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AI and sire selection

Artificial insemination (AI) allows farmers to improve profits through the genetic improvement of their herds. Managing an AI program is another process that requires careful planning. Good AI programs involve good heat detection (Chapter 10, page 77), proper AI practice and the careful selection of AI sires.

Conception rates resulting from AI are reduced substantially when semen is not stored and handled correctly or when insemination technique is unsound. InCalf research has shown that at least 40% of DIY (do-it-yourself) technicians could achieve at least a 5% increase in conception rates by improving AI practices.

> **Many DIY technicians could increase conception rates with improved AI practices.**

> **Ensure your AI technique is spot on at an AI refresher course.**

Assessing AI practice

The performance of AI can be assessed using the conception rate (pages 25, 28, 32).

The non-return rate can provide an early warning of a low conception rate to AI and is a worthwhile first check (page 25). If the non-return rate for your herd is less than 60%, or conception rate is low (less than 49% in seasonal/split calving herds or 43% in year-round calving herds) you need to investigate potential causes, such as the following, and take the recommended action:

- Inadequate AI practices or poor quality semen – review AI practices on your farm (page 108).
- Poor body condition at calving or excessive loss of body condition following calving – review body condition score targets and herd nutrition (page 61).
- Inaccurate heat detection – review your heat detection program (page 82).
- Excessive numbers of late calvers (seasonal/split calving herds) – review calving pattern.

There are other possible causes of low non-return rate and low conception rate. You may need to seek help from an adviser.

AI technicians, whether professional or DIY, can measure their performance using the conception rate. Conception rates can be compared to expected performance or between individual AI technicians.

The conception rate achieved in a herd can vary for a number of reasons. That makes it difficult to compare the conception rate achieved by a single technician to expected performance targets. However, conception rates achieved in heifer AI programs are generally high (expect 60% in heifers achieving target weights) and can be used to assess the AI practices of the technician. A conception rate of less than 55% in well-grown heifers suggests that AI practices should be reviewed.

The second method of assessing the AI practices of technicians relies on having more than one technician operating in the herd. Comparing the conception rates achieved by multiple technicians gives an indication of whether AI practices are up to scratch.

To reliably assess conception rates, you will need to use early (seasonal or split calving herds) or regular (year-round calving herds) pregnancy testing.

The InCalf Fertility Focus report provides estimates of non-return rates, conception rates and a comparison of the conception rates achieved by different AI technicians.

Professional AI technicians

If all inseminations are performed by professional AI technicians:

- Check that your technicians are accredited by the National Herd Improvement Association (NHIA).
- Check that non-return rates achieved by your technician are monitored as part of their business's quality assurance program.

DIY technicians

If most of the inseminations in your herd are performed by DIY technicians, compare the conception rates achieved by those who completed at least 50 inseminations in your herd (see Discussion Box below).

If the difference between technicians was more than 15%, review the AI practice of all technicians on your farm (page 108).

Assess the conception rates achieved in a heifer AI program if at least 50 heifers were inseminated.

Top technicians achieve conception rates of at least 60% in heifers that are well grown (at target liveweight for mating).

If less than 55%, review AI practice (page 108).

How would you ever work out any differences between the conception rates of technicians? We all work together.

If two of your farm team and yourself are trained as technicians, it's good practice to share the insemination duties and compare your results. Use your record keeping system to record who performed each insemination. Once pregnancy testing has been completed, work out conception rates for each technician. This is easier if you obtain an InCalf Fertility Focus report.

A good way to check AI practices is to get a professional technician to inseminate at least 50 cows. The resulting conception rate is a good benchmark to which other technicians can be compared. While the technician is at the farm, you could also have him/her check the AI practices for yourself and your farm team.

Alternatively, you can compare the practices of DIY technicians by comparing conception rates where at least 50 inseminations have been completed on similar groups of cows (similar time since calving, age and body condition). Alternating the days you perform the inseminations can do this for you. If two employees have each inseminated 50 cows, and one has a conception rate 15% lower than the other, it does not 'prove' that something was wrong with his/her AI practices but it does indicate a review would be worthwhile.

The minimum number of inseminations to use in a comparison is 50. You can detect smaller differences in conception rates between technicians if larger numbers of inseminations are completed. Use the look-up table in Appendix 1, page 175, to determine the differences in conception rate that can be detected when larger numbers of cows have been inseminated.

