Mating Management of Dairy Cattle

REPRODUCTIVE TARGETS

Targets need to be established for each herd. Targets will vary depending on the stage of development of the herd, the financial position and the long term breeding objectives of the herd. The following are a guide as to what is achievable in well managed, predominantly pasture fed herds.

A. Calving*:*

	Heifers	Cows
CS	5.5	5.2
Calved in 4 weeks (%)	77	67
Calved in 8 weeks (%)	100	96
Days to midpoint	13	15
Calving spread (days)	56	63
Inductions (%)	0	<5

B. Diseases:

	Heifers	Cows
Calving difficulties	<20	<10
Infections	<4	<5
Downers	0	<2
RFM	<2	<2

C. Mating

	Heifers	Cows
Pre mating heats (%)	75	85
Sub rate 21 d (%)	90	92
Sub rate 28 d (%)	94	96
NRR 42 days (%)	62	62
% Herd in calf 4 weeks	62	62
% Herd in calf 8 weeks	86	86
Abortions (%)	<2	<2
Empty (%)	<5	<5

Data from BJ McKay/Dairywin

THE OESTROUS CYCLE

Ovaries

Control the oestrous cycle under the influence of the hormones released from the hypothalamus and pituitary glands located in the brain.

Corpus Luteum:

- Gland on Ovary
- Forms in the site of ovulation
- Produces Progesterone
- Regresses from day 16 unless pregnant
- Maintains pregnancy
- Prevents 'Heat'

Follicles:

- Fluid-filled sacs
- Contains Ovum (egg)
- Source of the hormone oestrogen which is responsible for the signs of heat and also triggers release of the hormones which lead to ovulation
- Two or three waves of follicles per cycle.

ADVANTAGES OF A COMPACT CALVING

Most farms try to achieve a compact calving, with the majority of the herd calving within a 4 week period and the whole herd within 6-8 weeks. How compact your calving pattern is will determine or affect...

- Number of days in milk (lactation days)
- Number of replacements bred and the rate of genetic gain within a herd
- Number of involuntary culls (empties)
- Number of inductions
- Management practices regarding both labour requirements and feed management
- Costs and profits

The actual calving pattern depends on two factors....

1) SUBMISSION RATE

This is the percentage of the whole herd that is put up to be bred within a set period. The submission rate will depend on....

a) Oestrous detection.
b) The number of animals cycling.

2) CONCEPTION RATE

This is the percentage of animals bred which will hold to that service. The conception rates will depend on....

a) Cow fertility.
b) Bull/AI fertility.
c) Accuracy of heat detection.

ACHIEVING GOOD SUBMISSION RATES

Combining good management with efficient heat detection will contribute to ensuring target submission rates are achieved....

3 week Submission rate	92%
4 week Submission rate	96%

OESTROUS DETECTION.

Heat detection efficiency will reflect how much time goes into heat detection, the more often and the longer the duration of heat detection the more likely it is that cows are detected in oestrus. Pre-mating heats will increase the accuracy and number of cows being submitted for service. Also pre mating heat detection allows accurate determination of the non-cycling cows.

An essential requirement for the successful use of artificial breeding is **ACCURATE** and **THOROUGH** detection of oestrus.

Oestrus is defined as that period during which a cow will stand to be ridden by her herd mates or by a herd sire. It occurs every 18-24 days in cycling cows. It has an average duration of 15 hours but can vary from 2-30 hours.

Oestrous behaviour

With the approach of oestrus, most cows become increasingly restless, usually attempting to ride herd mates, especially those others which are already in oestrus.

However, when other cows attempt to mount these cows coming into heat they will move away. Once cows are in true oestrus they will stand when mounted. Because of this, they can be detected without the presence of a bull.

The oestrous cows tend to congregate together forming sexually active groups (SAG's).

These groups of restless cows move throughout the herd, with other cows joining or leaving them. Although an oestrous cow will stand to be ridden by any other cow in the herd, most of the riding in the group will be by other cows in oestrus. Cows in heat will frequently stand to be ridden by herd mates before they will stand for the bull.

As well as the riding activity, oestrous cows are more active, spend less time grazing and often have a raised body temperature. Some may bellow and many frequently change from their usual order coming into the shed to be milked. Oestrous cows often lead the herd from the paddock or lag behind. Many hold their milk for one or two milkings.

An astute observer of herd behaviour will note many of these changes in individual cows. They may also check for evidence of riding, which may cause hair removal near the head of the tail or mud marks on the flanks of the oestrous cow.

