Extension
UNIVERSITY OF WISCONSIN–MADISON

DAIRY WORKERS'


Photo credit: A. Bjurstrom

TRAINING MODULE 2

REPRODUCTIVE SKILLS

DAIRY WORKERS' TRAINING MODULES

Heifer Synchronization

Heifers…
An investment in the future dairy herd

- High quality dairy replacements for improving genetic progress
- Heifer raising is the second largest expenditure on the farm

Photo credit: A. Bjurstrom

Largest factor influencing heifer costs

Age at first calving

- Heifer housing
- Feed
- Labor
- Management

Heifer reproduction goal

Photo credit: T. Kohlman

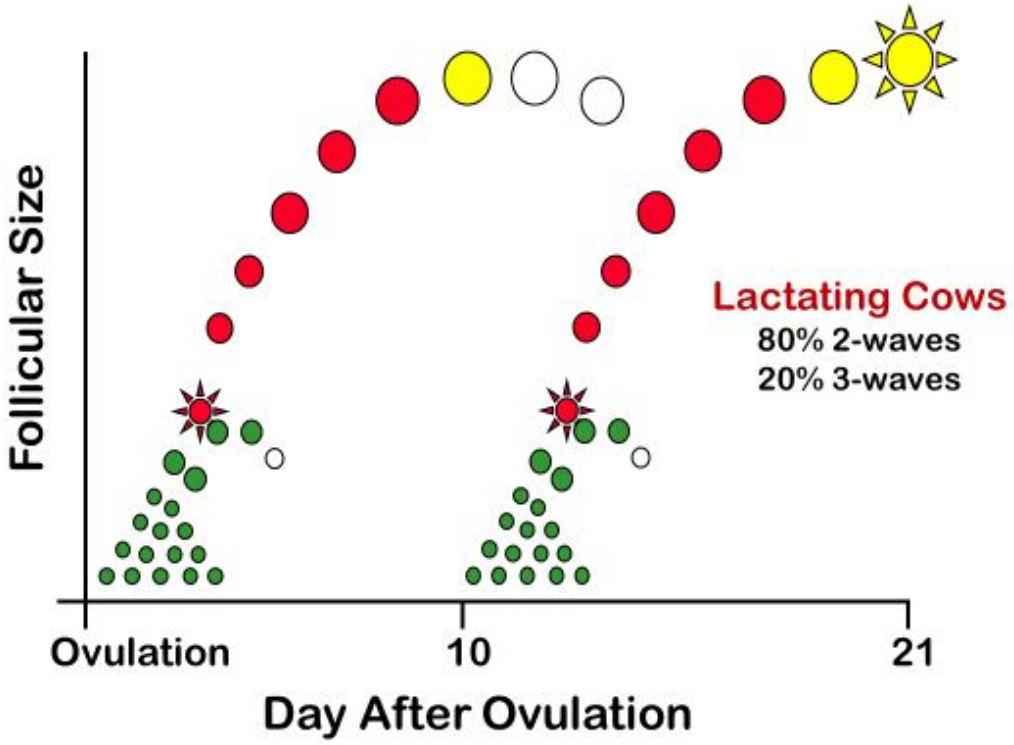
Raise heifers to reach a desired age and body weight early so they initiate puberty, establish pregnancy, and calve easily at a minimal cost

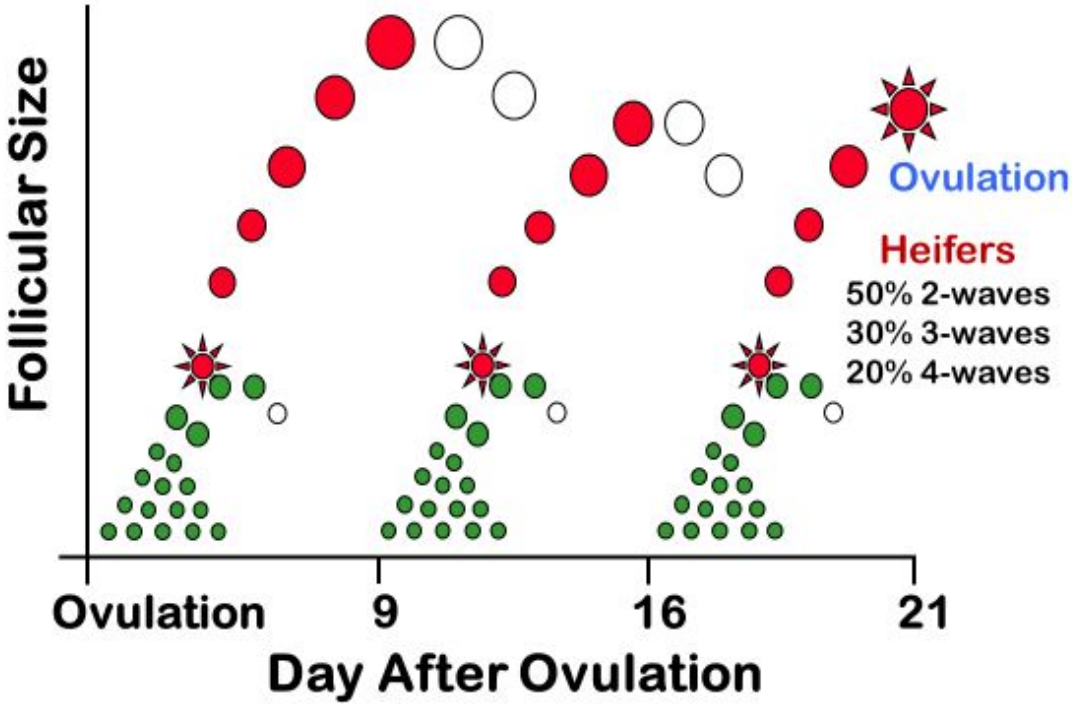
Cows versus heifers

	Cows	Heifers
Estrus Duration	7.3 ± 7.2 hours	11.3 ± 6.9 hours
Conception Rate	<50	>50
Pregnancy Loss	High	Low
Multiple Ovulation	14%	5%
Twinning Rate	8%	-1%

