- Physical – Liveweight, body condition score, scrotal size, and physical normality of the testes, penis, sheath, feet, legs, gait and head.
- Semen – both as a crush-side assessment and a laboratory examination for sperm abnormalities.
- Serving assessment used to determine whether a bull is capable of serving normally.
- Behaviour such as social dominance and the social relationship between bulls in mating groups.

Which of these traits are linked to calf output? All of them are to some degree, although some are more important than others. In the study of Holroyd *et al.* (2002), multiple regression models relating pre-mating measurements of physical, seminal and behavioural traits to calf output were developed. Providing bulls have values in the normal range for feet, legs, gait, penis, sheath and testicular tone, these traits should not limit calf-getting ability. Sheath and testicular traits such as scrotal circumference and testicular tone were generally not related to calf output. Dominance hierarchy was difficult to measure but where measured, was not consistently related to calf output (Fordyce *et al*. 2002, Holroyd *et al.* 2002). Measures of sexual behaviours in a serving capacity test were somewhat related to calf output but this relationship was not consistent. For example, in Santa Gertrudis bulls, the number of displays of sexual

interest and mounts but not serves was related to calf output whilst in Brahmans, only the combined libido score was positively related to calf output. Assessment of semen crush-side gives some indication of semen quality, but motility of semen, whilst useful as an indicator of whether semen is suitable for artificial breeding, is not a good predictor of calf output. However, the percentage of normal sperm in an ejaculate was positively related to calf output in Santa Gertrudis and Brahman bulls.

Where social dominance was obvious such as where there were marked differences in bull size and age, it was an important factor contributing to calf output. Where bull groups were of similar age and size, social dominance was difficult to measure thus its impact on calf output of individual bulls could not be determined (Fordyce *et al.* 2002).

The multiple regression models used in this work explained 35-57% of the variation in calf output of individual bulls. Other factors such as mating behaviour in the paddock may have been contributing to this variation in calf output. The importance of mating bulls with satisfactory levels of normal sperm is demonstrated in Figure 1 (Holroyd *et al.* 2005, p 142). These bulls were single-sire mated to about 40 females each. Bulls with lower levels of normal sperm achieved fewer pregnancies and at a lower rate compared with bulls with higher levels of normal sperm. The relationship is not always absolute but can be used as a guide for the likelihood of a bull being sub-fertile.

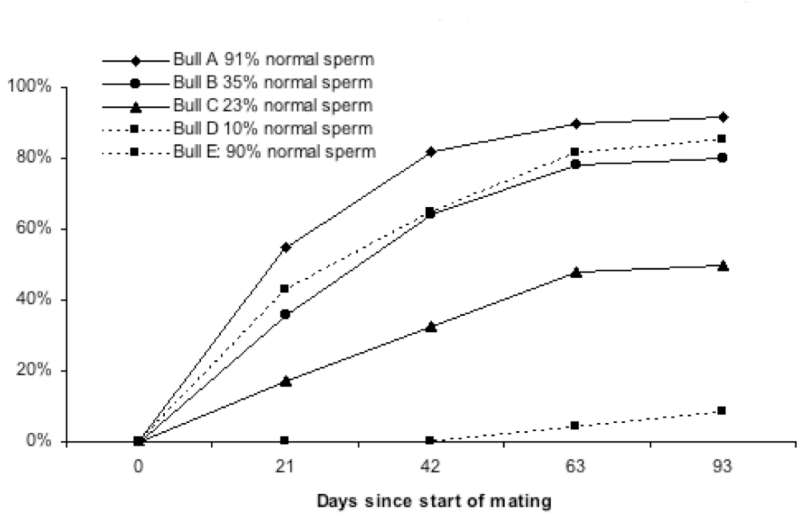

Figure 1. Cumulative pregnancy rates achieved by individual 2 yo (dotted line) and 3 yo (solid) line bulls.