Physiological changes which may occur are a swelling of the vulva and vagina, and a discharge of strands of clear mucous from the vulva. Often 2-3 days after heat, red mucus may be seen on the hocks or hanging from the vulva.

In many cases most of these signs are obvious to an experienced stockman. However, some cows frequently display oestrous with less obvious symptoms, or the oestrus may only be of short duration.

To avoid mistakes, unless in a small herd and the cows are well known individually, it is preferable to also use one of several alternative aids for detection.

Signs of oestrus:

1. Standing to be mounted. This is the most common sign exhibited but is not 100% effective. In a trial undertaken in Australia this occurred in only 80% of cows in heat.
2. Loss of mucus. The "bull-string" may hang from the vulva of the cow in heat and is a valuable aid in detection.
3. Relaxation and reddening of the vulval lips, vulva and vagina also occurs.
4. Changes in behaviour such as tail raising, twitching, increased excitability, irritability, bellowing and increase in urine outflow all may accompany oestrous behaviour.
5. Drop in milk yield, due to decreased grazing time and milk holding.
6. Sensitivity to back pressure may increase.
7. Group behaviour such as licking, sniffing, chin rubbing and resting in groups in the paddock increases. Increased involvement in the sexually active groups in the paddock.

The good stockperson puts all the signs together to make the decision.

Methods of oestrous detection.

A. Visual observation.

- During 15 minute periods before the herd is brought in for milking twice each day.
- In the yard before milking commences.
- At least once (preferably twice) between milkings.

Most cows will be detected if the herd owner is experienced, knows the herd well and the herd size is not large. It is unreasonable to expect other members of the family or employees unfamiliar with the herd to be equally competent at detecting cows on heat. In these situations an aid to detection is essential.

B. Tail painting

- This involves applying an enamel paint on the coat to lightly cover those points near the head of the tail which will be rubbed by the brisket of the riding cow when the oestrous cow stands to be ridden.
- An enamel high-gloss is the suitable form of paint to use in seasonal herds in New Zealand. There are specially formulated paints which can be purchased for this purpose. Some enamel paints are not satisfactory and roof paint may not be rubbed off. Water based paints do not last.
- The paint should be applied with a 50 mm brush, running forward for 130-150 mm from the tail head. Loose hair must be removed, and the paint should not be applied too thickly. Suitable colours include red, green and blue, although yellow may be used on Friesians and cross-breds. The colours are alternated as cows are mated; this highlights unmated cows.
- The tail paint should last 4 weeks unless the coat hair becomes loose with shedding. In this event, the strip should be peeled off and paint re-applied. One litre of paint should be sufficient to tail paint 80-100 cows.
- The paint strip should be checked at each milking. In almost 90% of cases, most of the paint will be removed when a cow is in oestrus (even though some have not been seen to be in oestrus). A further 5% of cows will lose only a little of the paint, and with the remaining 5% experience and judgement will be necessary as the paint strip may have only been rubbed but not removed.
- The paint is only rarely removed indiscriminately. Cows detected in oestrus on one day and inseminated that morning should have their paint re-applied at the next milking, or even at the next mornings milking.
- The more cows that are in oestrus at the one time the more successful is the tail painting technique at detecting cows in oestrus. This makes it ideally suited for large seasonally concentrated calving dairy herds. It is not so successful in smaller herds or in year round calving herds.

C. Spray paint

- This is tail paint in a spray can. Although more expensive than tail paint, it is convenient and more sensitive. Therefore it is more applicable for use on heifers and after the use of CIDRs.

D. KAMAR heat detectors

- This product is a useful aid for heifer AI programmes and synchronisation programmes. It is an indicator that is pasted on to the tail head of the cow and after the cow is ridden approx. three times the indicator goes red. They cost $2-$3 each, and are especially useful for small numbers of animals, or where observation is difficult.

E. Teaser bulls

- Teaser or vasectomised bulls are very efficient in detecting cows on heat, and therefore are a useful aid in detection.

F. Other methods

- Vaginal conductivity probes. No more sensitive than observation
- Pedometers. Record increase in activity. Very accurate, but expensive
- 'Heatwatch'. Pressure transponders attached to cow record mounting activity. Accurate but expensive.

Abnormal oestrous behaviour

Oestrous should normally occur every 18-24 days, but the first heat after calving may be followed by a genuine short cycle of about 8-12 days.

Less than 40 days after calving the first heat may be a silent heat. In fact about 70% of first ovulations after calving are not associated with standing heat. A silent heat occurs when the cow ovulates without the normal signs of oestrous activity being displayed.