Source: P. Fricke, UW Madison Department of Dairy Science

Follicular waves





Management barriers to high heifer fertility

- Optimal weight
- Heat detection
- Timing
- Compliance

Targeted breeding approach

- Reach 55% of mature body weight the first 13 months
- Rebreed 1st group by 14 months of age
- Breed 100% of heifers for first time by 15 months

Deciding when to breed Holstein heifers

Breeding Recommendations

Age = 13 months

Weight = 875 lb (396 kg)

Wither Height = 50 in (127 cm)

Calving Recommendations

Age at first calving = 22 - 24 months

Weight = 1250 lb (567 kg) post-calving

Wither Height = 55 in (140 cm)

Breeding strategies for heifers

- Natural service
- Visual heat
- Systematic breeding system
  - Artificial insemination (AI) to observed heat
    - Prostaglandin program
    - Progesterone programs
  - Fixed-time AI

Natural service

Natural service

Advantages

- Less labor with a lower level of skill than AI
- No heat detection

Disadvantages

- Cost
- Number of bulls
- Performance and fertility
- Breed date
- Biosecurity
- Genetics
- Safety

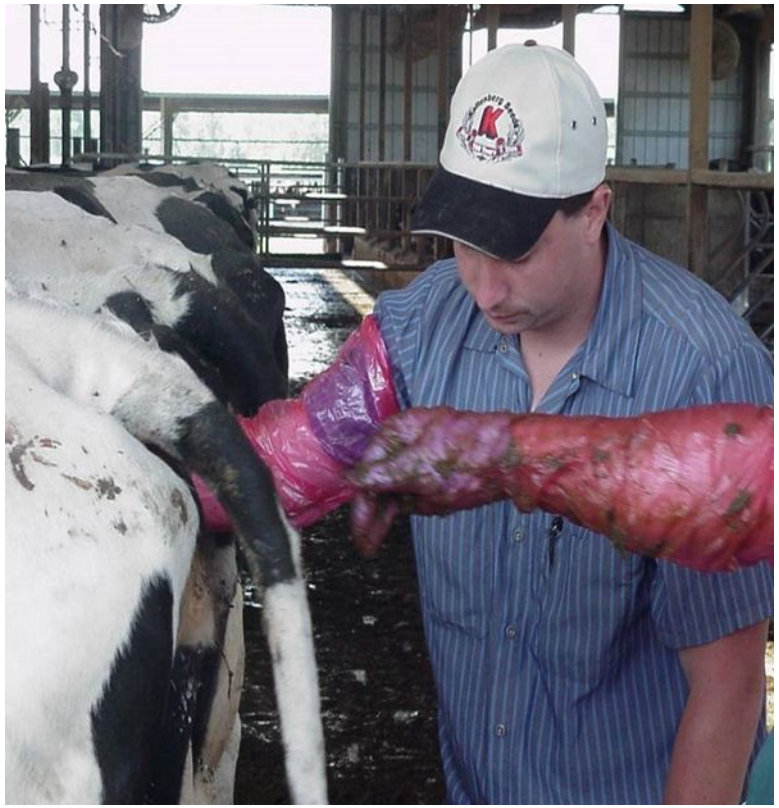
Utilizing natural service

- Breeding soundness exam (BSE)
- Physical exam
- Handling facilities
- Daily monitoring
- Rotate bull
- Less than 2.5 years of age
- 1 bull to 15 to 25 cows
- Nutrition
- Minimize heat stress
- Herd health

Visual Heat & AI

Advantages of artificial insemination

- Genetics
  - Proven, known genetics
  - Opportunity to increase genetic merit
- Economic advantage



Visual heat

- Considerable time and labor
- Eliminates use of hormone injections
- Overall success depends on:
  - Number of heifers cycling
  - Accuracy of heat detection
  - Efficiency of heat detection

Signs of estrus

Primary sign

- Standing to be mounted

Secondary signs

- Mounting other heifers
- Mucus discharge
- Swelling, reddening of vulva
- Bellowing, restlessness, and trailing
- Rubbed tail head, dirty flanks
- Chin resting, and back rubbing
- Sniffing genitalia

Improving heat detection

- Housing
- Floor surface
- Feet & legs
- Status of herd mates
- Detection aids

Estrus detection aids

- Record keeping
- Signs of estrus
- Mounting detection aids
- Activity monitors
- Hormone injections