Practice makes perfect. Send technicians to an AI refresher course every two years to ensure their AI technique is spot on.

Getting ready for AI

It is important to prepare for AI. A well-planned system with your farm team ready, supplies at hand and facilities in good shape is more likely to be successful.

- Check AI facilities provide a safe working environment.
- DIY technicians should:
  - Consider practising their technique on cows in heat in the fortnight before mating starts in seasonal/split calving herds. This can be done without using semen by blocking off the end of the gun with a piece of paper towel and placing a sheath over the gun.
  - Consider having their technique checked by a professional technician on the farm.
  - Attend an AI refresher course if they have not done one for two years or are not confident with their technique.
- Place a bench for straw preparation in a shaded spot with access to clean cold and hot water, a rubbish bin to dispose of gloves, paper and sheaths, and a hose to clean gumboots.
- Arrange for the technicians to check the facilities and to familiarise themselves with the yards and gates.
- Plan to have two people present for cow handling and inseminating. More staff may be required if a synchronisation program has been used.

Semen is a significant item in the farm budget. How effective it is, is up to you. Poor AI practice can be a costly and frustrating outcome of sloppy semen storage and handling, incorrect AI technique or poor timing of AI.

> ***What do you mean by having facilities in good shape?***
>
> AI facilities should be safe, accessible, convenient and comfortable for both the operator and the animal. Remember, it is the farmer's responsibility to provide a safe workplace for the technician.

Proper AI practice:

- **Know the location of each bull's straw before lifting the canister.**
- **Lift the canister only as high as the 'frost line'.**
- **Lift selected straws using tweezers.**

Semen storage and handling

The sperm contained within frozen semen straws are fragile and require great care when handling.

Are you doing everything correctly? Follow the checklist below to evaluate your semen-handling skills.

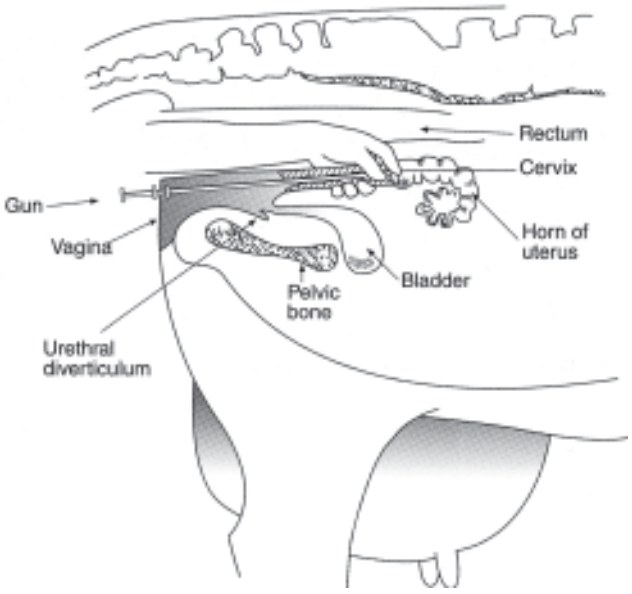
Checklist for semen handling	
Tank	
Check that the semen tank is full of liquid nitrogen when delivered.	
Twice weekly, check liquid nitrogen levels in the semen tank.	
Twice weekly, check the semen tank for 'frosting' on the outside of the neck of the tank. This indicates a tank insulation breakdown.	
Identify straws using coloured marker rods placed in the goblets (or a similar system).	
Know the location of each bull's semen before you retrieve the straw from the tank. You only have two seconds to check the bull's name on the straw before it starts to thaw.	
Handling straws	
Lift selected straws using tweezers; only lift one straw at a time.	
Only thaw as many straws as you can use within 10 minutes.	
Only lift the canister up to the 'frost line' in the tank to select straws.	
Thawing straws	
Thaw straws in a water bath kept at 32–38°C for at least 30 seconds. Keep straws in the water bath until shortly before use.	
Monitor water temperature continuously with a thermometer in the water bath. Semen is rapidly damaged if thawed in temperatures outside the 32–38°C range. An automated thawing flask that controls water temperature is useful if you are inseminating large numbers of cows.	
Ensure the water level covers all but the top 1 cm of the straw.	
On cold days, rub the gun briskly with a dry paper towel to avoid cold shock and keep the loaded gun warm before use.	
Only touch the ends of the straw and do not allow it to flick.	
Dry each straw thoroughly with a paper towel before loading into the gun.	
Load the straw into the gun, then cut it at right angles with clean scissors before covering with a sheath.	
Keep the loaded gun free of contamination and out of direct sunlight.	