Although the number of normal sperm in an ejaculate is an important indicator, no one single trait should be used as a predictor of calf output. Once traits such as scrotal circumference and percent normal sperm are above threshold levels, there may be little value in placing importance on selecting bulls with larger values of these traits to improve calf output. However, there are other reasons for selecting bulls with a large scrotal size as there is a genetic correlation with female age of puberty. Bulls with larger scrotal sizes sire daughters that have earlier puberty (Mackinnon *et al.* 1990).

Our studies and others have become the basis for the BBSE procedure and have been adopted by the ACV as the standard for the examination of bulls for reproductive function. A systematic BBSE will not identify the highly fecund bulls ('super bulls') but will identify sub-fertile and infertile bulls.

BULL BREEDING SOUNDNESS EXAMINATION (BBSE)

A BBSE is an examination of a bull for reproductive function. We conduct it using standards established by the ACV. These standards are based on scientific research that has related measures in bulls to calf-getting ability.

A full BBSE involves:
- Examining **Physical** traits with emphasis on body condition score, testes tone, penis, feet, legs, leg joints, gait and head;
- Palpation of the **Scrotum** and measurement of scrotal size;
- **Crush-side** assessment of **Semen** for concentration, contaminants such as blood and particularly for motility of sperm and suitability for laboratory evaluation;
- Laboratory evaluation of **Sperm Morphology** (shape). This involves high-magnification microscopy of a preserved semen sample by an accredited person to assess whether a random sample of 100 sperm is above thresholds for 8 categories of morphology; and
- **Serving** assessment to determine whether a bull is able to serve normally.

At the completion of a BBSE, the veterinarian will input the records into a computer program "Bull Reporter" to provide a certificate signed by the veterinarian and the owner/manager of the bull (Fordyce *et al.* 2006). This detailed certificate shows what measurements were undertaken and whether the bull met the fertility standards of the ACV.
Depending on the intended use of the bull or the requirements of various breed societies for sales, not all 5 categories (scrotum, physical, semen, sperm morphology and serving) are required. The more detailed the examination, the less the chance of mating a sub-fertile bull. Clients are advised to, at least, have bulls undergo a physical examination including palpation of the testes as a systematic physical examination of a bull is the foundation of a BBSE.

REASONS FOR UNDERTAKING A BBSE

BBSE establishes a baseline above which bulls can be regarded as having a high probability of being fertile. BBSE is a relatively quick and economic procedure to check that bulls are fertile either prior to sale or prior to mating. If fertile bulls are used, fewer bulls are required, thus enabling more females to be inseminated by high-value bulls; that is, genetic improvement can be accelerated. Accurate conduct and reporting of BBSE enables vets, buyers, owners and managers to make appropriate decisions on selection and management of bulls to maximise herd reproductive performance.

BBSE MEASUREMENTS AND STANDARDS (Entwistle and Fordyce 2003)

*1. Palpation of the **Scrotum** and measurement of scrotal size*
Palpation of scrotal contents will reveal abnormalities such as hernias, possible infections or one testicle being markedly different in size to the other. Measurement of scrotal size with a scrotal tape is a good indicator of daily and total sperm production. A bull will fail a BBSE, either if his scrotal contents are abnormal or, if his scrotal size is not within normal ranges (Table 1).

Table 1. Guidelines for minimal scrotal size (Entwistle and Fordyce 2003, p28)			
Age (months)	*Bos taurus* and *Bos indicus* cross bulls on moderate to good nutrition	*Bos indicus* bulls on moderate to good nutrition	Bulls on poor to marginal nutrition
12- 15	30 cm	24 cm	2 cm less
18	32 cm	28 cm	2 cm less
≥24	34 cm	30 cm	2 cm less

*2. Assessment of **Physical** traits*

Body condition score is a visual assessment on a scale of 1-5 with bulls in very poor condition being 1 (Fail) and fat bulls being a 5. Ideally bulls should be in the range of 3 to 4. Tone of the testes is assessed during palpation and is a guide to the health of testicular tissue. Bulls with very soft or very hard tone fail a BBSE. The penis is assessed visually for any abnormalities by gentling exteriorising it from the sheath, either during semen collection, or during a serving assessment. Feet, legs and leg joints are assessed both in a vet crush and whilst walking for any abnormalities such as elongated claws, sickle hocks and joint swellings. The head is examined from both the side and the front to determine any problems, particularly with the eyes, jaws and teeth. Gait is assessed either prior to entry into, or after release from the crush. Bulls are viewed from both the side and behind focussing on tracking and joints. Bulls with any abnormalities of the penis, feet, legs, gait and head, fail a BBSE.