Systematic breeding

Advantages of a systematic breeding program

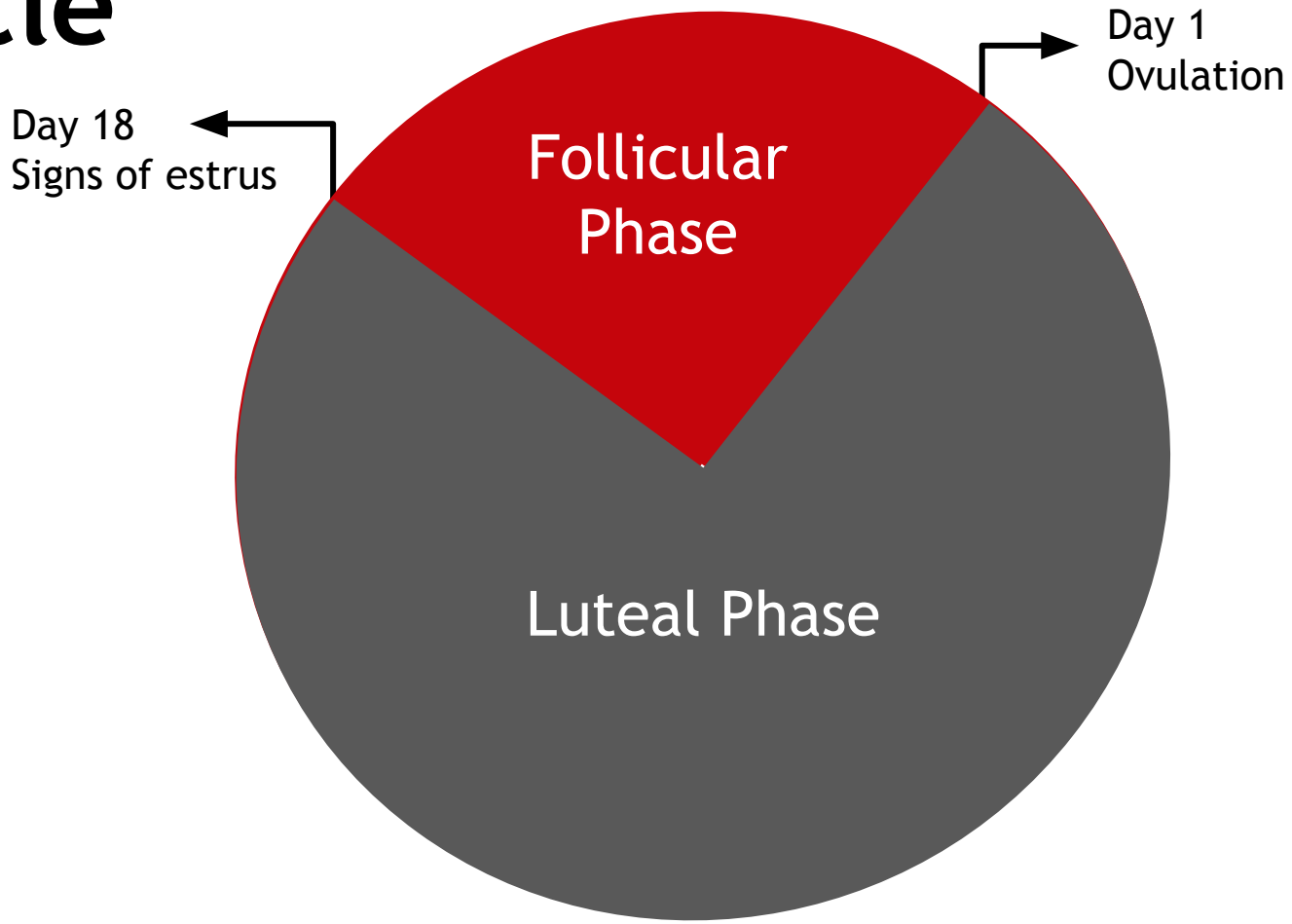
- **Improve** efficiency of heat detection
- **Achieve** timelier first service
- **Reduce** variation in calving interval among heifers
- **Reduce** involuntary culling for reproductive reasons
- **Concentrate** labor for reproductive management to specific time periods
- **Improve** overall reproductive performance of herd

Synchronize heats and induce ovulation

- Synchronizing allows use of natural estrous cycle
- Utilizing hormones must be administered at specific times following a proven standardized system
- Failure to follow leads to poor results and additional costs