Insemination technique

Patience, practice and proper hygiene are the keys to good insemination technique.

Checklist for insemination technique	
Wipe the lips of the cow's vulva clean of mucus, dirt and faeces using a clean paper towel.	
Provide a clean entry for the gun through the vulva – Open the lips by pressing your arm down in the rectum or with the aid of paper towel.	
Direct the gun upwards at 45° to avoid the opening to the bladder.	
Follow the progress of the gun with your hand in the rectum. Do not push your hand towards the cervix ahead of the gun.	
Work the gun through the cervix. Place the index finger at the front of the cervix to feel the gun passing through, preventing the gun progressing too deep into the uterus. Position the gun so it is only just protruding from the front of the cervix.	
Deposit all the semen slowly into the body of the uterus just through the cervix. Wait a moment before withdrawing the gun.	
Remove the gun with a smooth action while the arm is still inserted in the rectum.	

Sperm deposited in the cervix are less likely to progress to the uterus; they flow back into the vagina with the mucus.



Correct placement of semen: deposit all the semen just through the cervix.

Can I save a few bucks by splitting straws?

Splitting straws involves using a single straw on more than one cow. If you choose to split straws, you risk low conception rates and may spread disease (Appendix 3, page 179).

Focus on improving AI conception rates by avoiding short cuts. There are probably better ways to save a buck!

Timing of AI

Both sperm and eggs have a limited lifespan in the race for the two to meet. The timing of AI in relation to a cow's heat signs is important to the likelihood of conception. Best conception rates occur following insemination 4–12 hours after a cow has first stood to be mounted.

Inseminate cows at the next opportunity after detection of standing heat:

- Cows first seen on heat before or at the morning milking – inseminate that morning or that evening.
- Cows first seen on heat through the day or at evening milking – inseminate that evening or the next morning.
- If inseminating twice daily, do not delay insemination unnecessarily.

It is not necessary to re-inseminate a cow if she is still on heat at the next milking. However, if the cow is on heat two milkings (24 hours) later, re-inseminate her.

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The InCalf AI Practice Risk Assessment Tool may be useful in helping identify areas of your AI practice that may increase your risk of reduced herd reproductive performance.

Withholding inseminations

Once mating begins in seasonal/split calving herds, inseminate all cows seen on heat that have calved more than 3 weeks before.

In year-round calving herds, inseminate all cows seen on heat after their Voluntary Waiting Period, except cows definitely to be culled and cows where an Ovsynch® program is being used (Appendix 5, page 188).

I hate stuffing around with AI at night when I really just want to go in for tea. Can I get away with once a day AI?

Good news! Herds can inseminate once daily with no decrease in conception rates.

Before changing from twice daily to once daily insemination, consider the staff and facilities necessary to inseminate the larger numbers of cows at the once daily AI session.

If changing from twice daily to once daily AI, change for a short period and assess non-return rates before changing permanently.

AI sire selection

Choosing AI sires with high Australian Profit Rankings (APR) is the first step to making sure herd genetics for profit are maximised. Profit includes improving genetics for fertility.

Some AI sires produce daughters that are genetically more fertile than others. The genetic make-up of your herd for fertility may be a little better or worse than average. However, the differences between herds are generally small. In most Australian herds, it is unlikely that genetics are limiting reproductive performance.

By taking reproductive performance into account in the APR, along with milk production and other traits when selecting AI sires, it is likely that any long-term genetic decline in reproductive performance due to selection for milk production can be stopped and possibly reversed.

The APR helps determine which AI sires are best. The APR combines Australian Breeding Values (ABVs) for milk production, daughter fertility and other characteristics. AI sires with high APRs are genetically best overall for profit.

Australian Breeding Values (ABVs) are the best estimates of an AI sire's genetic merit – his ability to pass on particular characteristics to his daughters. ABVs are available for a range of characteristics such as protein yield, survival, calving ease, etc. ABVs are available for fertility for an increasing number of sires. Select AI sires that are best value for money by considering their Australian Profit Ranking (APR) and semen cost (page 113).