Abnormal ovarian conditions associated with cysts can result in frequent, irregular periods of oestrous activity. These cows can become nymphomaniacs and/or infertile and therefore should be seen by a vet. Early treatment of these cases improves the success rate considerably.

Oestrous activity is known to occur in pregnant animals in about 5% of pregnancies. These cows should be examined before it is assumed they are empty.

Errors in detection.

One New Zealand study has shown that 22% of cows were detected in oestrus by herd owners at two consecutive milkings, and that 55% of cows were first detected as being in oestrus at the morning milking.
Errors in detection were most frequent at the morning milking. The herd owners were only uncertain of oestrus in 7% of the cows in their herds. The conception rate of this group was 55%.

A. Errors in identification.

The incorrect cow is put up due to an error in identification. The wrong cow is inseminated and the cow in oestrus is missed. The result is a lowering of the conception rate and more spread out calving pattern. This constitutes the most expensive and yet easily remedied error. Well identified cows and a notebook will prevent most of these errors.

B. Errors of omission.

A cow on heat is not seen and therefore not submitted for service. The result is a lower submission rate and therefore a more spread out calving pattern.

C. Errors in diagnosis.

These result from too liberal interpretation of oestrous symptoms, so submitting cows when not in oestrus. The result is a lowered conception rate.

This error type soon corrects itself as the cow comes into oestrus and is picked up correctly, which is the usual sequence of events and poses no major problems.

If however, the error sequence is reversed i.e., a correct insemination is followed by an incorrect one within 21 days, the problem is more serious as the conception rate to the correct first insemination is reduced by 50%. This can be avoided by being sure the cow is in heat at subsequent matings and recording doubtful heats with a ‘?’.

Timing of insemination.

It is preferable to record all cows detected in oestrus since the previous milking. In most herds the cows are drafted out for insemination at the morning milking.

The cows should be kept away from the herd for as short a time as conveniently possible, as their presence in the herd promotes the formation of the sexually active groups.

Cows seen in oestrous at the morning milking should be inseminated later that morning. These cows should not be held back and inseminated later that afternoon or the next morning. However, if she is still plainly in heat at the milking following the insemination she should be drafted out and re-inseminated the next day. This should only occur in 8% or less of your herd and is best applied if the same semen can be used on both occasions.

Cows drafted out at one milking for subsequent insemination should be held close to the shed with access to feed and water.

After they have been inseminated they can then be returned to the herd. Occasionally farmers keep these close to the shed to milk them first and repaint them at the next milking. This has management advantages but reduces the formation of the sexually active groups in the paddock.

Oestrous detection is more difficult in maiden heifers and in town supply herds, mainly because the sexually active groups are less likely to be formed. For the same reasons, detection efficiency tends to decline as the breeding programme goes beyond the 7th to 9th week, as more cows become pregnant and they are less likely to partake in the groups. In these herds, at these times, it is often preferable to run the bull with the cows.

It is not unrealistic to achieve detection rates of 90%. With this achievement, calving patterns are maintained at levels which optimise production per cow per year, maintain a low empty rate and contribute to high fertility.

THE NUMBER OF ANIMALS CYCLING.

Ideally one cow should produce one calf every 365 days. With the average length of gestation 282 days, that only leaves an average of 83 days for a cow to recover from the calving, start cycling and conceive.

The first part of this 83 days is the time taken for the uterus to shrink down ("involute") and prepare for the next pregnancy. This period averages about 42 days and is referred to as the post-partum anoestrous interval or PPAI. For simplicity we will refer to it as the '***anoestrous interval***'.

Whilst most animals will eventually cycle it is important that cows start cycling as soon as possible after calving to meet the one calf per cow per year goal.

The number of animals cycling at the start of the mating period depends on a number of factors:

- Variation among herds.
- Calving spread.
  Cows with a short interval between calving and the start of mating are more likely to be anoestrus than cows with a long interval.
- Age of cows.
  Younger cows are more likely to be anoestrus than older cows.
- But is **not** related to breeding worth of cows.

The anoestrous interval

A. Condition Score at Calving

This is the single most important factor determining how long after calving a cow will cycle. For each additional condition score at calving the anoestrus interval will be reduced by 6 days. This applies for condition scores between 3 and 6. For example a cow in condition score 4 will take an extra 9 days on average to cycle than a cow in condition score 5.5

B. Feeding Level After Calving

The better the cow is fed from calving, the sooner she will cycle. For each additional 3 kg DM/cow/day fed, the anoestrous interval will decrease by about 3 days. This is independent of the effect of the condition score.

