

# Optimising Reproduction



Focus on dairy cattle



UNIVERSITY OF COPENHAGEN



Food Animal Biotechnology

# Basic Dairy Production System

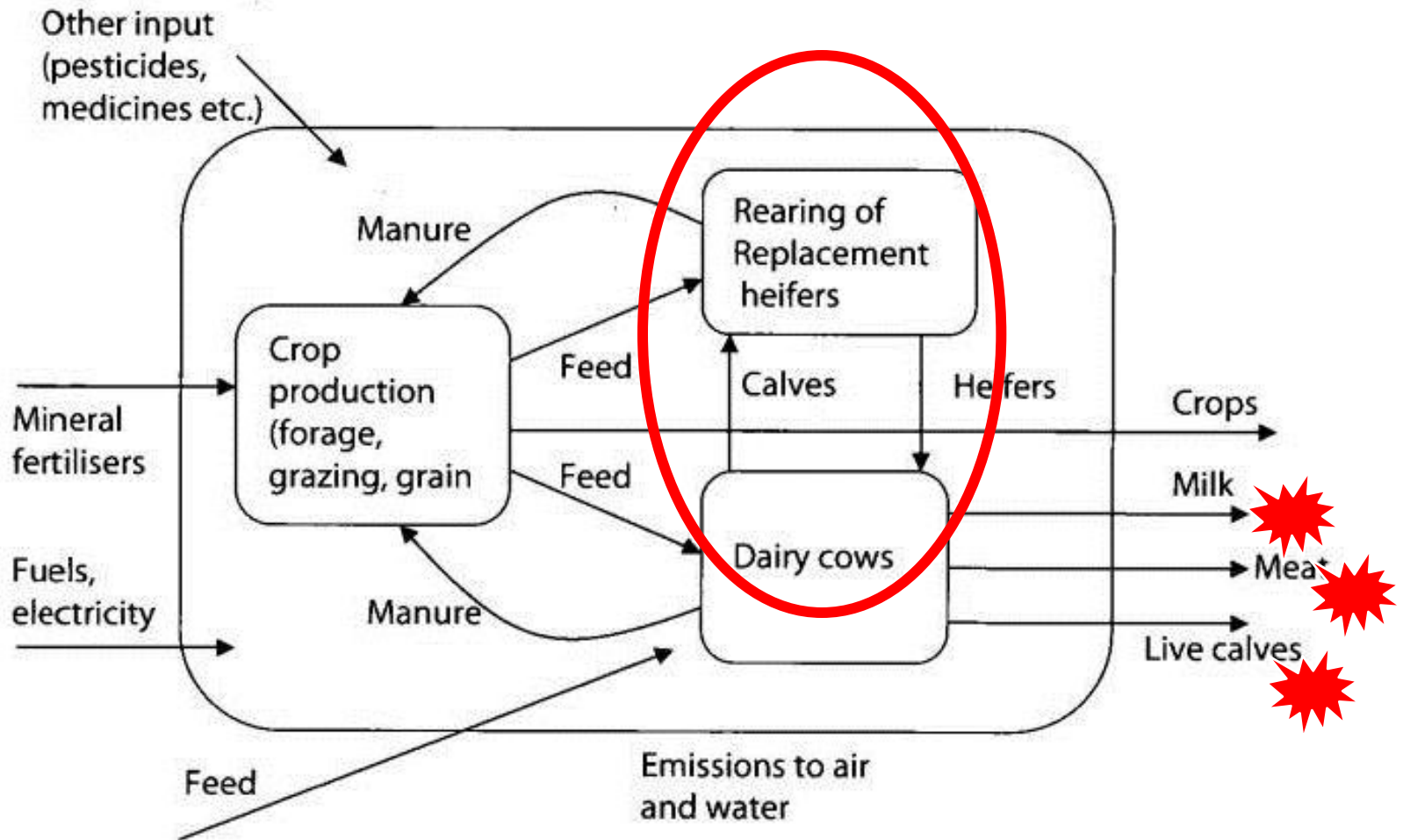
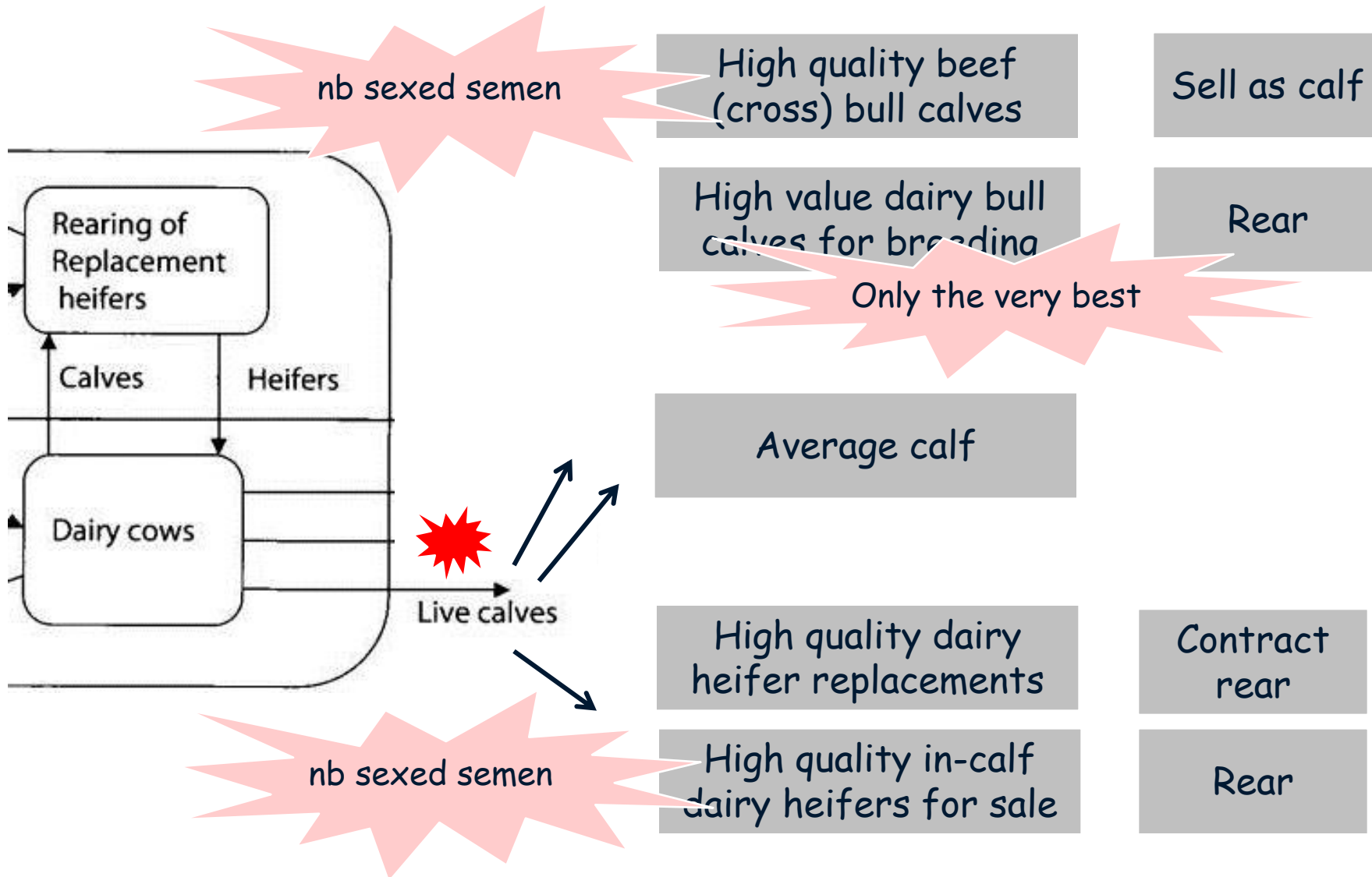


