Oestrus detection: its role in reproductive performance

G.J. Sawyer
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-its role in reproductive performance

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Every cattleman is familiar with the signs that
denote cows "on heat"... that is, in oestrus.
But there is a big variation between animals in
the intensity and duration of their oestrus
behaviour. Sometimes the signs are difficult to
detect. This can be the source of a costly
problem in herds geared to artificial
insemination.

Fortunately, herd health programmes have
achieved great progress in increasing
reproductive performance, usually by increasing
oestrus detection rates. Much can be gained
from such work to improve the Western
Australian dairy industry's productivity.

Results from herd-health schemes

Many studies conducted in the U.K., New
Zealand and Australia have emphasised the
importance of oestrus detection among cattle in
herds using artificial insemination (Esselmont,
1974; Pelissier, 1976; Boyd, 1977). Researchers
setting up a health programme for commercial
dairy herds, have recognised this as one of the
major elements limiting reproductive potential.
They set performance targets... a calving-to-
conception interval of 90 days with a standard
deviation of 40 days or less, and an intervaling
interval of 375 days with a standard deviation of
45 days (Blood et al, 1978).

In setting these targets they reduced the
emphasis on the first-service pregnancy rate, a
commonly held measure of fertility among many
farmers and also some practitioners. In fact, in
studies involving nine farms, the pregnancy rate
to first service actually declined to less than 50
per cent in farms with herd health programmes,
although on several properties the rates were
increasing again towards the end of the study
(Morris et al, 1978).

The calving-to-conception interval is a more
important consideration as it determines the
overall reproductive performance of the herd
within a given time and hence the most efficient
production of milk. The average calving-to-
conception intervals for herds on herd health
schemes were reduced by 24 days from 119
days and the intervaling interval was reduced
by 27 days. Ideally these intervals should be
reduced even further.

Researchers attributed the improvement in
performance of participating properties mainly
to improved oestrus detection in conjunction
with accurate and reliable record keeping as
well as treatment of temporary nutritional
deficiencies, prompt treatment of genital tract
disorders and the stimulus given to improved
performance by regular reports from the
scheme.

Why is oestrus detection important?
Poor oestrus detection is costly because it is a
major determinant of reproductive performance.
This is an "opportunity cost" because it
represents an unseen loss of both calves and
milk production. This unseen loss occurs
especially when cows calve throughout the year,
which is the case under the present market milk
supply system in Western Australia. A cow's
timeline calf and milk production is limited
automatically if she does not calve down at the
optimum interval of 365 days.

This is best illustrated by an example. Take a
100-cow herd (about the State average size)
with an average production of 4,000 litres per
cow... the average for cows participating in the
herd recording scheme... and assume an eight
year herd life for each cow with her first calv
dropped at two years. This means that during her productive life she should produce six calves and complete six lactations. On a herd basis this is 600 calves and 600 lactations or 2,400,000 litres of milk if every cow in the herd has a calving interval close to 365 days.

For comparison take a 100-cow herd with an average calving interval of 13 months or 395 days. Over the same eight years each cow will produce 5.5 calves and have 5.5 lactations because each year they have taken just slightly longer to get back in calf. Production for this herd would be 550 calves and 550 lactations or 2,200,000 litres of milk. The overall difference between these two herds during this time is 200,000 litres of milk which is about $30,800 when valued at surplus milk price. At this rate the gross benefit of reducing a long calving-to-calving interval is about $1.30 per day in Western Australia. However, the costs of feed to produce the extra milk and the cost of milking must be balanced against this. The net annual cost of long calving intervals is estimated to be between $1.0 and $1.5 million for the whole State. This is projected to increase as the production of milk per cow increases in Western Australia. There is also the loss of 50 calves which at current prices represents $1,000 to $2,000 if sold as day-old calves. Perhaps more importantly, having fewer calves dropped means a reduction in selection pressure for heifer replacements in the dairy herd, or in the potential to raise dairy beef.

The chin-ball harness.