The estrous cycle

- 2 major phases
  - Follicular phase
  - Luteal phase



Hormones of the estrous cycle

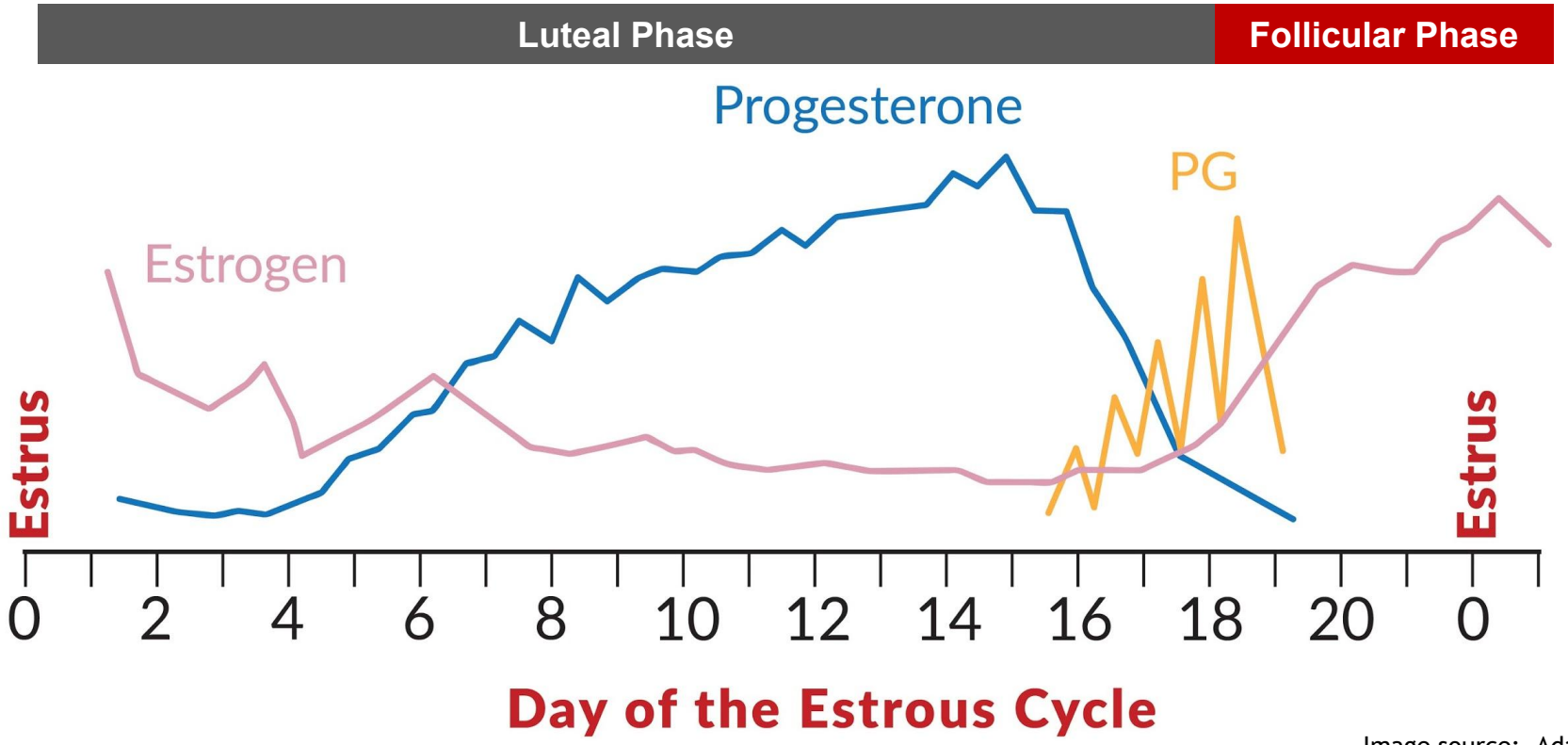


Image source: Adapted from Paul Fricke

Physiology of the estrous cycle

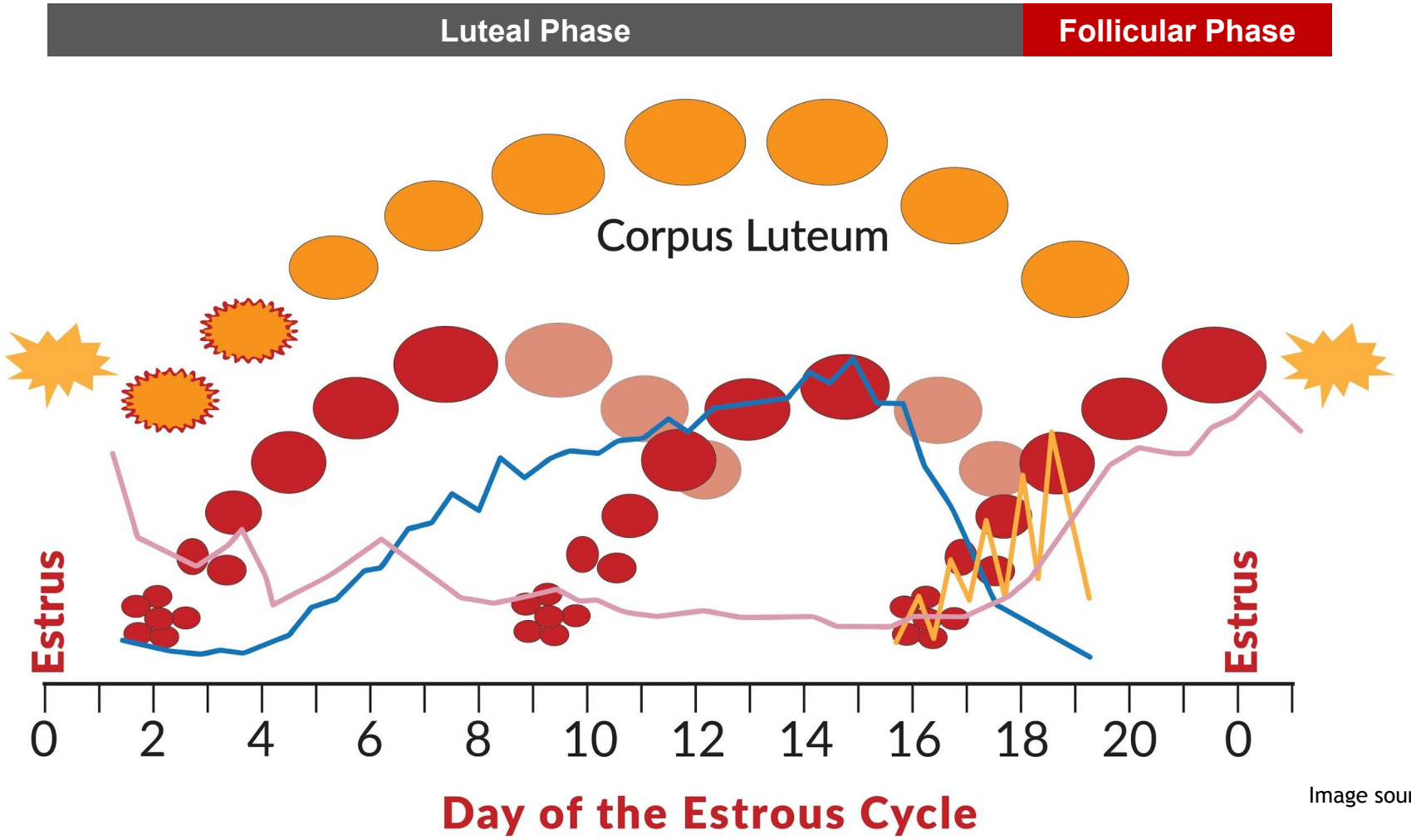


Image source: Adapted from Paul Fricke

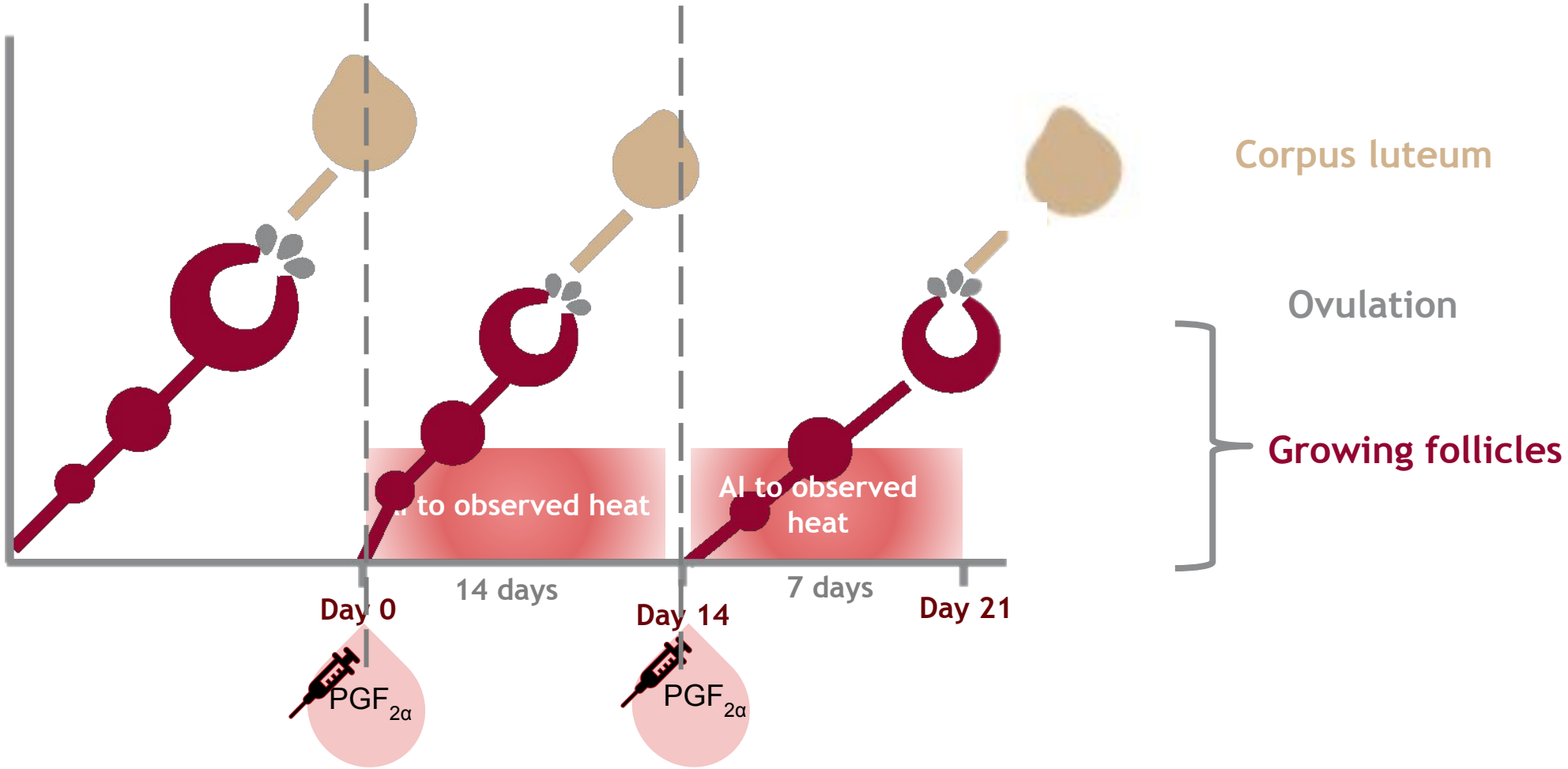
Hormonal manipulation of ovarian function in heifers*

- Progestin
  - CIDR® Intravaginal Insert (Zoetis)
- Prostaglandin $F_{2\alpha}$
  - Lutylase® (Zoetis)
  - Estrumate® (Merck)
- Gonadotrophin Release Hormone
  - Factrel® (Zoetis)
  - Fertagyl® (Merck)
  - Cystorelin® (Boehringer Ingelheim)

*FDA approved drugs for synchronizing estrous cycles in cows or heifers.