Figure 1. Principal description of the milk production system.

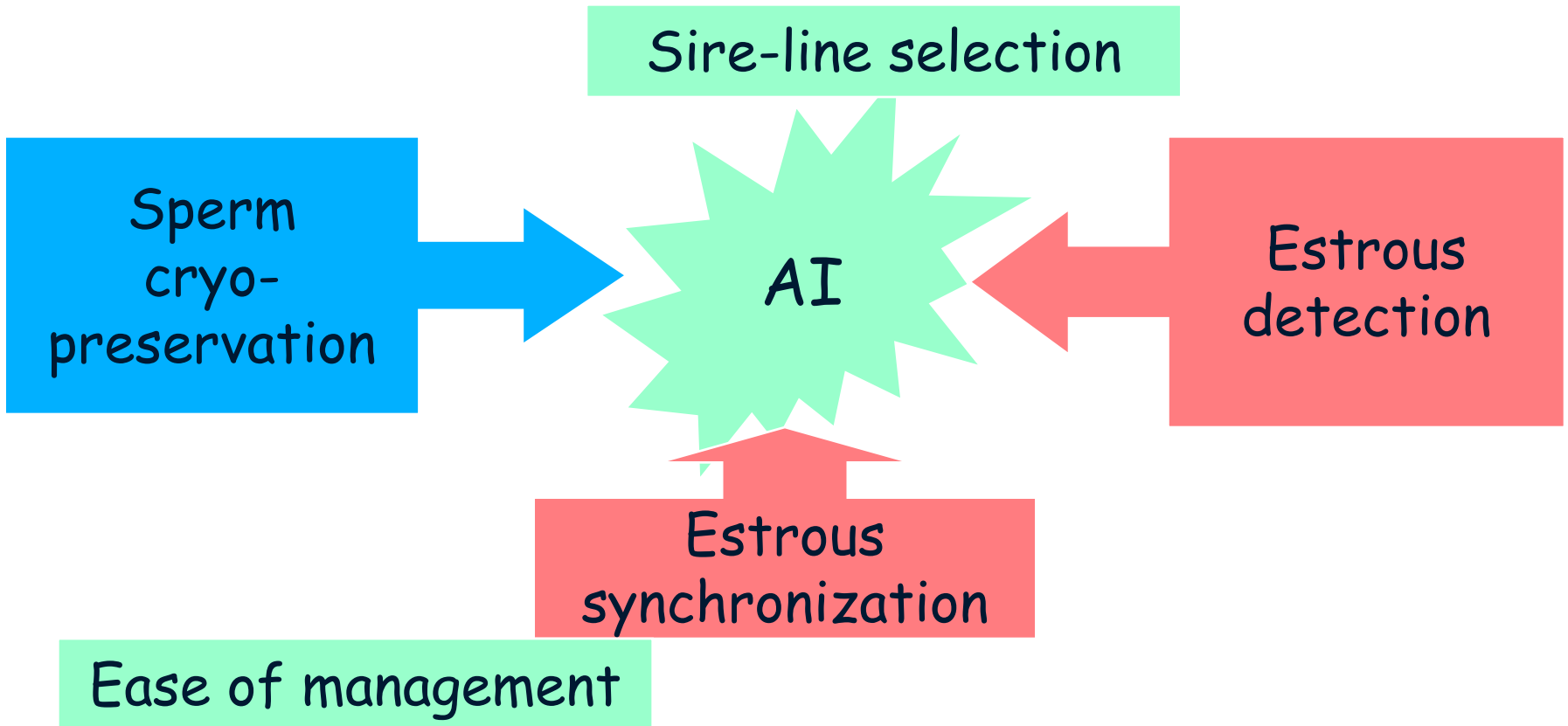
# Options provided by breeding



# Breeding



♀ Agricultural needs have driven Reproductive Biology!



# Estrous synchronization and timed AI

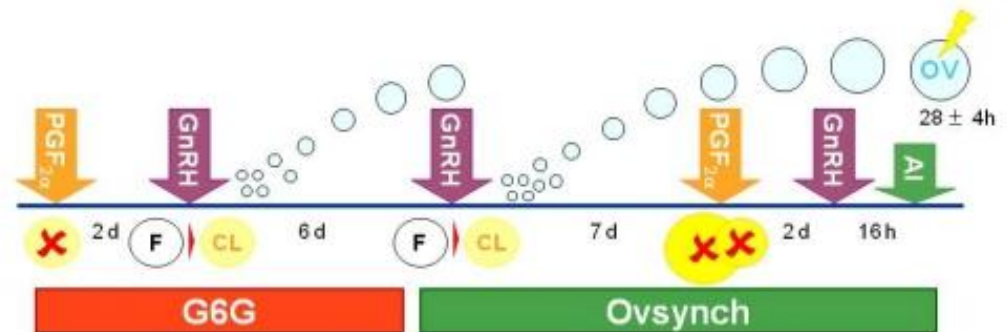
## Ovsynch<sup>®</sup>

Traditional Method

- GnRH – Day 0
- PGF<sub>2α</sub> – Day 7
- GnRH<sup>2x</sup> – Day 9
- Timed A.I. – up to 24 hours after second GnRH

