Managing Herd Bulls on Large Dairies

P.J. Chenoweth, Department of Clinical Sciences, Kansas State University, Manhattan, KS 66506
Phone: (785) 532 5700 FAX: (785) 532 4309 Email: peter@vet.ksu.edu

J.D. Champagne, Dairy Management Services, Tulare, CA

J. F. Smith, Animal Sciences and Industry, Kansas State University

Introduction

Despite the proven genetic (and other) advantages of A.I., natural service (NS) bulls are not a rarity on U.S. dairies. Here, a number of scenarios appear to exist. One is the widespread use of NS bulls on large dairies, especially those newly established, such as in south-west Kansas. Another involves the use of NS bulls in conjunction with pastured females. These options may be combined on the same operation. Another option is to use NS bulls for specific purposes, such as with heifers to reduce dystocia or to produce dairy beef. Dairies employing NS bulls often purchase their replacement heifers, rather than raise them. On newly established large dairies, NS bulls may be exclusively employed initially, and then at decreasing levels as improvements occur in both management and facilities. From the evidence available, it would appear that NS dairy bulls are seldom subject to close scrutiny or monitoring, especially when compared with procedures commonly accepted in the cow-calf sector. In addition, their general level of management seems to be lower in comparison with those associated with other facets of the dairy industry. As a consequence, many dairies are failing to adequately exploit an often underrated resource - the natural service bull.

Natural Service Bull Usage

Estimates from large dairy herds in Florida, and Texas indicate that the use of NS is widespread particularly in those using rotational grazing management systems. One survey (NAAB, 1995) showed that less that twenty per cent of dairies used artificial insemination exclusively. It has been estimated that 60 percent (or more) of large dairy herds in Florida and California employ some degree of natural breeding (Risco, pers. comm). A recent survey (Champagne et al, 2002) showed that nearly 90% of California dairies employed NS bulls, with 12% of herds using NS for more than 60% of breeding. Here, confirmed pregnancies were similar for both AI and NS, regardless of herd size or cow lactation number. Despite evidence of such widespread usage of NS bulls on U.S. dairy farms, there is little information available re. the optimal management of such bulls.

Natural Service Bull Advantages

Bulls may be used in dairy management schemes for a number of reasons, as shown in a recent California survey (Champagne et al, 2002). Here, producers could select more than 1 category.
Problem/hard breeders - 51%
To get cows pregnant - 32%
Clean-up following A.I. - 27%
Heifer breeding - 13%
"No-heat" cows - 13%
Reduced labor - 8%
No heat detection – 6%

A common theme involves problems with heat detection or getting cows bred. The lack of trained, motivated personnel to adequately perform essential tasks such as heat detection can be a major concern on large dairies, especially those that are newly established and those situated in more isolated rural areas. Poor heat detection rate (HDR) is, in turn, a major cause of lowered reproductive performance, production and profitability on dairies (Tables 1-3).

Table 1. Estimated long-term (10 yr) effects of heat detections rates (47, 57, & 67%) on milk production & net revenues/cow/yr at a seasonally adjusted conception rate of 30% (Chenoweth and Larsen 1992)

Heat detection rate	Annual milk production/cow (10 yr avg)	Excepted change per +10% HDR	Net revenues/ cow/year (10yr avg.)
47	14,914 lb		Base
57	15,284 lb	+370 lb	Plus 6%
67	15,476 lb	+192 lb	Plus 10%

This problem can be exacerbated by lack of trained personnel and reduced female heat activity in hot weather. Here, it is a common perception that a motivated bull will detect more heats than will humans, particularly if the latter are poorly trained and motivated. In other words, NS bulls circumvent human errors in heat detection.

Improvement in areas such as cow cull and retention rates are also associated with improved HDR.

Table 2. Culling/replacement rate and average months in the herd/cow when conception rate averages 30% and heat detection rate is varied (47, 57, & 67%) (Chenoweth and Larsen 1992)