Must be prescribed through a Veterinarian-Client-Patient Relationship (VCPR).

Systematic breeding: AI to observed heat

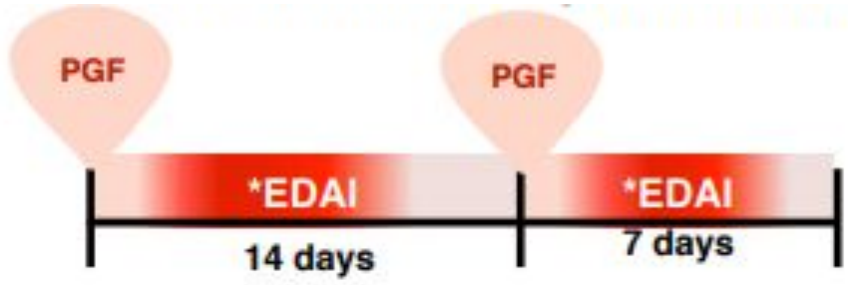
AI to observed heat: Prostaglandin program



Two PGF injections followed by heat detection

Image source: H. Schlesser & C. Worster
Source: Dairy Cattle Reproduction Council, 2018

AI to observed heat: Prostaglandin program



Two PGF injections followed by heat detection

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	PGF injection	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat
Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat
Breed on visual heat	PGF injection	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat
Breed on visual heat	Breed on visual heat					