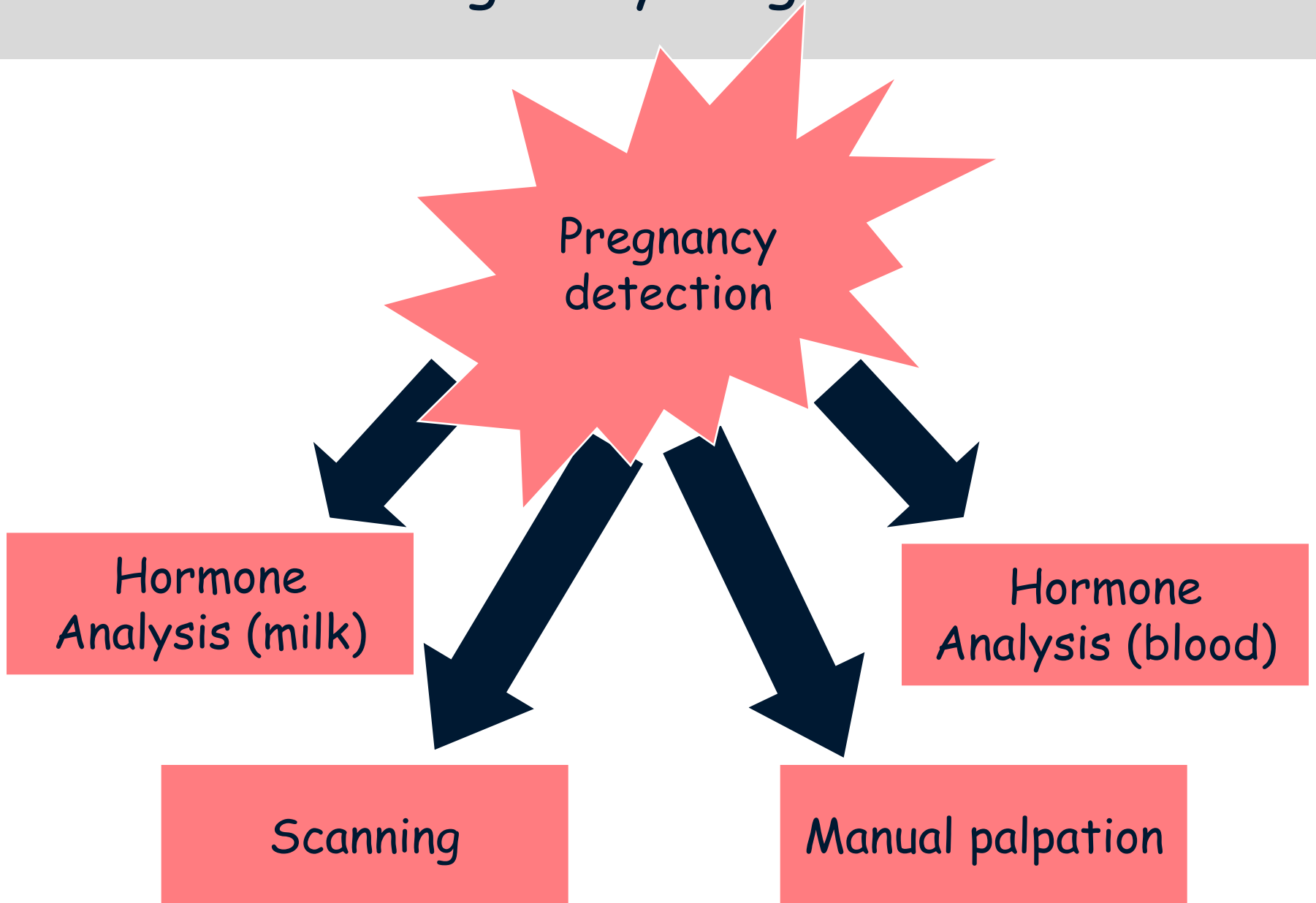
0 M Inject GnRH	1 T	2 W	3 Th	4 F	5 S	6 S
7 M Inject PGF <sub>2α</sub>	8 T	9 W Inject GnRH	10 Th Timed A.I.	11 F	12 S	13 S

## Improved technique



**Figure 1:** G6G/Ovsynch in lactating dairy cows: Schedule of injections, underlying ovarian dynamics and synchronization response (F: Follicle; CL: Corpus luteum; X: Luteolysis; Ov: Ovulation).