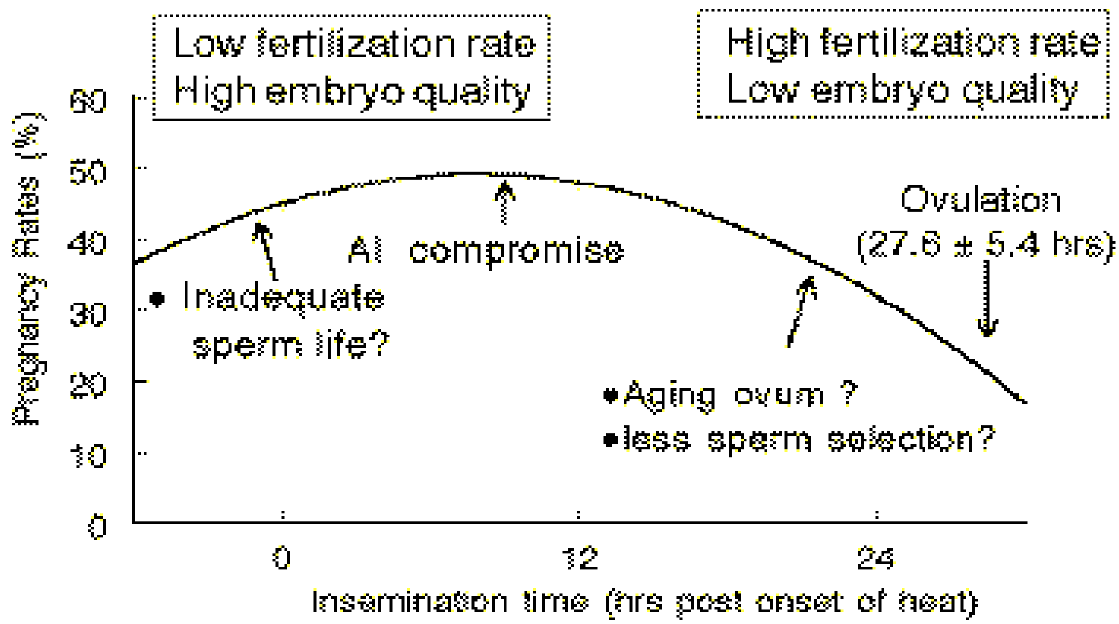
	Heat Detection Rate (HDR)		
	47%	57%	67%
Replacement rate	.41	.35	.33
Avg. mo in herd/cow	25.06	28.08	29.54

Table 3. Effective pregnancy rate (conception rate x heat detection rate) influence on milk/cow/yr, net income/cow/yr, and replacement rate (Chenoweth and Larsen 1992)

Effective pregnancy rate	Milk/cow	Net $/cow	Replacement rate
.15	14,826	Base	.38
.25	16,127	Plus 20%	.27
.27	16,110	Plus 20%	.27
.35	16,482	Plus 26%	.26
.45	16,726	Plus 30%	.25
.63	16,951	Plus 34%	.27

From these estimates, it is apparent that CR and HDR exert their greatest effects on herd production, profit and cow replacement rate, when EPR is between 15 and 25%.

Figure 1 (Saacke et al. 2000)



It is possible that a number of other advantages accrue from using NS bulls, although most are poorly documented. One is the so-called “male effect”, or “biostimulation”. This effect has been shown to influence female reproductive responses in a number of species. A widely accepted application of this phenomenon occurs with sheep. Here, rams introduced just prior to the normal breeding season will induce and part-synchronize estrus in ewes. This effect appears to be most effective when the females are in a "transitional" cyclicity state and the males have been excluded from the flock for some period before being reintroduced as a novel stimulus. More work needs to be done to fully exploit such effects in cattle where biostimulation is less dramatic. An apparent advantage has been described for natural breeding over AI (e.g. Pelissier 1976, Langley 1978) although this may be confounded with other effects associated with the timing of service, and multiple services (Saacke et al, 2000). NS bulls may improve herd fertility because multiple services of females can provide an improved balance between fertilization rate and embryo quality (Fig 1). However, this implies that NS bulls are fertile. A clear-cut advantage has been shown for post-partum return to estrus, whereas the evidence for the advancement of heifer puberty are more equivocal. It still remains uncertain whether or not other advantages, such as stimulating cyclicity in sub-cycling females, might accrue from the presence of bulls on dairy farms. An intriguing strand of anecdotal evidence suggests that herds employing NS bulls have a markedly lower prevalence of cystic ovaries than do herds without bulls.

Thus bulls continue to be used in dairy herds because heat detection and conception rates have important impacts on cow production levels and net returns, both annual and lifetime, as well as on replacement/culling rates within herds. This is despite indisputable advantages for A.I. in promoting genetic progress. However, in the case of large dairies which do not raise all or most replacement heifers, the genetic balance can be maintained by purchasing replacement heifers from breeders who are using A.I. with semen from proven bulls.