Source: Dairy Cattle Reproduction Council, 2018

AI to observed heat: Progesterone program

CIDR program with PGF injection at removal followed by heat detection

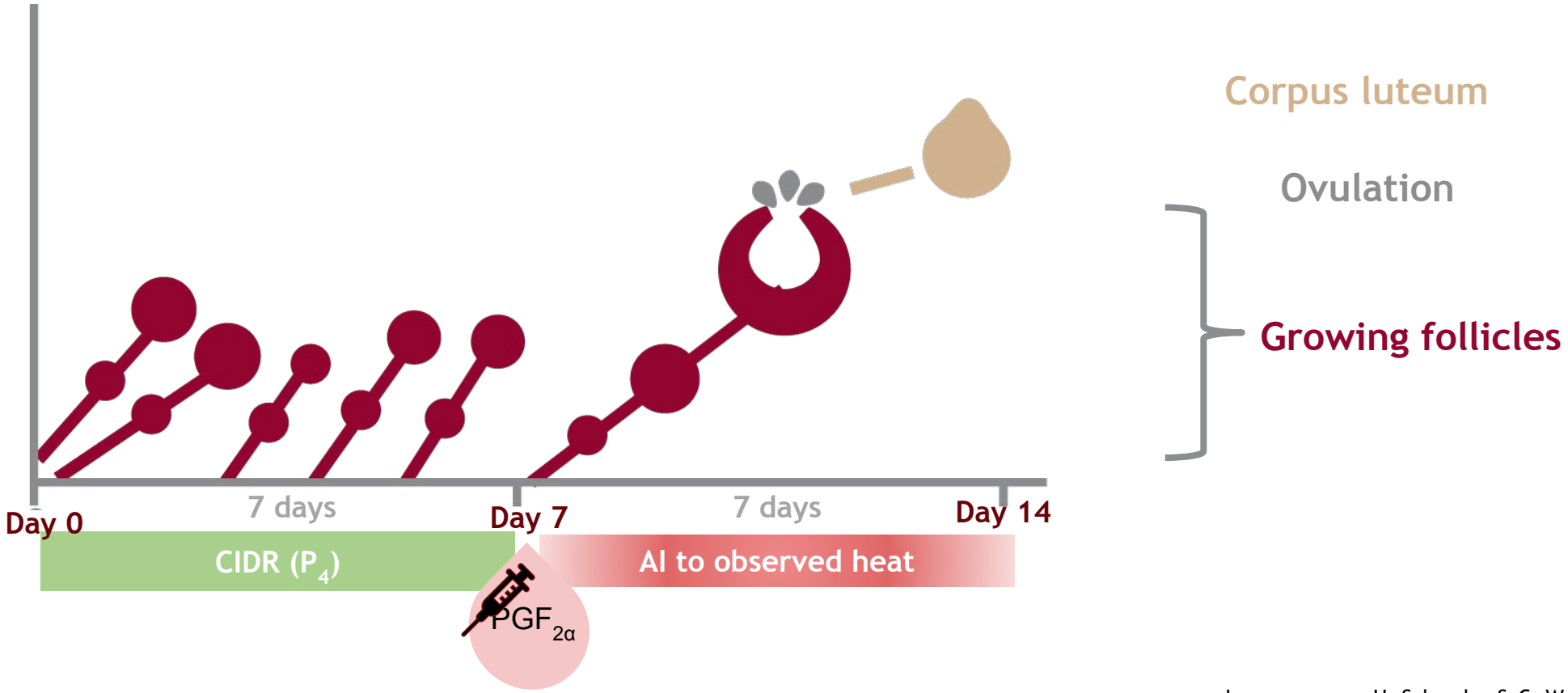
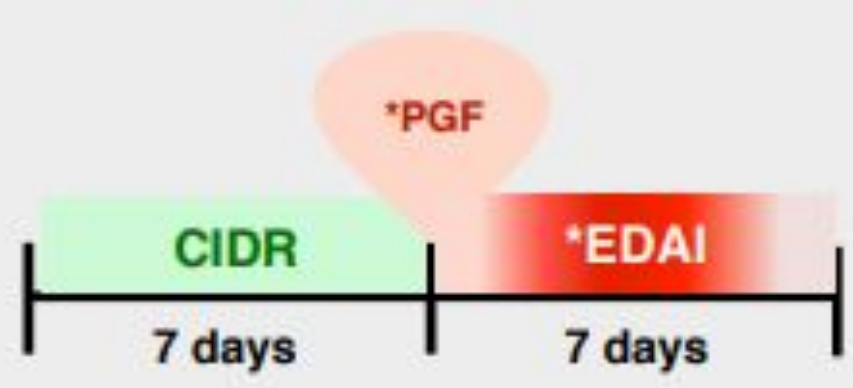


Image source: H. Schessler & C. Worster

AI to observed heat: Progesterone program



CIDR program with PGF injection at removal followed by heat detection

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	CIDR insertion	CIDR	CIDR	CIDR	CIDR	CIDR
CIDR	CIDR removal  PGF injection	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat	Breed on visual heat
Breed on visual heat	Breed on visual heat					

Source: Dairy Cattle Reproduction Council, 2018

Systematic breeding: Fixed-time AI

Fixed-time AI systems

- Induce puberty in heifers
- Control timing of ovulation
- Eliminate need for estrus detection
- Allow all heifers inseminated on same day
- Higher drug costs and more trips through chute