Because cows are calved the year round in irrigation districts, the calving intervals are longer than in dryland areas where cows are calved in a more seasonal pattern. This may reflect the difficulty of accurately maintaining a high identification and detection rate of cows for breeding purposes when calving is not compact.

**Oestrus detection and record keeping**

Once a cow has calved, she must be remated successfully within about 85 days (365-280) if a 12 month calving interval is to be maintained. Under most management systems a rest period of about 30 to 40 days is needed to allow the cow's uterus time to prepare for the implantation of the next fertilised egg. This leaves 45 to 50 days for successful remating; that is, about two cycles or up to three heat periods.

The likelihood of mistakes in heat detection increases as the size of dairy and beef enterprises using artificial insemination increases. In fact, the present calving intervals in Western Australia are reflecting below-par reproductive performance (Table 1). However there are other penalties, besides a delayed interval from calving to first service, for failure to detect cows in oestrus. They include:

- false classification of oestrus, which shows up as a low conception rate and irregular cycles.

The chin-ball harness.

**The scope for improvement**

The Table 1 data have been extracted from 1981/82 herd recording records (Pavy and Sawyer, unpublished data) and show the calving interval and milk production by region and by age.

Although the sample size for this data is only about 8,000 cows, the trends for all regions are similar and can be taken as good indicators of the State situation. The estimates of C.I. are probably conservative, because cows culled from the herd, often for infertility, are not included.
Table 1.—Mean calving interval (days) and milk production (kg) from four dairy regions and cow ages

<table>
<thead>
<tr>
<th>REGION 1</th>
<th>REGION 2</th>
<th>REGION 3</th>
<th>REGION 4</th>
<th>STATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryland—North of Waroona</td>
<td>All irrigation Harvey-Darling</td>
<td>Dryland-Busselton, Capel, Boyanup, Albany</td>
<td>Dryland-heavy rain, Margaret River, Augusta Manjimup, Walpole</td>
<td></td>
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</tbody>
</table>

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<th></th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td>2</td>
<td>148</td>
<td>3823</td>
<td>395</td>
<td>1031</td>
<td>3774</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>4254</td>
<td>397</td>
<td>893</td>
<td>4440</td>
</tr>
<tr>
<td>4</td>
<td>121</td>
<td>4401</td>
<td>382</td>
<td>667</td>
<td>4797</td>
</tr>
<tr>
<td>4+</td>
<td>359</td>
<td>4616</td>
<td>394</td>
<td>1508</td>
<td>4257</td>
</tr>
<tr>
<td>ALL</td>
<td>746</td>
<td>4362</td>
<td>392</td>
<td>4099</td>
<td>4534</td>
</tr>
</tbody>
</table>

- delayed interval from calving to conception and even from first service to conception.
- a lack of information on pre-service heats so that cows with irregular cycles due to dysfunction of the ovaries are not recognised early.
- a low number of animals submitted for service within a restricted breeding period.
- the wrong assumption that the herd may have an anoestrus problem. This has been a notable feature of cows called up for No Visible Oestrus in various herd health programmes. In most cases the cows were cycling and simply had not been detected.
- a high percentage of empty cows.
- the risk of culling high producing cows for supposed anoestrus.

The last point raises an interesting question on the heritability of oestrus behaviour in cattle. Little is known about the subject at this stage, although some work has been carried out on the heritability of progesterone, oestrogen and LH hormone levels. All these hormones are involved in the manifestation of behavioural oestrus.

Adequate oestrus detection requires good identification of cows, and recording of all oestrus dates. Otherwise farmers will have no information on such vital factors as the last date of calving and pre-service heats. Thus they may inseminate cows too soon or too late after calving.

The human element

The farmer is the most important element in oestrus detection. Here are some tips on the human errors and ways to avoid them, as noted by Trim (1976) from Massey University, New Zealand.