Bull Selection

Natural service bulls representing dairy, beef or dual-purpose genotypes may be reared on-farm, purchased, leased or borrowed. In the recent California survey (Champagne et al,2002) 64% of bulls were home-grown, 30% came from multi-sources (e.g. sale barns, contractors), 29% came from a single source and 3% were leased.

Reasons for selecting bulls were as follows (note, more than 1 category could be selected):
Dams milk production - 74%
Bull conformation - 36%
Bull BCS - 35%
Bull age - 22% (with the emphasis on early pubertal bulls)
Bull cost - 12%

Whatever their origin or purpose, the primary mission of the NS bull is to detect and breed estrous females as quickly and efficiently as possible. The ability of the bull to perform this task is influenced by a number of factors including:

- Semen quality (and quantity),
- Libido and mating ability,
- Social "status" (both with other bulls and also with females in the breeding pasture).
- Freedom from reproductive disease

Thus, selection of bulls for natural service duty in dairies should pay particular attention to physical (and reproductive) soundness, sex-drive (libido), mating ability and health. It is highly recommended for all NS bulls to first pass a breeding soundness examination (BSE), as recommended by the American Society for Theriogenology. This should be repeated on working bulls on an annual basis at least. This topic is discussed in more depth later.

Younger bulls (i.e. less than 2 to 2.5 years of age) are preferable to older bulls for the following reasons:

1. They are more tractable and pose less danger to humans.
2. They can be used in multi-sire groups with less danger of the more serious aspects of social dominance being manifest (e.g. injured bulls, broken fences).
3. They have less chance of having developed degenerative or other age-related pathological or psychological problems which might lower their reproductive performance.
4. Although their full reproductive potential is not yet attained, this is probably less important than in beef operations where higher mating loads over shorter periods are more common.

Although younger bulls are preferred, they should be pubertal and not of disparate physical size (larger or smaller) compared with females. For young Holstein bulls being used with mature cows, this would preclude bulls less than approximately 1000 lb body weight The safety aspect is a very important consideration which will be revisited. However, bulls of any age which have bad temperament should not be tolerated on dairy farms. In the recent California survey (Champagne et al, 2002), bull size (73%) and health (65%) were the most common reasons for culling bulls, with bull temperament (53%) and age (37%) also being important.

Care should be taken when buying bulls from sale barns, or other situations in which animals from diverse sources are commingled (approximately 30% of dairy bulls in California). Here, appropriate biosecurity measures should ensure that the diary form is not purchasing unwanted problems, and that on-farm quarantine measures help to reinforce biosafety. Contract bull raisers should adhere to similar health and nutrition protocols as those which have been tried and tested in the beef cattle industry.

The presence of mature bulls on a dairy poses particular concerns and obligations. Facilities should be suitable for bull restraint and handling to minimize the possibility of human or animal injury. A sobering statistic shows that dairy bulls cause more human fatalities in the U.S. than do beef bulls (even though the latter are far more numerous). Working facilities need to be more robust and more safety-oriented than those used just for females. Alleys and chutes suitable for safely moving and working bulls are often lacking on dairies. In addition, fencing around pens and pastures should be sufficiently secure to prevent bulls either from cohabiting with the wrong females or from disrupting other activities or programs. In general, the presence of bulls on dairy farms necessitates a higher level of facilities, stockmanship and caution.

Breeding Soundness Evaluation

The Breeding Soundness Evaluation (BSE) is a relatively quick and economic procedure for screening bulls prior to sale or use. Its objective is to establish a baseline, above which bulls would be regarded as satisfactory potential breeders. Using this system, bulls are placed into the categories of satisfactory, unsatisfactory and classification deferred. Most developmental work on the BSE has been done with beef bulls. It has received less atention on dairy farms, and this was illustrated in the recent California survey (Champagne et al, 2002). Here 67% of bulls had not received an evaluation of breeding soundness, even though many producers recognized that it might be useful.

BSE Procedures

Breeding soundness evaluation should be performed on any bull before placing him in the breeding pen or pasture.

The routine BSE includes the following steps:
1. Physical examination.
2. Reproductive examination (including measurement of scrotal circumference*).
3. Collection and examination of semen..

In addition, a libido/serving capacity test may be included, as may special tests for diseases (e.g. vibriosis or trichomonosis). These procedures will add predictive value to the assessment process and may be specifically indicated at times, but they are not part of the routine BSE.