Fixed-time AI: 5-day CIDR-Sync with GnRH & 2 PGF

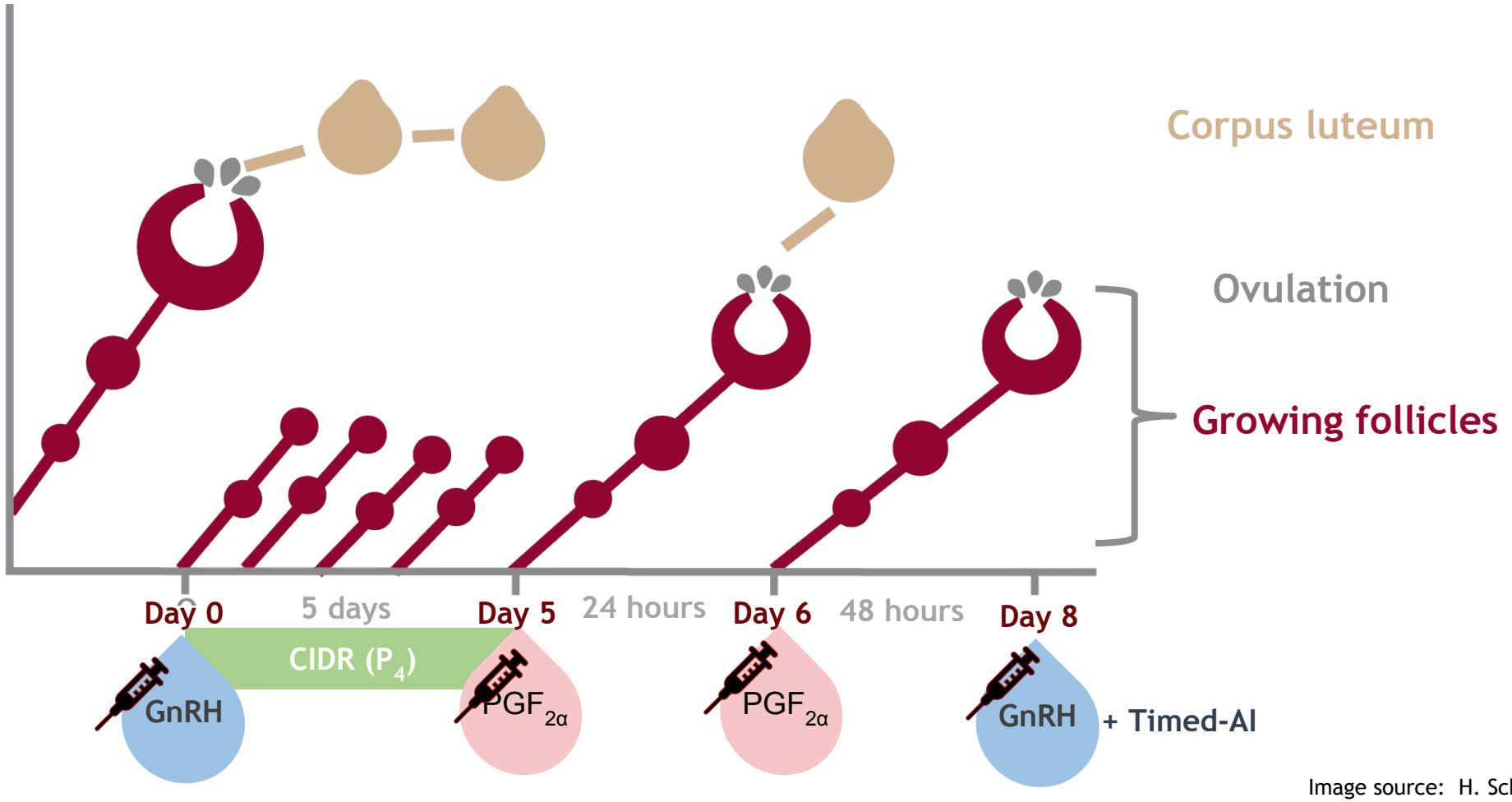
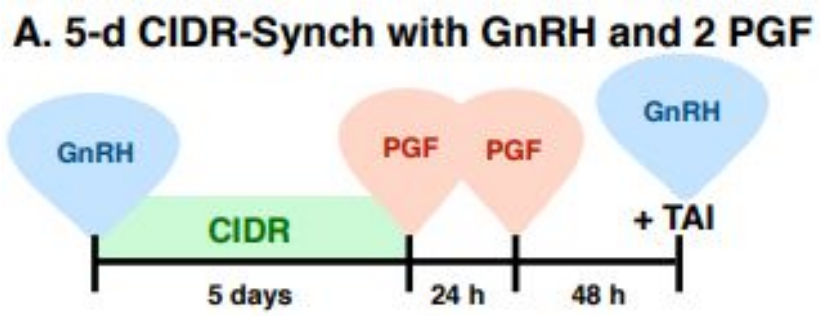


Image source: H. Schessler & C. Worster

Fixed-time AI:
5-day CIDR-Synch with GnRH



Sun	Mon	Tue	Wed	Thu	Fri	Sat
			CIDR insertion GnRH injection	CIDR	CIDR	CIDR
CIDR	CIDR removal $PGF_{2\alpha}$ injection	$PGF_{2\alpha}$ injection		GnRH injection Timed AI		