# Pregnancy diagnosis



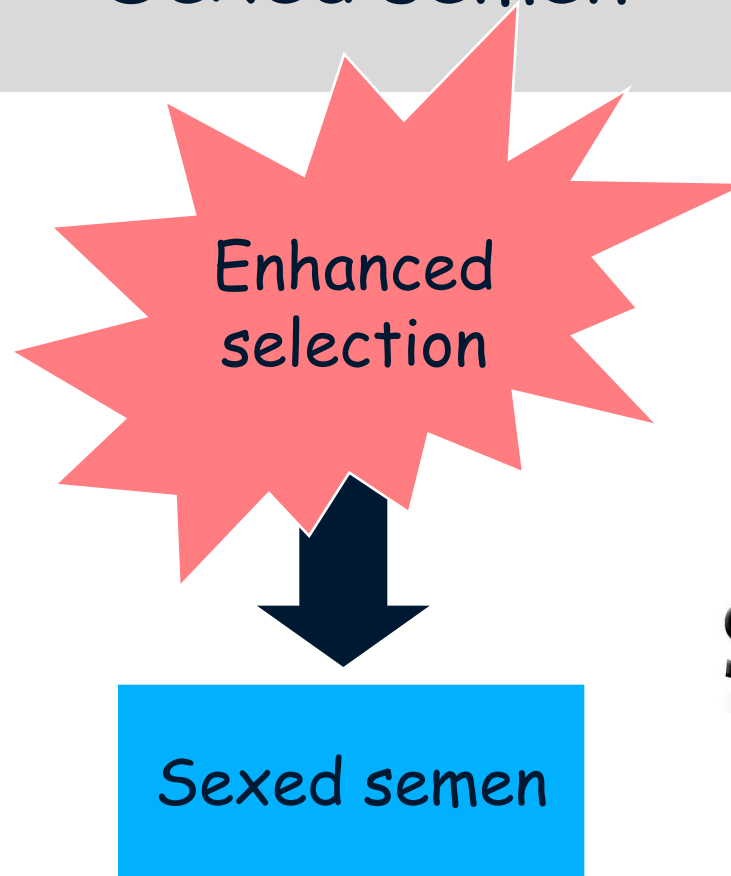
# Embryo transfer: Dam line selection



*Sample ET Programme*

Donor	Days	Recipient	Days
Reference Heat	0		
Insert PRID Coil	7		
Commence course of FSH Injections	11	Prostaglandin injection	0
Remove PRID Coil	13		
FSH injection can complete	14	heat detection - only put forward for transfer those recipients showing heat	3
Heat due Insemination PM	15		4
2nd Insemination AM	16		5
Flush	22	Transfer	11