C. Age

Heifers have a longer anoestrus interval, meaning they take longer as a group to cycle after calving. Cows take an average of 42 days from calving to the first visible heat, heifers take an average of 56 days from calving to first visible heat.

D. Other factors

- Breed: Jerseys average 3 days sooner than Friesians
- Season: Some seasons better than others. Nutritional effects?
- Diseases: Calving Disorders, Metabolic, RFM's.
- Stress: Lameness, Herd Stress.

Anoestrous Cow Management

A. Hormonal treatment

Cows which have not been detected cycling should be put up for a veterinary examination before the beginning of the mating season.

At this examination, some of these cows will have cycled and been missed, and can be brought on with a prostaglandin injection, or left to come on naturally. Others will have inactive ovaries and therefore are not cycling (anoestrus) and should be treated, as long as they have been calved at least 4 weeks.

Treatment of these anoestrus cows will usually consist of a CIDR being inserted in the vagina. After 5 to 6 days the CIDR is removed and a hormone injection is given the following day. The response rate is dependant upon the depth of anoestrus, animal age, condition and time since calving. Up to 90% will cycle within 2-4 days. Of those remaining, some may have a silent ovulation. A 3rd visit is recommended 2 weeks after the injection to recheck any cow still not mated.

The CIDR treated cows will have conception rates to their first heats of around 45%, so the earlier in the mating season the cows are examined and treated the more time these animals will have to conceive, and therefore the earlier they will calve.

B. Once daily milking or delayed treatment

Comparison of reproductive performance of anoestrous cows treated with CIDRs 7 days before the PSM (CIDR early), or 21 days after the PSM (CIDR late), or milked once daily from 7 days before the PSM for 4 weeks (OAD).

	CIDR early	CIDR late	OAD
Inseminated by PSM + 21 days	94%	66%	76%
Pregnant by PSM + 21 days	53%	38%	42%
Interval to 50% pregnant	21 days	26 days	28 days
Empty rate	5%	12%	14%

From Rhodes *et al.* Proc NZVA DCV 1998

TO ATTAIN GOOD SUBMISSION RATES:

- **Ensure stock are in good condition at calving (CS 5-5.5)**
- **Ensure there is sufficient feed available for calved animals (14+ kg DM/cow/day)**
- **Induce early**
- **Treat anoestrous cows prior to the start of the mating period**
- **Veterinary check of cows with a history of a discharge, RFM, difficult calving, etc. a month prior to the start of mating**
- **Ensure sufficient time and importance is given to heat detection, and animals are accurately identified.**
- **Synchronise heifers?**

CONCEPTION RATES

A conception rate is the percentage of animals bred which hold to that service. This is not to be confused with the non-return rate, which is the percentage of animals which are mated which have not returned within a set time, usually 42 days.

The target rates vary according to when they are measured, as there are always some animals which lose their pregnancies.

NON-RETURN RATE
is an estimate of
CONCEPTION RATE
is an estimate of
PREGNANCY RATE
is an estimate of
CALVING RATE

Target rates are

- At 42 days the Non-return-rate should be 62%-65% +
- The actual calving rate should be 58%-60%.

Cow fertility

This is relatively constant, across herds, but will be affected by the following.....

1. Post partum period

The longer the interval since calving, the better the conception rates, with or without a premating heat.

2. Number of pre-mating heats

If an animal has 1 or more premating heats, it will have better conception rates, compared with animals mated to their first heats.

Pregnancy rates at various intervals from calving with or without premating heats.
(From Macmillan and Clayton, Proc NZSAP 1980)

	Days from Calving			
Number of PMH	< 30	30-39	>39	Avg.
0	32	42	49	44
1	39	49	65	51
+1	40	51	67	53

3. Age

The highest fertility levels are seen in 3 to 4 year-olds, slightly lower levels in animals 5 to 8 years old, with heifers having lower rates again. As a group 8 year-olds and older have the lowest fertility, with a higher incidence of repeat breeders and early embryonic deaths.

4. Cow condition

Cows in moderate condition score (between 4 and 5 at mating) have the best conception rates. Animals in either poor or excessive condition have decreased fertility.

5. Breed

Breed will affect fertility to a minor degree, with Jerseys less fertile than Friesians or the crosses.

6. Nutrition

The effect of nutrition on fertility is still not clear. Many experiments have been done with sometimes conflicting results.