*3. **Crush-side** assessment of **Semen***

Semen is usually collected by electroejaculation, but in trained bulls, collection using an artificial vagina is possible. An estimate of concentration and motility of the ejaculate is made. Contamination of the semen by pus, blood or urine may indicate fertility problems. Bulls that have dilute semen, or have sperm motility less than 30% fail a BBSE. Bulls with sperm motility of at least 30% are deemed to be suitable for natural mating. If sperm motility is 60% or more, the bull may be suitable for both natural and artificial breeding.

*4. Laboratory evaluation of **Sperm Morphology***

Semen always contains sperm with both normal and abnormal shape. The assessment for morphology is usually conducted in a laboratory because of the need for high magnification microscopy rather than in a cattle yard environment. A laboratory estimation of morphology is done as a wet-mount preparation on several drops of semen preserved usually in either PBS-glutaraldehyde, or buffered formal saline. The current procedure of the ACV is for sperm to be classified in 8 categories (Entwistle and Fordyce 2003 p78). These categories are based on the work of Barth and Oko (1989) and Barth (2000) and the maximum acceptable limits within each category to pass a BBSE is as follows; proximal cytoplasmic droplets (20%); mid-piece abnormalities (30%), tail abnormalities and loose heads (30%), pyriform heads (20%), knobbed acrosomes (30%); vacuoles and teratoids (20%) and swollen acrosomes (30%). The ACV has developed 2 threshold levels for a bull to pass a morphological examination as part of a BBSE. There is a prerequisite of 70% morphologically normal sperm for bulls to be highly likely to be fertile under natural mating (both multiple- and single-sire) and that there is a high probability that their semen can be frozen. Bulls with 50-69% morphologically normal sperm will have a high probability of being fertile under natural matings but caution should be exercised in mating them as single-sires or with high mating loads. Their semen may not be suitable for freezing.

For any morphology results to be certified using the Bull Reporter program, it must be performed by a morphologist who has been accredited through a process overseen by

the ACV. This accreditation process is designed to standardise the identification of various morphological abnormalities.

*5. **Serving** assessment*

To pass a BBSE where a serving assessment is required, a bull must exhibit at least one serve in a standard serving test of 10 minutes for *Bos taurus* bulls and 20 minutes for *Bos indicus* bulls. He must also show no other abnormalities, especially of his penis, that may indicate impaired fertility. Brahman and Santa Gertrudis bulls can perform in serving capacity tests providing attention is paid to managing the bulls, particularly to getting them sexually aroused (Bertram *et al.* 2002). Generally how bulls performed in a serving capacity test was not a good indication of their calf getting ability (Holroyd *et al.* 2002). The value of some form of serving assessment is useful to demonstrate that bulls have the ability to serve, rather than trying to determine how many serves a bull can do which is not a good indicator of calf output

ARE THESE PHYSICAL AND SEMEN TRAITS REPEATABLE?

Scrotal size (r = 0.70 - 0.96) and sheath size (r = 0.61 - 0.70) are moderately repeatable. Sperm morphology (% normal sperm) is generally moderately repeatable (r = 0.69 – 0.75) once bulls have reached sexual maturity (Holroyd *et al.* 2005). If bulls experience some form of stressful process such as trauma, illness or even relocation to harsher climates, this may impair spermatogenesis with a resultant decline in levels of normal sperm. This is usually transient, but may persist for many months

TIMING OF A BBSE

New bulls should pass a BBSE and then be checked on an annual basis. Whenever a problem is suspected, bulls can undergo a full BBSE. Ideally bulls should have a BBSE as close as possible to the start of the mating period, but still allowing time to replace a bull should it fail a BBSE. Even in extensive herds, where animals are handled maybe only twice yearly, bulls should have at least a quick physical examination whenever bulls come through the yards. With sale bulls a BBSE must be conducted a maximum of 28 days prior to sale to meet the standards of the ACV.