*Measurement of scrotal circumference at 12-15 months of age provides an indication of normal development. Bulls with small scrotal circumferences (e.g.. less than 30 cm at 15 months of age) should be considered as questionable prospects, not only because of reduced sperm production but also because the scrotal circumference in bulls is genetically associated with age at puberty in heifers. Bulls with larger scrotal sizes will tend to sire daughters which reach puberty earlier than the daughters of lesser bulls.

BSE Thresholds.

Assuming that a bull is free of physical or pathological problems which would render him otherwise unfit for breeding, to be classified as “satisfactory” on the BSE, he must equal or exceed the following thresholds:
1. Individual (progressive, %) sperm motility - 30%
2. Normal sperm morphology - 70%
3. Scrotal circumference. As follows -

< 15 months	- 30 cm
>15<18 months	- 31 cm
>18<21 months	- 32 cm
>21<24 months	- 33 cm
>24 months	- 34 cm

Problems With Natural Breeding

Apart from issues of safety and security, natural breeding can pose extra problems. These include those associated with bull infertility. Reasons given for culling bulls in California (Champagne et al,2002) did not mention fertility per se, even though health (65%) was a major cause for culling.

A host of factors can contribute to bull infertility, and a full description of all is beyond the scope of this presentation. Much of the risk, however, can be obviated with bull breeding soundness evaluations (initially and regularly thereafter), combined with astute observation of the breeding pen or pasture, as well as attention to herd health aspects.

Particular bull problems on dairy farms occur with lameness (see case report below), much of which may be attributed to dietary factors. Rations formulated for middle to high producing dairy cows contain higher energy, protein and calcium levels than those required by the bull. This excessive energy intake, can predispose bulls to acidosis, laminitis and lameness, especially when they are acutely introduced to such diets. High levels of dietary calcium can also cause lameness in conjunction with bone lesions in the spine and hip regions. Mature bulls have similar dietary requirements to those of a dry dairy cow.
Another determinant for lameness in dairy bulls is type of flooring and its surface. Bulls confined to hard unstable surfaces for long periods of time are more likely to develop lameness problems, whereas slick or unstable surfaces can cause injury and sexual tentativeness.

To minimize such problems, the following guidelines can be used:
1. Introduce bulls to lactating cow rations (.78-.80 NE1) gradually (preferably over a period of weeks).
Do no move DMI more than 1 lb in 2 days
Do not move both intake and energy at the same time
Adjust intake, roughage and energy in steps
2. Periodically remove bulls from hard flooring surfaces and lactating cow rations.
3. Minimize physical obstacles that interfere with bull movement (e.g. insufficient space behind free stalls, as well as protruding objects). Also avoid situations where bulls are jammed together.
4. Regularly monitor bulls, and remove those requiring foot care and/or showing early signs of lameness.

The importance of such precautions is illustrated in the case report, below.

A Case Report
Bulls were examined on a large, newly established, 2500 cow dairy in SW Kansas in January of 2000. This was a new facility where the management procedures and personnel were still evolving as the dairy was growing in size and attempting to achieve production goals. All breeding was exclusively performed by NS bulls. It was evident, however, that natural breeding was not as successful as it should be, with a large number of cows (more than 500) remaining open after more than 200 DIM.

NS bulls were obtained under contract by a supplier and varied in age. The bull to female ratio (BFR) was approximately 1:40. Female herds consisted of approximately several hundred females. The cow groups included varying numbers of open and pregnant females at any given time. Bulls spent much of their time in free-stalls, on concrete, although access had recently been provided to outside dirt lots. In the free-stalls, the “working” area consisted of the concrete alley-way behind the stalls, which was periodically flushed with water. Bull groups comprised mixed ages of bulls and these were generally kept intact, although they were rotated between cow groups at approximately 1 week intervals. Bulls were fed the same diets as their respective cow group. Both cows and bulls were vaccinated for Leptospirosis (5 way) and vibriosis. A total of 98 bulls were subjected to a physical examination, 66 of which were electro-ejaculated for semen assessment. Approximately 30 bulls were subject to sampling for Trichomonosis. An additional 20 young bulls were subjected to visual appraisal only.