# Sexed semen

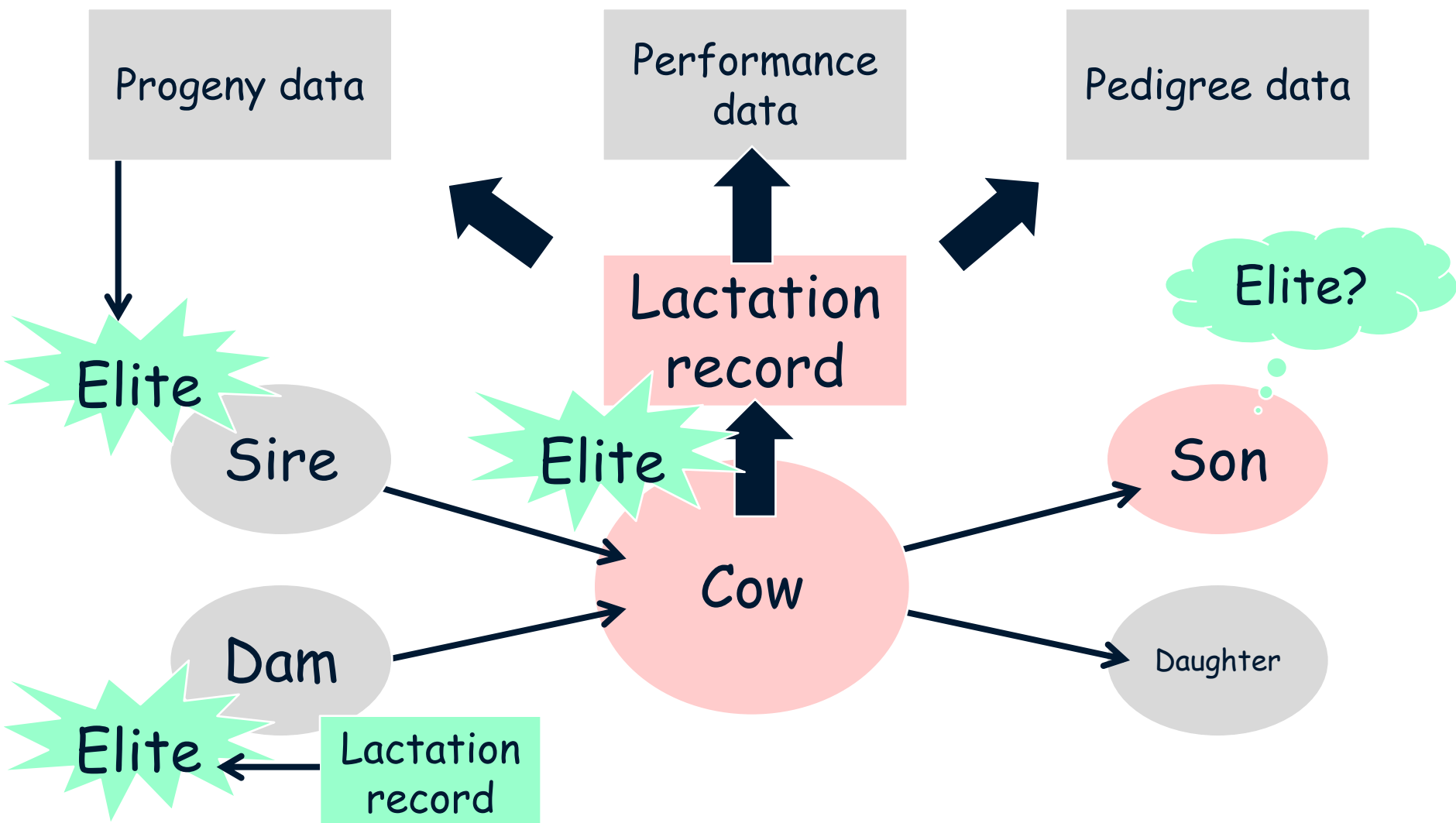


## Sex Selection through AIH.

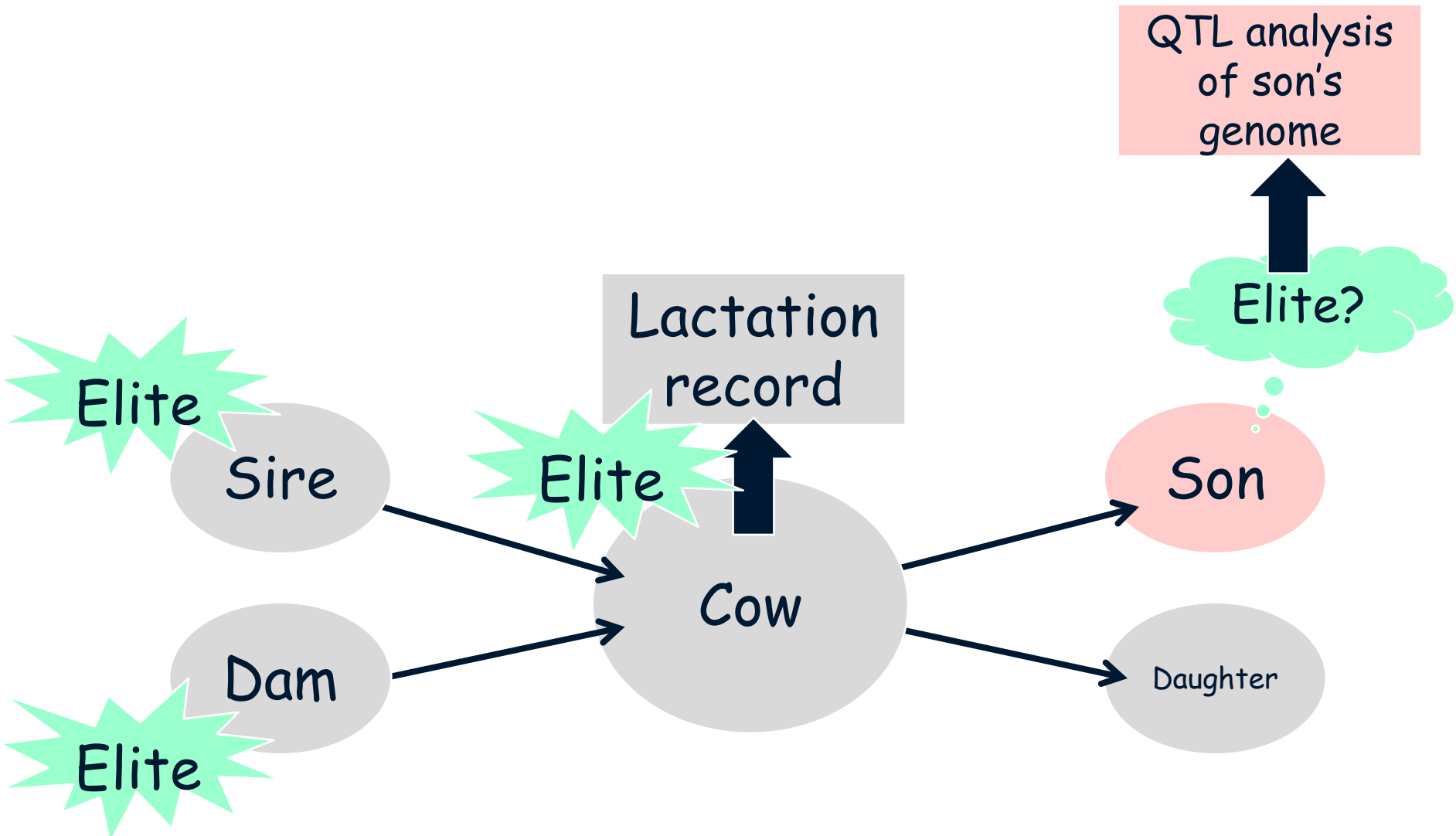
Rabbi J. David Bleich has noted that the Talmud offers specific advice on how to increase the probability of a male birth. With regard to sex selection, he concludes, the primary halakhic concern is not with regard to the decision to engage in sex selection but with the method to be employed. Rabbi Bleich has already indicated over a decade ago that, in his opinion, sex selection using AIH (artificial insemination with the husband's semen) after separation of the X- and Y-bearing sperm would be prohibited.