- Loss of large amounts of body condition (>1.5) is associated with ketosis and hence with lower conception rates.
- Excessive dietary protein i.e. CP > 25% ?
- Trace element deficiencies: Se, I_2, Cu?
- Acute changes in feed intake.

7. Level of production

High production levels may depress individual cow fertility. However, studies within pasture based herds have in fact shown that higher producing cows tend to have higher fertility. This may be related to the fact that higher producing cows are generally in better body condition at calving and mating and compete better for a limited feed resource.

8. Disease

Where there are disorders at calving such as metabolic disease or RFM's, fertility will be lowered. Some diseases, e.g. BVD may lower conception rates. Certain trace element deficiencies will affect fertility eg Iodine and selenium.

Repeat breeders

These are cows that have been mated and returned 3 times or more. As a group these cows have a conception rate less than 50%. Note that it is normal for 5 % of the herd to have 3 matings.

A significant proportion of these animals have an infected or damaged uterus as a result of a difficult calving, RFM's, a dead calf etc. Some of these cases can be successfully treated, so put up any cows with discharges, or a history of RFM's or difficult calvings, for a vet examination prior to the start of mating. This gives the animal a much better chance of being treated in time to get her in calf.

Repeat breeders can be treated with Gonadotrophin Releasing Hormone (GnRH; brand names are 'Receptal' or 'Fertagyl'), the hormone released by the hypothalamus in the brain that triggers ovulation. Treatment with GnRH, 11 to 13 days after a mating, will increase conception rate by 10 - 15%. Bear in mind that this group has a untreated conception rate of < 50%, so it will only increase conception rates to a "normal" level of 60 - 65%.

Long Returns

Cows that return 4-5 weeks or more after service are said to have a long return. This will usually be due to natural attrition of non-viable embryos, and should be less than 2% of successful matings.

There are some diseases, e.g. B.V.D. which may cause a higher than normal rate of long returns.

If a higher than 'normal' level of long returns is experienced you should contact your veterinarian to try and establish a diagnosis.

Cows which have a long return and show a discharge may benefit from veterinary treatment.

Bull/AI Fertility.

There will be a variation in effectiveness of AI technicians, often dependent on experience, but in most cases this isn't a major source of variation. In most cases there shouldn't be any problems with the fertility of the semen as it will have been extensively trialled.

Bull fertility in the period after AI is covered later.

Farmers accuracy of heat detection.

If cows are put up wrongly, they will return and therefore there will be a lower non return rate. Therefore ensure the right cow is put up at the right time.

TO ENSURE GOOD CONCEPTION RATES

- **Ensure a compact calving, so all animals have as much time as possible before mating starts.**
- **Ensure animals are in good condition at calving and not losing weight approaching or through the mating period.**
- **Ensure good facilities and quiet cows for your AI technicians.**
  Warn of AB tech. of synchrony/non-cyclers i.e. semen/time allowance
- **Ensure the right cow is put up at the right time for insemination.**
- **Do not isolate individual animals after mating**

Oestrous Synchronisation

Synchronisation is the manipulation of the female's oestrous cycle, in order to facilitate the mating of a group of cycling animals within a short time span.

Benefits of synchronisation

- The main advantage of synchronisation is that it brings cows and heifers which would normally cycle in the latter half of the heat cycle in the first 3 week period, into the first few days of the mating round. Subsequent returns are then also in the first week of each return period.

- This concentrates calving, advances the mean calving date, and brings the calving tail-end forward 10 - 14 days as well as producing more cow-days in-milk.

- Anoestrus in 2 and 3 year olds is reduced because they have a longer time to cycle. This is important if you are trying to minimise inductions and gain as many lactation days as possible.

- Synchronisation allows AI of heifers being reared away from home, resulting in more high BI heifer replacements and therefore a faster genetic gain for the herd.

- A more even line of replacement calves will be produced.

- Bull requirements will be reduced, especially where resynchrony is used and a second round of AI is undertaken.

METHODS OF SYNCHRONISATION

Maintaining the Corpus Luteum.

Progesterone "holds-up" the cycle enabling all cows to reach a similar stage, thus when the progesterone is removed all cows are able to come on heat. Progesterone delivery systems include CIDRs and ear implants

It was found in the earlier programmes that longer periods of progesterone control of the cycle using CIDRs gave better synchrony, but reduced conception rates.

Shortening the activity of the Corpus Luteum.