Results and Discussion:
During examination it was observed that many of the bulls were “tentative” in their footing on concrete. Twenty-one of the 98 bulls were classified as poor breeding prospects and they were recommended to be culled. An additional 7 bulls had problems which might compromise breeding success, but which could improve with time. Screening for Trichomoniasis was negative for all samples. No obvious problems were detected in the young replacement bulls which were subjected to a visual appraisal only. The major problems encountered in bulls were as follows:
Lameness - 23/98 (23%).
Of these, 13 were severely lame (13.3%)
Accessory genital disease (“seminal vesiculitis”) - 17/98 (17.3%)
Penile problems (inflammation, injury) - 7/98 (7.1%)
Poor semen quality - 4/98 (4%)
Other problems - cryptorchid (1), lumpy jaw (1), eye cancer (1), respiratory infection (3)

The most common bull problem encountered was lameness. Lame bulls were recommended for culling only if the problem was severe and probably irreversible. Lameness in the hind limbs was regarded as being more detrimental to reproductive success than was forelimb lameness. Severely lame bull problems included a dislocated hip, a dislocated knee cap, a number of swollen joints (particularly of the lower limbs) and acute foot soreness. There was little evidence of severe laminitis, although it is probable that subclinical laminitis was present. With bulls being fed the same rations as lactating dairy cows, it is probable that some bull lameness problems would be caused by excessive energy and calcium in their rations. However, it was considered that a large number of the lameness problems observed in this herd were due to trauma - e.g. from loss of footing or fighting with other bulls.

The relatively high prevalence of seminal vesiculitis/accessory genital disease observed (17.3%) was of concern, although only 2 bulls had this in severe form . Active vesiculitis will adversely affect semen quality. Often the infection will spread to other parts of the genital tract where it may lead to irreversible problems. The factors leading to increased seminal vesiculitis in a group of bulls are not all known. This problem is often encountered in young beef bulls on performance test, when there is a combination of high energy rations and intensive rearing (and perhaps increased homosexual behavior). Without further observations and tests, it would be difficult to determine the cause in this case. However, managerial options such as rotating bulls, reducing cattle density in pens, and perhaps feeding chlortetracycline (CTC) should help to reduce this problem

Transmission of Venereal Disease.
Venereal diseases of importance in cattle include vibriosis (or campylobacteriosis) and trichomoniasis. Ureaplasmosis, under certain conditions, may also be problematical. Natural service presents a very real risk of the transmission of venereal disease. Reputable A.I. organizations ensure that bulls are free of such diseases by regular sampling and preventive treatments, and also by safeguarding semen with the addition of appropriate antibiotics. The important disease entities in question are as follows:

Vibriosis
This is caused by a bacteria (Campylobacter fetus) which localizes within the bull's penis and prepuce. Older bulls (>3 yrs) are more likely to become carriers. No clinical signs are seen in the infected bull. However, when he services a susceptible female, the transmitted organism multiplies in her cervix and then ascends the reproductive tract during diestrus. If the original ovum is fertilized, it is destroyed early giving a normal or slightly prolonged return to estrus. Subsequent breedings are infertile, probably due to interference with gamete transport. Spontaneous recovery in cows occurs after approximately 4 months, with some degree of convalescent immunity being conferred after this time. Bulls, however, do not appear to develop immunity from natural infection, probably because the organism does not truly infect the bull, but colonizes on the surface of the penis. Some abortions may occur particularly in the second trimester. The herd picture, where a number of susceptible females are exposed to infection, is primarily one of repeat breedings with irregular estrous cycles being a common sign. Both cows and bulls may be sampled for diagnosis of vibriosis although female sampling is generally more successful. A positive finding in any of the sampled females is indicative of herd or group infection. Vaccination of females affords best protection with best timing within several weeks of breeding. Some success has also been obtained with vaccinating bulls against vibriosis, both to afford protection, and to effect a cure.

Trichomoniasis
Tritrichomonas foetus, a protozoan, also causes infertility as well as abortions. The clinical manifestations of vibriosis and trichomoniasis can appear very similar. Again, the organism is carried within penile and preputial crypts of bulls with older bulls more likely to be chronic carriers. Infectivity is high, with the protozoan then localizing within the vagina, uterus and oviduct of infected females. Embryonic or fetal wastage following the initial fertilization occurs due to inflammatory changes to the uterus and fetal membranes with abortion often resulting around 3 months gestation (range 1 to 9 months) following the infective, fertile service. A typical picture is one of an increased calving interval of 90 to 100 days. Some degree of convalescent immunity follows although this varies. Abortions of 3- to 4-month-old fetuses may go unnoticed. Thus, the major signs of infection may be infertility (with prolonged or erratic return to estrus) along with some pyometras (pus in the uterus) and perhaps later, more apparent, abortions.