- Clouded observation. Clearly distinguish one cow from another by large easy-to-read numbers.
- Supreme optimism. Don’t rely on memory, write down observations.
- Unqualified hope. Don’t go away on a Saturday expecting cows not to come on heat during your absence.
- Blind faith. After mating, don’t look the other way and believe they are all in calf.
- Deep-rooted obstinacy. If a cow is put up for mating two or three days early, admit it and correct the mistake then put her up again when she really comes on heat.
- “Changing horses”. Keep to well-tried techniques, don’t change the approach halfway through mating.
- Rigidity. Make allowance for variation not only from cow to cow, but from heat to heat in the same cow.

Careful observation by farmers is still a very accurate method of oestrus detection, especially if they check the herd three times daily...early in the morning, around noon and late in the evening (Williamson et al, 1972(b); Fullerton, Sawyer and Cotherson, 1982). However, with today’s demands on farmers’ time and managerial expertise, the use of hired labour, and the increasing tendency for large herds to be managed and milked by one person, various aids may help improve detection rates.

Aids to oestrus detection

A number of investigators report techniques which may be used to aid oestrus detection. These range from measuring the vaginal electrical resistance (VER) in cows (McCann and Patterson, 1981) to attaching heat detector pads which are activated after mounting (Williamson et al, 1972(a); Stevenson and Britt, 1977), using pedometers to measure the increased activity of cows at oestrus (Williams, Yer and Gross, 1981) and training dogs to recognise, presumably by odour, cows in heat (Kidd et al, 1978). Most of the foregoing techniques suffer disadvantages of impracticality or inaccuracy as aids in oestrus detection. The best of these is the heat detector pad which is about 70 per cent efficient when correlated with progesterone levels of detected cows. Detector pads are difficult to obtain in Western Australia and generally have given way to a more popular technique—tailpainting.

The idea of tailpainting originated in Victoria with the advent of dairy herd health schemes. A strip of enamel paint 20 cm x 5 cm is applied from the first coccygeal vertebra to cover rubbing points on the cows when ridden. It has been adopted widely in New Zealand, with much success...about a 90 per cent efficiency. The tail paint picked up an extra 24 cows not observed by the farmer in several large herds totalling 350 cows (Macmillan and Curnow, 1978).

A Western Australian trial on 12 dairy properties involving approximately 350 cows (Sawyer—unpublished data) also indicated improvement in oestrus detection by using tailpaint. The improvement in oestrus detection
averaged 22 per cent (range 10 to 40 per cent) and in nine herds, increased by 15 per cent or more. The technique is both simple and relatively cheap, but is best suited to dairy herds where breeding is on a seasonal basis, such as in New Zealand and Western Australian dryland dairy areas. It is inconvenient for year-round breeding programmes. Paint strips must be checked daily but touched up or repainted regularly, usually every two weeks, to save having a brush and paint in the dairy each day.

The other broad category of oestrus detection aids involves "teaser" animals. These may be prepared by surgical means or by hormone treatment of castrated males or females. The teaser animal usually wears a chin-ball marking device on the head and leaves a mark on the back or rump of cows after mounting them. The techniques for preparing teaser bulls include:

- vasectomy
- fixing the penis within the prepuce, either by curetting and suturing the penis to the preputial wall, or closing the preputial orifice and constructing a fistula
- peneotomy.

These techniques suffer the disadvantages of cost of the operation, the risk of transmission of venereal diseases if coitus is not prevented, and the fact that these animals often must be kept all year round but used only during a comparatively short mating period.

Steers or cows treated with testosterone (Britt, 1976; Kiser et al, 1977) also have been used to detect oestrus in cattle, especially in the United States. The response rate to testosterone was variable, and the large doses required . . . 700 mg per week . . . made these treatments relatively costly. In contrast a relatively cheap and reliable technique which consistently produced male behaviour in steers was reported by Sawyer and Fulkerson (1981). This technique evolved as a result of observations of male behaviour produced as a side effect of hormone treatments using oestrogen and progesterone, administered to induce lactation in heifers.