Reducing the rate of assisted calvings, particularly in heifers, can be achieved by avoiding high-risk breeds of sires and certain sires within a breed. Check the calving ease ABVs that are available for some sires.

What if I want to put more emphasis on daughter fertility when picking sires?

APRs are calculated for typical Australian herds. Reproductive performance is economically important in all herds; the APR takes this into account. For herds where reproductive performance is even more important economically, for example in seasonal calving herds, a customised list is available. This customised profit index is available from ADHIS at www.adhis.com.au

Don't forget to compare value for money.

Is that fertility ABV connected to the fertility of the semen or that of the daughters?

There are two parts to AI sire fertility:

Semen fertility – Bulls with higher semen fertility produce *semen* that is more likely to get cows pregnant and so conception rates are higher. While conception rates are similar for semen from most bulls, a small number of bulls and particular batches of semen have a reduced conception rate. This is not related to the fertility Australian Breeding Value (ABV).

Daughter fertility – AI sires with higher daughter fertility ABVs produce *daughters* that are more likely to become pregnant sooner, due to genetics. This is because daughters of some bulls cycle sooner after calving or have higher conception rates. Fertility is not highly inherited but the genetic differences are large enough to warrant inclusion in the Australian Profit Ranking (APR).

By choosing sires with a high Australian Profit Ranking, you also select for daughter fertility.

In summary:

- Choose sires with a high Australian Profit Ranking (APR).
- Select AI sires that are best value for money (page 113). You can access the current list of all AI sires at the Australian Dairy Herd Improvement Scheme (ADHIS) web site, www.adhis.com.au.
- Select a range of AI sires, rather than one or two to reduce the risk of using sires that produce semen of lower fertility.
- Don't change breed or strain or cross-breed to improve herd reproductive performance without careful consideration.
- If you wish to use sires not yet proven in Australia, choose sires with a high APR(i) and select those with high genetic merit for fertility using the breeding values published in the country of origin. An APR(i) estimates the APR that a sire would achieve when proven in Australia, and is based on breeding values provided by Interbull.
- When seeking a calving ease sire for use on heifers, check the calving ease ABV is no higher than 3 with moderate to high reliability (more than 60%). Avoid using sires with an ABV for calving ease above six on mature cows in order to avoid unnecessary calving difficulties.

Avoiding inbreeding

Inbreeding can have a negative effect on profitability through lower fertility, lower milk production and higher incidence of genetic diseases. Avoid the negative effects of inbreeding by not mating AI sires with related cows.

- Select a different AI sire if you know the proposed AI sire and the cow have a close ancestor in common.
- Ask your semen supplier about computer programs to detect AI sires that are too closely related to your cows.

How to identify AI sires that are the best value for money

The Australian Profit Ranking (APR) is reported in dollar figures allowing us to compare potential gain with semen price.

Each APR point represents an extra dollar of profit per lactation. Given that half the genetics comes from the bull (and half from the cow), and that the daughter will survive for five lactations on average, the lifetime profit from each extra APR point is worth $2.50 in lifetime profit.

How do I work out which bulls are better value for money?

Here's an example, if you want to compare two bulls, 'Gorgeous' and 'Dazzle', you need to check the difference in APR.

'Gorgeous' has an APR of 100 and costs $15.

'Dazzle' has an APR of 130 and costs $20.

The APR difference between the two is 30.

Multiply this by $2.50 to give the extra lifetime profit of $75.

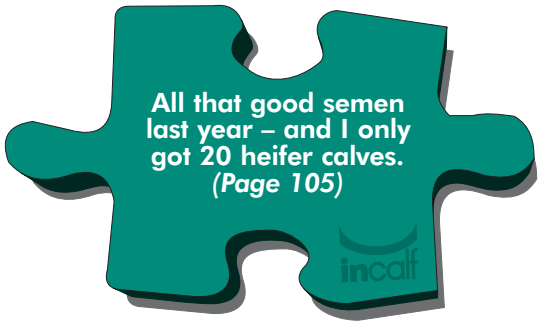
Now, the difference in semen price between the bulls is $5, but it will take about five doses to produce a heifer calf so the extra semen cost per heifer calf is really $25.