Prostaglandins cause the Corpus Luteum to shrink and stop producing natural progesterone, bringing on a new cycle prematurely. Prostaglandin on its own can be used

for synchronisation, but only works between days 7 and 15 of the cycle which means you need to give 2 injections 11 days apart to get whole mob synchrony. Conception rate is good, but synchrony is poor, heats being spread over 3-5 days.

Combination methods

As the concept of follicle waves became better understood, it was realised that some larger follicles persisted through the period of progesterone influence, and these probably provided the follicle for ovulation. This 'persistent' follicle contained an ageing egg which subsequently yielded lower conception rates.

More recent programmes have therefore incorporated an oestrogen injection or vaginal capsule at the start of the programme, specifically to remove any of these follicles which may be present on the ovaries. Further follicle waves are prevented by the progesterone influence until the removal of the implant/CIDR device.

Further improvements in conception rates have been achieved by shortening the period of CIDR insertion through the use of a prostaglandin injection to remove any functional corpus luteum tissue. This tissue may have produced natural progesterone for a period after the CIDR was removed.

HEIFER SYNCHRONY

A. CIDR/ODB/Prostaglandin - 'Genermate'

- CIDR and ODB capsule inserted day 0
- Inject PG day 6/7
- Remove CIDR day 10
- Set time AI

Genermate *vs*. Daily Detection

	Genermate	Daily Detection
N	656	651
Inseminated (%)	100	98
Conceived to 1st AB (%)	54	63
Pregnant to AB (%)	74	66
Empty (%)	4	4
Mean day of calving	295	301
Approx. cost $/heifer at home [away]	42 [56]	16 [50]

(From ZZ Xu, *pers. comm.*)

B. Improved 'Genermate'

- CIDR inserted day 0 + inject ODB
- Remove CIDR + inject PG day 8
- Inject ODB day 9 or 10
- AI day 10 & 11 (99% in heat)
- Conception rate 62%
- Pregnant to AB (24 days) 86%

(From Taufa *et al.* Proc Ruakura Farmers Conf. 1998)

C. Two Prostaglandin Injections

- Two injections, 11-13 days apart
- Conception rates good
- Oestrus spread over 5 days
- Cost/heifer @ home $30 [Away $38]

D. Single Prostaglandin Injection ('Why wait')

- Daily AB for 7 days
- Inject non-inseminated animals with PG on day 7
- Continue AB for 5-7 days
- Cost/heifer @ home $18 [Away $36]

MILKING COW SYNCHRONISATION

A. CIDR/Prostaglandin

- CIDR inserted with ODB capsule day 0
- Inject PG day 7
- CIDR removed day 9
- 89% in heat over 5 days
- Conception rate to 1st AB 53%
- 82% pregnant to AB (7 weeks)
- Interval to conception reduced by 1.3 days compared to unsynchronised controls (From Xu *et al.* NZ Vet Journal 1996)
- Medium cost option
- $26 drugs + 2 vet visits

B. CIDR/ODB/Prostaglandin (Improved)

- CIDR inserted with ODB injection day 0
- CIDR removed & inject PG day 7
- Inject ODB day 0 if no heat detected
- 98% in heat over 4 days
- Conception rate to 1st AB 64%
- 88% pregnant to AB (7 weeks)
- Interval to conception reduced by 8 days compared to unsynchronised controls (From Taufa *et al.* Proc Ruakura Farmers Conf. 1998)
- Moderate cost option
- $28 ($30) drugs + 2/3 vet visits

C. Two Prostaglandin injections

- Two injections, 11 to 13 days apart
- 82% in heat over 7 days
- Conception rate to 1st AB 62% [71% in controls]
- 86% pregnant to AB (7 weeks) [87% in controls]
- Interval to conception reduced by 2 days compared to unsynchronised controls (From Xu *et al.* Theriogenology, 1997)
- Medium cost option
- $14 drugs + 2 vet visits

D. Single Prostaglandin Injection ('Why wait')

- Record pre-mating heats
- Inject PG to cows which were on heat 7-14 days previously
- Low cost option
- $7 drugs + 1 vet visit

E. 'Ovsynch' programme

- Developed in USA (No CIDRs or ODB)
- GnRH injection day 0
- PG injection day 7
- GnRH injection day 9
- Fixed time AI day 10
- Conception rate to 1st AB 38% [66% in 2x PG]
- 64% pregnant to AB (30 days) [72% 2x PG]
  (From Jemmeson World Buiatrics Conference 1998)
- Drug costs approx. $32 per cow + 3 vet visits

SPECIAL CONSIDERATIONS

1. Reasonable facilities are required, especially a good race. This is essential to ensure good working conditions for the AI technicians, and so enhance conception rates.