Oestradiol-benzoate at a dose rate of 8 mg/week/250 kg bodyweight is injected subcutaneously to produce "teaser steers". A preparation in an oily base is available commercially (Intervet, Australia), on veterinary prescription. It should be administered under veterinary supervision.

The following points should be noted if this type of "teaser" animal is required.

- Select steers that are about 15 to 24 months old, ideally about 300 kg liveweight. If they are too big or too small they will not mark cows well.
- A double dose can be given initially to rapidly build up levels, then followed up three or four days later with a single dose. Steers should be ready to use a week later.

<table>
<thead>
<tr>
<th>Methods of oestrus Detection</th>
<th>Cows correctly detected</th>
<th>Cows missed or silent heats</th>
</tr>
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<tbody>
<tr>
<td><strong>FARM A</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation only</td>
<td>20 50</td>
<td>20 50</td>
</tr>
<tr>
<td>Steers plus obs.</td>
<td>29 88</td>
<td>4 12</td>
</tr>
<tr>
<td>Tail paint plus obs.</td>
<td>28 80</td>
<td>7 20</td>
</tr>
<tr>
<td><strong>FARM B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation only</td>
<td>17 68</td>
<td>8 32</td>
</tr>
<tr>
<td>Steers plus obs.</td>
<td>27 90</td>
<td>3 10</td>
</tr>
<tr>
<td>Tail paint plus obs.</td>
<td>25 78</td>
<td>7 22</td>
</tr>
<tr>
<td><strong>FARM C</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation only</td>
<td>24 75</td>
<td>8 25</td>
</tr>
<tr>
<td>Steers plus obs.</td>
<td>15 88</td>
<td>2 12</td>
</tr>
<tr>
<td>Tail paint plus obs.</td>
<td>16 70</td>
<td>7 30</td>
</tr>
<tr>
<td><strong>FARM D</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation only</td>
<td>21 75</td>
<td>7 25</td>
</tr>
<tr>
<td>Steers plus obs.</td>
<td>13 87</td>
<td>2 13</td>
</tr>
<tr>
<td>Tail paint plus obs.</td>
<td>18 78</td>
<td>5 12</td>
</tr>
<tr>
<td><strong>OVERALL</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Observation only</td>
<td>82 67</td>
<td>43 33</td>
</tr>
<tr>
<td>Steers plus obs.</td>
<td>84 88</td>
<td>11 12</td>
</tr>
<tr>
<td>Tail paint plus obs.</td>
<td>87 77</td>
<td>26 23</td>
</tr>
</tbody>
</table>

*The tell-tail signs of oestrus activity.*
• Steers should be run with the herd for a few days before the programme starts so a “pecking order” can be established.

• Injections should be continued once a week for about four weeks. After this a booster injection every two weeks will probably be enough.

• Treated steers should be used at a ratio of one steer to 40 cows at the start of an A.I. programme. This ratio can be reduced as cows are inseminated but should not go beyond one steer to about 70 cows.

• Steers usually mount many more times than bulls, and can mark cows heavily with ink so the reservoir of the chin ball harness may need topping up quite frequently.

Steers treated in this manner have been used extensively on most Department of Agriculture Research Stations and some Western Australian dairy farms, with a detection rate of 90 per cent or better. This is higher than is generally achieved by observation alone.

Preliminary results of a comparison of three methods of oestrus detection made on four farms are shown in Table 2.

The results so far indicate that the detection rate with tail paint is lower than that observed with teaser steers. Also there seems more chance of making a wrong diagnosis based on the rubbing off of the paint strip.

Farmers have commented that on some occasions the paint strip lifted due to animals shedding their coats, a phenomenon which unfortunately coincides with breeding in many dryland dairy areas of Western Australia. The detection rate with steers is high, and no worse than if cows were watched continually for 12 hours each day as was the case on Farm A. At present day costs a three to four day reduction in the length of the average calving-to-calving interval would pay for the use of treated steers on an almost continuous basis. In seasonal herds the cost is less than a one day reduction in the length of the calving-to-calving interval.

References