Diagnosis is best done with samples from bulls although female sampling is useful. Bulls may be treated for trichomoniasis although there are no approved products for this purpose. A vaccine is available for female use only and which has been shown to reduce the abortion losses associated with trichomoniasis.

Ureaplasmosis

A bacteria, Ureaplasma diversum is a common inhabitant of the respiratory and reproductive tracts of cattle. It has been implicated in a number of reproductive tract disorders including granular venereal disease, early embryonic loss, weak calf syndrome, abortion and seminal vesiculitis in bulls. Following experimental inoculation, granular vulvovaginitis resulted in 3-6 days followed by endometritis and salpingitis. U.diversum strains differ in pathogenicity as does female susceptibility. Heifers appear to be particularly susceptible. Although U.diversum may be cultured from prepuberal heifers, breeding activity appears to disseminate it more rapidly, suggesting that venereal transmission may occur. There is no vaccine available although evidence suggests that feeding of chlortetracycline (CTC), at 1.1 mg/kg for several weeks coinciding with the start of the breeding season helped to constrain the adverse reproductive effects of U.diversum.

Environmental Stressors

Heat Stress

High environmental temperatures can adversely affect bull fertility. Adverse reproductive effects will occur before bulls show overt signs of hyperthermia (e.g. hypersalivation, rapid open-mouth breathing, shade seeking). Holstein bull fertility has been shown to be lowest during the hot summer months in subtropical regions with most effect apparently due to depressed semen quality. Bulls in bull studs in all regions of the U.S. generally show lowered semen quality over the summer months. It is important to realize that there is a delayed effect of excessive heat upon spermatozoa with the damage often occurring a month or two before major changes are observed in the ejaculate.

Both scrotal and testicular configuration are important in helping to maintain an optimal temperature for sperm production with poor conformation and/or fat in the scrotal neck acting to compromise this ability. Studies in Oklahoma have shown that provision of shade during the hot months afforded some protection against decreased semen quality in young bulls.

Nutritional Considerations.

Some relevant nutritional considerations have been previously addressed.

In general, the natural breeding bull should be neither overfat or overthin, but in good working condition. Overfatness can lead to premature mating fatigue, greater susceptibility to heat stress and a compromised testicular thermoregulatory system. There is evidence that overfeeding of young bulls decreases both semen quality and libido. In addition, an excessive paunch can prevent proper intromission during mating.

Recently, there has been considerable interest in the possible deleterious effects of cottonseed products on bull fertility. In many dairy regions of the United States as much as 8 pounds (15% of ration dry matter) of whole cottonseed is fed in total mixed rations balanced for high producing dairy cattle. In surveyed California dairies (Champagne pers comm), 59% fed cottonseed products. A mature Holstein bull with an dry matter intake of 13 kg could consume as much as 13 g of free gossypol per day. Whether or not gossypol intake at this level has a detrimental effect on bull fertility is not definitively known. An increase in sperm midpiece abnormality and a reduction in sperm production per gram of testicular tissues in Brahman bulls fed 2.75 kg of cottonseed meal (8.2 g of free gossypol per day) has been reported. In contrast, Hereford bulls ingesting 7.6 to 19.8 g of free gossypol daily from whole cottonseed showed no significant sperm abnormalities. A number of factors can contribute to such differences. These include the type of cottonseed product (e.g. meal vs whole seed). The CSM processing method employed (e.g. pressure vs solvent extraction), the particular gossypol enantiomers present, and the rate of ingesta passage, which is influenced by the amount of roughage in the diet. In addition, the feeding of relatively high levels of antioxidants may counter the deleterious reproductive effects of gossypol in bulls.

Recommendations in terms of gossypol intake in the total diet for bulls used for breeding is 200 mg/kg for diets composed of cottonseed meal and 900 mg/kg for diets composed of whole cottonseed. However, the relevance of gossypol studies to commercial cattle operations needs to be carefully considered. The free gossypol content in the cottonseed meal study rations cited above, were obtained from solvent extraction methods, which accounts for less than 2 per cent of the oil extraction method used today.