# National Breeding Programmes: Progeny Testing



# National Breeding Programmes: Genomic Testing



# National Breeding Programmes: Traits of Interest

- Ω In the UK, PTAs (predicted transmitting abilities) are available for:
  - Production traits:
    - Milk (kg), fat (kg, %), protein (kg, %) Persistency (280d yield as % of 60d yield) = £PIN Profit Index evaluation
  - Health, welfare and fitness traits:
    - SCC, Fertility, Lifespan, Locomotion
  - Management traits:
    - Temperament, Milking ease, Calving ease
  - Type traits:
    - 17 conformational traits are assessed
  
- Ω PLI, Profitable Lifetime Index has been used since 2007 as improved selection index. Production traits are 45% of assessment, others combined are 55%

# Heritability values

**Table A2.1.** Heritability estimates for major health and production characteristics of dairy cows (based on [www.dairyco.org.uk/library/farming-info-centre/breeding/breeding-briefs.aspx](http://www.dairyco.org.uk/library/farming-info-centre/breeding/breeding-briefs.aspx)).

Trait	Heritability
<i>Production</i>	
Milk yield	0.55
Protein yield	0.51
Protein percentage	0.68
Fat yield	0.47
Fat percentage	0.68
<i>Linear type</i>	
Stature (ST)	0.41
Body depth (BD)	0.33
Rump angle (RA)	0.30
Rear leg side (RLS)	0.20
Fore udder attachment	0.22
Udder support (US)	0.19
Teat placement rear (TPR)	0.29
Teat length (TL)	0.29
Chest width (CW)	0.25
Angularity (ANG)	0.34
Rump width (RW)	0.26
Foot angle (FA)	0.10
Rear udder height (RUH)	0.23
Udder depth (UD)	0.35
Teat placement rear (TPS)	0.29
<i>Composite type</i>	
Mammary	0.27
Legs and feet	0.16
Type merit/type score	0.32
<i>Management</i>	
Lifespan	0.06
Somatic cell count	0.11
Temperament	0.11
Body condition score	0.27
Maternal calving ease	0.04
Locomotion	0.10
Fertility	0.03
Ease of milking	0.21
Direct calving ease	0.07



**Figur 9.5.** Trækthjælp med kæder. Der må kun trækkes med hvad der svarer til voksne personers trækraft.