SELECTION OF BULLS AS WEANERS AND YEARLINGS

Selection should be based on a number of birth, growth, carcase, temperament, physical and reproductive traits. Comments here will be confined to physical and reproductive traits. Obviously bulls should have 2 normal testicles but the condition of unilateral hypoplasia where one testicle is markedly smaller than the other, is hard to detect in the weaner bull. If possible, select 25-50% more animals than anticipated for sale or mating as this allows some latitude for culling at a later date on traits such as growth, carcase and temperament.

In weaner and yearling bulls, physical traits such as scrotal size and sheath size are at least moderately to highly correlated with later life values from 10 months onwards (Holroyd *et al.* 2005). However trying to select yearling bulls on semen quality traits is not as clear-cut. In some instances there has been a good relationship between semen quality as a yearling compared with that found when bulls have reached sexual maturity

and in other cases the relationship has been poor (Holroyd *et al.* 2005) for reasons we don't understand.

MANAGING YOUNG BULLS FROM WEANING TO MATING

Puberty is reached when bulls are capable of siring progeny, albeit small numbers. As a general rule puberty is reached when scrotal size reaches 25-27 cm, regardless of breed. However semen quality at puberty is generally poor. In *Bos indicus* x *Bos taurus* composites, the average age and weight at puberty in bulls grazing pasture is about 15 months (330 kg) and in Brahmans about 17 months (340 kg). Age at puberty can be reduced by better nutrition (Holroyd *et al.* 2005).

Having reached puberty, bulls undergo a period of reproductive development until they reach sexual maturity. There are increases in scrotal size and improvement in both the quality and quantity of an ejaculate and increases in sexual behaviours of seeking, mounting and serving. Sexual maturity is reached in most composite bulls by 17 months of age and by 21 months in Brahman bulls (Holroyd *et al.* 2005)

Avoid excessive feeding of concentrates to young bulls as overfatness is one of the main reasons of bulls having poor reproductive performance. We have demonstrated that feeding moderate amounts of concentrates (6kg/day of commercial bull pellets through self feeders) to Brahman weaner bulls increased both liveweight and scrotal size but have little effect on semen quality. However, there are some detrimental effects. Flight speed (a measure of "temperament") increased making bulls more difficult to handle and there is a risk of acidosis and lameness. Any advantages in liveweight and scrotal size in fed bulls were lost after 12 months on pasture (Holroyd *et al.* 2005).

From a management point of view, it makes good sense to run groups of young bulls together. This is more efficient for vaccination programs, parasite control, supplementation and feeding strategies. The optimum size of bull groups is generally a compromise of grazing conditions, handling and husbandry requirements. Providing there is no great weight range between animals, there appear to be few problems either from bullying, trauma or homosexual activity of grazing young bull groups of 200-300. Sound fencing, in most cases will keep animals confined. In addition, running bulls in larger groups provides an opportunity to more effectively conduct genetic analyses as the effect of different managements can be reduced.

PURCHASING BULLS AND RELOCATING THEM TO THEIR NEW HOME

There are continuing reports in northern Australia that a varying proportion of bulls are either sub-fertile or infertile in their first season after being relocated to a new environment. Invariably these relocated bulls are newly-purchased. In most cases this depression in fertility is not recognised until bulls have been resident on their new properties for 12 months or more. Our studies in relocation of bulls are reported in Holroyd *et al.* (2005). In one experiment, 50% of bulls failed a BBSE up to 3 months after a sale and relocation. This appeared to be independent of breed, age and property of origin. Most of these BBSE failures were from changes in semen quality. Most bulls subsequently passed a BBSE after being provided with favourable nutrition and management. Experimentally we showed that for bulls relocated under favourable conditions (loaded with familiar bulls, minimum transport times and good nutrition on arrival both in the yard and paddock) there were minimal effects on semen quality.