2. Heifers must already be cycling and have reached good body weights, preferably growing more than 0.6 kg/day in the 4-6 weeks before synchronisation.

3. Heat detection is not absolutely necessary, but an advantage in achieving top conception rates. Using Kamar heat detectors is the most effective form of heat detection in these situations. A single fixed-time insemination gives reasonable results in a runoff situation.

4. Synchronisation is a fairly labour intensive procedure, so everyone involved needs to know beforehand what is expected of them and when.

5. Good technicians experienced in the insemination of heifers are essential.

6. If resynchrony is used, the used CIDRs need to be washed in a virucidal disinfectant. A bull ratio of 1:8 is recommended to ensure enough bull power is available for the second round, if not using AI.

Good Bull Performance

Introduction

The role of the bull in dairy herd fertility is frequently underestimated. Every year there are sad stories of mating disasters, lost opportunities and disputes where a breakdown in bull service has been the major problem. In most cases, the situation could have been prevented by a bull Breeding Soundness Evaluation (BSE) and regular bull care and maintenance.

A common assumption that most farmers make is that all bulls are 100% fertile. This assumption is 90% correct, the problem is not the 90% fertile but the 10% infertile or subfertile bulls.

The effects of poor bull performance are not known until its too late. The effects of 'dud' bull(s) in a mob of heifers can be quite disastrous, especially if they are not monitored closely.

Basic Anatomy And Physiology

The reproductive tract of a bull is not nearly as simple as it looks from the outside. Sperm is formed in the testicles, which hang free from the body and operate at a lower temperature. It takes between 8 and 9 weeks for the sperm to develop within the testicles.

From there the sperm travel up inside the abdomen via the epididymis to the accessory sex glands, which provide nourishing fluids and an environment for final maturation and storage of semen.

Final ejaculation of semen during mating occurs with the assistance of the bulbourethral gland and penile muscles. Hopefully the penis will be working, fully extended from the sheath and placed correctly in the vagina of a cow in heat!

As with any biological system, the whole apparatus needs to be working well and in a co-ordinated manner for a motivated bull.

CAUSES OF POOR BULL PERFORMANCE

1. Conformation Defects

Leg, hip and hoof conformation is very important as bulls must be able to walk and mount repeatedly without pain. Leg and pelvic conformation defects can be heritable.

Penile and preputial deformities are not uncommon, as are small or absent testicles. Other conformational defects (e.g. undershot jaw) should not be ignored, especially if they might limit the bulls performance under pressure. Eye conditions are also important, as a bull performs better with visual stimulation.

Older bulls must be checked carefully. In addition to developing teeth problems, arthritis begins to creep in. It is estimated that 15% of range Angus bulls should be culled each year due to the effects of age.

2. Systemic Diseases

Any fever can reduce sperm quality by heating up the testicles. As sperm takes 8-9 weeks to form semen quality may be reduced for up to 9 weeks after the fever. Other diseases such as heart, lung or gut diseases will also limit a bulls mating performance.

3. Genital Diseases

Any of the reproductive organs can suffer. Conditions encountered include:

- infection/inflammation
- abscesses
- warts
- hernias
- lacerations
- haematoma.

4. Semen Defects

Sometimes these are permanent 'production faults', (primary abnormalities), where the testicles produce faulty sperm. Secondary abnormalities are usually temporary and may be caused by conditions such as fever, bull immaturity, or semen collection technique, where the semen has been temporarily damaged. In the future semen quality should be restored.

BREEDING SOUNDNESS EVALUATION (BSE)

A bull Breeding Soundness Evaluation (BSE) is a systematic check of a bull to ensure potential fitness for breeding. A BSE should be done well in advance of mating (at least 3 weeks before) to allow for bull treatment and recovery, or replacement - before alternatives become scarce and expensive. There are 3 options:

1. Thorough physical and genital exam.

- internal and external examination
- palpate testes and epididymis and penis
- measure scrotal circumference

Assuming libido and penile deviation/corkscrew are not a problem, about 10% of bulls are unsound for breeding. Up to 90% of these unsound bulls will be picked up by an experienced operator in a thorough physical and genital examination. The remaining 10% will only be identified by semen evaluation.