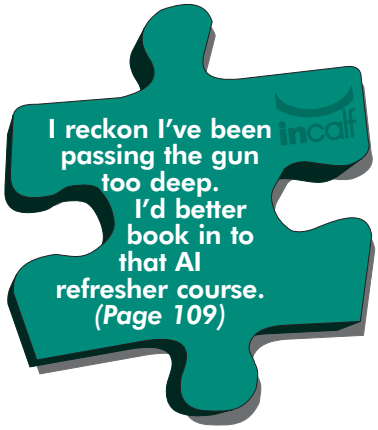
So, for an extra $25 in semen, you can get $75 in extra lifetime profit. That sounds like a good deal. It looks like you'll be 'Dazzled' this year!

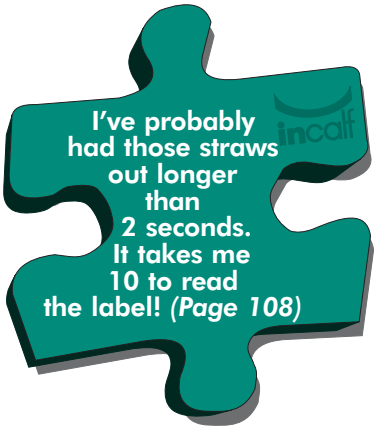
Bull name	*APR*	*ASI*	*Milking speed*	*Temperament*	*Survival*	*Somatic cell count*	*Liveweight*	*Daughter fertility*
Goodbull	154	130	93	94	1	10	0	1
Lucky	153	127	95	96	5	-7	4	4
George	139	116	96	95	3	0	-7	-1
Fred	129	111	96	94	0	-8	3	3
Dazzle	130	109	94	94	4	-1	1	-2
Prettyboy	129	100	95	93	0	3	2	-1
Busker	124	98	95	92	5	-6	11	4
Letsgo	121	109	92	93	2	21	5	2
Dazion	120	100	92	95	1	25	9	-1
Shady	116	108	93	90	2	2	-1	2
Glen	116	101	96	89	1	-2	-3	2
Gryphon	115	99	93	91	-1	-2	7	-2
Fabulous	115	92	93	93	0	12	2	-6
Damion	115	71	95	91	2	9	8	6
Socks	112	98	95	89	4	-7	3	-4
Skidsteer	112	96	90	95	2	3	-2	-1
Presto	112	74	95	89	3	3	-1	0
Zandenburg	111	110	92	90	1	-9	3	1
Gorgeous	100	100	95	94	-2	-16	1	3

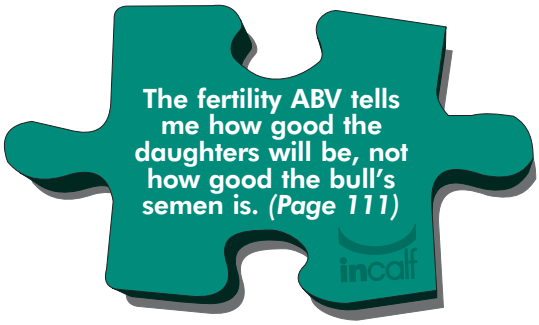
$20

$15

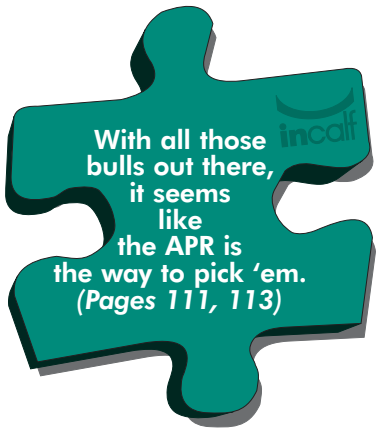

All that good semen last year – and I only got 20 heifer calves. (Page 105)


I reckon I've been passing the gun too deep. I'd better book in to that AI refresher course. (Page 109)


I've probably had those straws out longer than 2 seconds. It takes me 10 to read the label! (Page 108)


The fertility ABV tells me how good the daughters will be, not how good the bull's semen is. (Page 111)


Gee, the professional technician did a lot better than I did last year! (Page 106)


With all those bulls out there, it seems like the APR is the way to pick 'em. (Pages 111, 113)


No more twice daily inseminations for me. I might even get to tea on time. (Page 110)


I've heard that my semen supplier can give me a list of matings to avoid inbreeding. (Page 112)