Bulls undergoing a more stressful relocation process such as through sale yards and mixing with unfamiliar bulls may be more prone to semen quality changes post-relocation.
Ideally relocating bulls at a young age and allowing an adaptation period prior to mating is desirable. Purchasing bulls then immediately relocating them to a new environment and expecting top reproductive performance might be an unrealistic expectation. When purchasing bulls, make sure that they have passed a BBSE. Insist on that they be free of campylobacteriosis, trichomoniasis and pestivirus and that they have been vaccinated for campylobacter and pestivirus.

HOW MANY BULLS TO USE?

In most cases mating 2.5% bulls (1 bull to 40 females) has been found to be adequate in a number of herd sizes and different types of country (Holroyd *et al.* 2005). We could not demonstrate any reductions in subsequent number of calves or differences in calving times with lowered bull percentages. The proviso is that these bulls have passed a BBSE. Caution should be exercised with smaller mating groups: e.g. if mating 250 females, 6 bulls are required and with 80 females, 2 bulls are needed. If one bull is lost out of the 6 then it is not a disaster, but if one bull is lost out of the 2, this may well interfere with pregnancy rates. Less bull injuries were recorded when bulls were mated at 2.5% as opposed to 6%.

MATING AGES OF BULLS

As a general rule, bulls should be mated as young as possible. There is no reason why bulls should not be used initially at 2 years of age. Keeping a bull until it is older is a waste of its peak reproductive life and decreased genetic progress. It is a myth that bulls have to be in prime condition to be joined. If possible, bulls should be mated in groups of similar age and weight. Young bulls are far easier to handle than older bulls. Once bulls have reached 6 years of age, they are more prone to injury and reproductive problems. As well, they are more likely to be carriers of the venereal diseases, vibriosis and trichomoniasis. Culling bulls after several matings should accelerate genetic improvement in the herd if bulls are being purchased on genetic differences.
Few yearling bulls (14-16 months of age) will pass a BBSE, but providing they do pass, mating bulls as yearlings is possible. Based on our studies, pregnancy rates will be reduced if yearling Brahman bulls are used (Holroyd *et al.* 2005).

MATING NEW BULLS

If introducing new bulls and mating them as multiple sires, try and mate all of the new bulls together, rather than putting them into established bull groups, as invariably the new bull will get bullied and be at the bottom of the peck order. This effect may be greater when high (>4%) bull to female mating ratios are used. This recommendation of introducing new bulls is based on anecdote but appears to be supported by science according to the review of Petherick (2005).

VACCINATION PROGRAMS FOR BULLS

Vaccination is good insurance for optimising reproductive performance of bulls. Vaccines can be given simultaneously with, possibly, the exception of tick fever. The following vaccinations are recommended.

- Vibriosis (*Campylobacter*) causes fertilisation failure and foetal loss. Vaccinate initially with 2 doses, 4-6 weeks apart with the second dose 4 – 6 weeks prior to mating. Thereafter an annual vaccination is recommended. Bull vaccination alone is the most appropriate strategy in extensive northern herds.
- Bovine ephemeral fever (BEF) is an enzootic viral disease transmitted by biting insects including species of *Aedes*, *Anopheles* and *Culicoides.* Bulls are prone to BEF, showing fever and lameness, and may not be able to stand. Bulls may die from exposure and dehydration. Recovered bulls have transient semen defects for several months (Burgess and Chenoweth 1975). Initial vaccinations are done 2-4 weeks apart and then annually.
- Pestivirus (BVDV) is a highly contagious viral disease causing embryonic and foetal losses in females and calves that are poor doers and susceptible to other diseases. Whilst pestivirus usually has little effect in bulls, insist that purchased bulls are free of pestivirus. Bulls can be vaccinated as part of a herd vaccination program.
- All breeds have varying susceptibility to the various tick fevers (babesiois and anaplasmosis). Use of current tick fever vaccines appears to pose little risk of reactions particularly when bulls are vaccinated as weaners. One vaccination gives lifetime immunity.
- Bulls should be vaccinated annually against botulism and the common clostridial diseases with a 5 in 1 vaccine.