2. Semen Evaluation

- collected by electroejaculation, massage or back-raking
- motility and concentration can be assessed on the spot

- morphology (sperm anatomy) may be assessed at a lab

A BSE in dairy practice will usually involve (1) and/or (2). This does not assess sex drive or ability to mount, intromit and ejaculate. These can be assessed at mating time or by the serving capacity test (3), which is a test usually conducted by bull breeders.

3. Serving Capacity/Capability

- depends on bull numbers and facilities
- number of services per bull in 20 minutes
- demonstrates ability and desire to serve.

Serving capability can be assessed by the vet or farmer if the bull is seen successfully mounting and ejaculating. The serving capacity test was developed for beef bulls and effectively ranks bulls according to sex drive (libido).

The test is excellent at identifying functional problems such as arthritis, corkscrew penis or penile deviation. These are faults which may not be identified by other means.

The BSE has a positive cost benefit ratio, as well as offering peace of mind. If the bull team is not up to it, herd fertility and subsequent milk production will undoubtedly suffer (or require more inputs such as inductions).

BULL QUARANTINE

- TB card
- Leptospirosis vaccinated +/- antibiotic treatment as come onto farm
- EBL tested before coming onto farm
- Worms/Lice i.e. anthelmintic
- Sexually Transmitted Diseases

BULL CARE AND MAINTENANCE

During the mating season, the bull becomes a "sexual athlete". He must be prepared, fed and maintained accordingly.

Lameness

Lameness is a very common cause of bull failure, particularly in milking herds. Farmers and farm workers may not notice the bull going lame if he doesn't come all the way to the shed. As with all lameness, early intervention can prevent the problem becoming worse. Rotation of bulls can allow bruised feet to heal before progressing to more severe forms of lameness.

Systemic diseases

Bulls occasionally come down with other systemic diseases during the mating period. They should be given the same general and veterinary care as other herd members. Simply 'resting' the bull for 1-2 weeks may not be enough, especially where a high fever may cause poor semen quality for up to 9 weeks after the illness.

Sick bulls can occasionally spread infectious diseases e.g. mange, BVD, IBR pneumonia or venereal disease. Cast an eye over the bull for general appearance and health every time you look at him. Include the penis and testicles in your assessment.

Weight loss

A bull is expected to lose weight during the mating period - probably about one condition score per month. It goes without saying he needs to be in reasonable condition to start with.

Bull ratios

Bull ratios should generally be in the order of 1:30 - 1:50. Heifers require more bull power than cows, particularly if inexperienced bulls are used. If you are fortunate enough to buy a highly ranked serving capacity tested bull, you could mate as low as a 1:70 ratio.

With synchronised mobs, a higher bull ratio is required. Remember that returns to AI service from synchronised matings come in synchronised as well. A bull ratio of 1:4 cows served per day is realistic.

In the dairy herd situation back-up bulls are often used, so some bulls can be rested. This is good practice, and provides some insurance against individual bull failure. However, it does not provide a guarantee of fertility and a Breeding Soundness Evaluation is still a wise move.

TO ENSURE GOOD BULL PERFORMANCE-

- **Purchase bulls in good condition with an option of returning if unsound.**
- **Contact the vet for a Breeding Soundness Evaluation one month before bulls start mating.**
- **Pay attention to bull ratios, and bull care and maintenance.**
- **Promptly replace unsound bulls.**
- **Note bull behaviour in the paddock, including aggression (this is a disaster if the dominant bull is infertile) and successful service. Feet must leave the ground during ejaculation.**
- **Ensure good recording. Records of bull matings are very useful in analysis of expected calving data and pregnancy testing if required.**

APPROACH TO REPRODUCTIVE MANAGEMENT

SUMMARY

Assessment of reproductive performance

- LIC reports
- Dairywin
- PD results
- Last years calving pattern

Pregnancy Testing

- 6-7 weeks - post-AB to accurately plan inductions
- 8 weeks - after the end of mating to define empties

Mating Management Timetable

Procedure	Days to Mating	Date
Start Calving	-83	25 Jul
Induction	-60	17 Aug
Select and Test Bulls	-45	1 Sep
Tail Paint Cows	-35	11 Sep
Treat 'dirty' cows	-30	16 Sep
Treat non-cyclers	-7	9 Oct
Start mating	0	16 Oct
Check non-cyclers	14	30 Oct
End AB, Bull to herd	35	20 Nov
Bull out, dated PDs	90	14 Jan
Final PDs	135	10 Mar

CONCLUSION

- **What are your objectives?**
- **What improvements are you going to make to your herds reproductive performance?**
- **How are you going to assess those changes?**