Behavioral Aspects

Social effects can strongly influence reproductive behavior in many species and cattle are no exception. Thus, bulls which are lower in dominance rank may be inhibited in their reproductive behavior by more dominant bulls. In general, older bulls are more dominant than younger ones while body-size and presence of horns play a lesser, although not insignificant, role in establishing and maintaining dominance. Breed differences also occur. Older females can also inhibit young bulls, particularly if age and inexperience are confounded. Such inhibition can occur even from a distance, for example from dominant animals in an adjacent pen or pasture. Dominant bulls attempt to monopolize the female herd or group in the breeding pasture or corral. As bull dominance appears to be a different trait from either sex-drive or sperm production, a dominant bull which is either infertile or impotent can depress herd reproduction rates.

Bulls may also be inhibited in their sexual function by their physical surroundings, for example by being within a totally enclosed building or by loose or unstable flooring. Wet or slick concrete as well as muddy conditions can lead to feet and leg problems in bulls and cows alike while unsure footing can cause bulls to become "shy" breeders.

In general conservative bull-to-female ratios (BFRs) are recommended for NS bulls on dairies, as many variables exist. These include constant changes in the numbers of available females, and various constraints to optimal bull performance as described elsewhere. Conservative BFRs are within the range of 1:15 to 1:25. This is reflected in actual bull usage (Champagne et al, 2002), where 60% of surveyed California dairies using bulls employed them at a BFR of <1:30.

Rotation of bulls, and the provision of “rest” periods are both important managerial considerations. Nutritional aspects have already been discussed. However, of interest are findings from the California survey (Champagne et al, 2002) which showed that 47% of dairies did not ever move bulls from the breeding pen once they were admitted. A further 22% moved bulls once a year, or less. Movement of bulls appeared to be mostly because of necessity (e.g. lameness, injury) than by design. Here, the following observation is relevant: “the length of time a bull stays in the breeding corral is a major determinant re. the success or failure of bull breeding management” (Champagne et al 2002).

Biosecurity and Health Recommendations

Natural breeding bulls should, in general, be subjected to similar biosecurity and health programs as the female herd, with several exceptions. Venereal disease protection is of particular importance. Despite this, 71% of California dairies using NS bulls took no special precautions against venereal diseases (Champagne et al,2002). Vibriosis vaccination is recommended for both bulls and females. Vaccination of females for trichomoniasis may be considered if this disease is suspected to be a problem. This vaccine can reduce abortion losses associated with trichomoniasis. It is possible that diseases such as ureaplasmosis will be shown to cause significant reproductive problems, leading to recommendations for either vaccination or prophylactic antibiotic treatments. Special attention should be directed to both endo- and ecto-parasite control.

Bulls, and females, on dairies are often in a state of flux, with constant changes in group sizes, composition and dynamics. This poses problems in terms of biosecurity. Here, a veterinary protocol for ensuring that such movements pose minimal risk to herd health and biosecurity is highly recommended

Summary and Recommendations

Natural service (NS) bulls are widely employed on large dairy farms despite the well-proven genetic progress achievable through AI. The reasons for using NS bulls are many. It is apparent that gaps often occur in both selection and management of dairy NS bulls. The following recommendations are would help optimize bull usage on dairy farms.

1.All virgin bulls should be subjected to a breeding soundness evaluation (BSE) before admittance to the herd.

2. All bulls should be given a physical exam every 6 months and a full breeding soundness exam every 12 months.

3. Adequate handling facilities should be provided for the working and handling of bulls to reduce the risk of injury to both animals and personnel.

4. Bulls in freestall housing should be given access to dirt lots.

5. All working bulls should be monitored daily.

It is important for personnel to be especially alert for signs of lameness. Early detection of lame bulls is critical and employees should be trained to observe common lameness signs, as well as other problems associated with breeding bulls. Lame or otherwise injured bulls should be treated and/or replaced as soon as possible.

6. It is beneficial to rotate bulls in and out of the breeding herd.

7. Bulls ideally should be less than 2.5 years of age. Aggressive, older and large, heavy bulls should not be retained on the dairy.

8. A suitable bull to female ratio is approximately 1 bull to 15-25 open cows.

9. If a dairy has large breeding pens (i.e. containing large groups of females) it may be beneficial to distribute open cows over more pens to reduce the number of bulls in any given pen.

10. Avoid drastic changes in diets fed to bulls. Don't put bulls abruptly onto the same diets as lactating cows without increasing intake and energy in steps.

11. Minimize heat stress by providing shade and cooling systems.

12. Bulls should be subjected to the same vaccination and preventive health program as the cows (with the exception of vaccinations for brucellosis, trichomoniasis and MLV IBR).

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