FUTURE PERSPECTIVES AND ISSUES
RESEARCH

1. Early life predictors of fertility.

CRCs or Cooperative Research Centres are partially funded by the Australian Government and address issues that one research organisation alone can not solve. Current work within the CRC for Beef Genetic Technologies is exploring whether bull reproductive traits can be used to identify early life predictors of fertility both phenotypically (his fertility as reflected by improved calf output) and genetically (his female and male progeny's fertility such as age at puberty) as well as improving lifetime reproductive performance of females. Observations will be made on 3500 young bulls produced by sires selected from BREEDPLAN® herds recording reproductive data such as scrotal size and days to calving. The aim is to develop breed-specific (Brahman and Composite) heritabilities from about 80 sires with 20 progeny per sire per breed. Genetic correlations will be estimated using approximately 1500-2000 dam/son pairs per breed. These bulls will be studied from weaning until 24 months of age. The study commenced in April 2005 and will be completed in November 2011.

2. Other areas of research.

- High energy diets. Whilst there have been some reduction in levels of high-energy diets fed to bulls, feeding bulls for sale is an entrenched practice in the beef cattle industry particularly the stud sector. There appears to be very few reproductive benefits of this feeding, apart from possibly increasing the onset of puberty and it is used mainly as a marketing tool for the sale of bulls. There is considerable interest

from bull sellers on cost effective levels to feed bulls to maximise growth but without compromising physical and reproductive traits and sale price.
- Relocation. Industry feedback still indicates that some relocated bulls have impaired fertility. Our studies found 50% of relocated bulls fail a BBSE within 3 months of relocation and this failure appears not to be related to genotype, age, location and prior feeding. Measurements are required on bulls that have been exposed to larger insults than those imposed in our experiments, such as following bulls through sale yards as part of the relocation process.
- Reproductive behaviour. The multiple regression models in our studies only explained 35-57% of the variation in calf output of individual bulls. Further research into cattle reproductive behaviour may provide some valuable key concepts in developing more efficient and profitable mating management of bulls.

EXTENSION

There is on-going education of veterinarians and cattle producers in the conduct and value of a BBSE. A video on "Bull selection and using the BBSE measures with confidence" has been developed and a CD on "Structure, semen and sperm abnormalities" is now part of the teaching material of some of our Agricultural Colleges. There is ad-hoc training for veterinarians in the use of Bull Reporter.

ISSUES

Two issues being considered by the ACV are in the competency of conducting a BBSE and timing of a BBSE prior to sale:
- *Competency to conduct BBSE*
  The ACV is currently assessing the feasibility of a scheme to demonstrate competence in the use of the ACV standards for the conduct and reporting of BBSE by veterinarians. It will be based upon an open book examination, a declaration of experience in the assessment of at least 100 bulls and demonstrated competence in the use of Bull Reporter.
- *Timing of BBSE prior to sale*
  The current recommendation by many breed societies and sale agents is that a BBSE must be conducted a maximum of 28 days prior to sale. This period puts pressure on bull owners, veterinarians and laboratories to have testing done within what is generally a 1-2 week period given turn around times for paperwork and samples to laboratories. There are moves to extend this period to 70 days before sale as an indicator of bull fertility at the point of sale. By 70 days prior to sale, bulls are usually well advanced in their pre-sale nutritional program. Any defects in semen quality are likely to be evident at that time. Regression in either physical or scrotal traits is very unlikely during the next 2 months, although there may be a temporary effect on hooves. The main issue is in potential changes in sperm morphology that can occur even when evaluation is within 28 days of sale.

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