Source: Dairy Cattle Reproduction Council, 2018

Fixed-time AI: 5-day CIDR-Synch without GnRH & 1 PGF

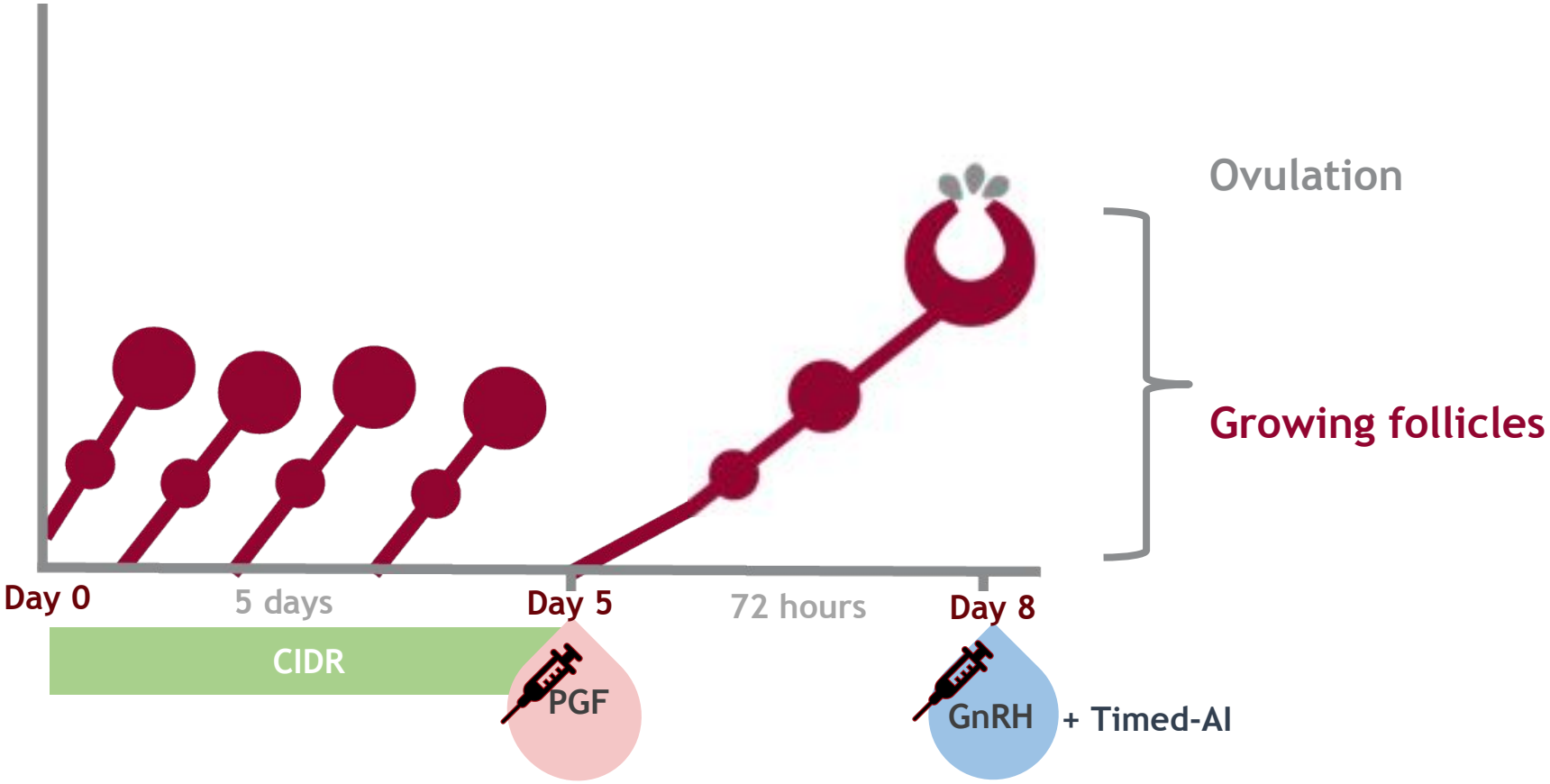
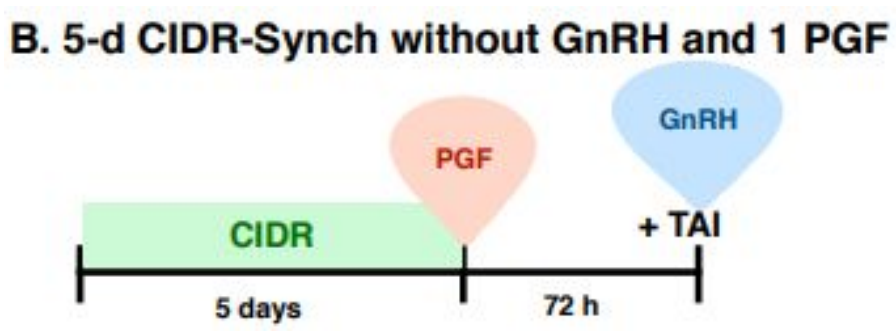


Image source: H. Schessler & C. Worster

Fixed-time AI:
5-day CIDR-Synch without GnRH



Sun	Mon	Tue	Wed	Thu	Fri	Sat
			CIDR insertion	CIDR	CIDR	CIDR
CIDR	CIDR removal $PGF_{2\alpha}$ injection			GnRH injection Timed AI		

Source: Dairy Cattle Reproduction Council, 2018

Compliance

Absolute compliance

What if you were only 90% compliant with the a 5-Day CIDR-Synch with GnRH Protocol?

Shot	Heifer 1	Heifer 2	Heifer 3	Heifer 4	Heifer 5	Heifer 6	Heifer 7	Heifer 8	Heifer 9	Heifer 10
1-GnRH	x	x	x	x	x	x	x	x	x	
2-PGF		x	x	x	x	x	x	x	x	x
3-PGF	x	x	x	x	x	x	x	x	x	x
4-GnRH	x	x		x	x		x	x	x	x
Completed protocol?	No	Yes	No	No	Yes	No	Yes	Yes	Yes	No

Source: Adapted from Dairy Cattle Reproductive Council

Will the protocol work for you?

Cost factor of compliance

Considerations:

- GnRH = $3.20 per dose
- Prostaglandin ($PGF_{2\alpha}$) = $2.50 per dose
- Cow handling = $1 per cow
- CIDR application = $9 to $10 per cow

Protocols (excluding semen):

- 2 $PGF_{2\alpha}$ protocol = $5.50 per heifer *(three handlings)*
- CIDR + $PGF_{2\alpha}$ protocol = $14.50 per heifer *(three handlings)*
- 5-Day CIDR-Synch with GnRH protocol = $23.40 per cow *(four handlings)*
- 5-Day CIDR-Synch without GnRH protocol = $17.70 per heifer *(three handlings)*

Source: adapted from J.Fetrow, University of Minnesota College of Veterinary Medicine

To achieve compliance

Correct injections | Correct cow | Correct days

Synchronizing & inseminating best management practices

- Personnel
- Record keeping
- Facilities
- Animal handling

Worker safety

- Do not work alone
- Properly restrain heifers
- Handle loaded syringes with care
- Never carry loaded syringes in pockets
- Keep needles properly covered
- Identify exit route
- Properly dispose of used needles and bottles
- Use all products according to label under the supervision of VCPR

Hormone use and administration

Use hormones with caution

- Prostaglandin should not be used by pregnant females
- Progesterone can increase symptoms of pregnancy

Heifers…
An investment in the future dairy herd

- High quality dairy replacements for improving genetic progress
- Heifer raising is the second largest expenditure on the farm

Photo credit: A. Bjurstrom

Heifer reproduction goal

Photo credit: T. Kohlman

Raise heifers to reach a desired age and body weight early so they initiate puberty, establish pregnancy, and calve easily at a minimal cost

Extension
UNIVERSITY OF WISCONSIN–MADISON

DAIRY WORKERS'


Photo credit: A. Bjurstrom

TRAINING MODULE 2

REPRODUCTIVE SKILLS

DAIRY WORKERS' TRAINING MODULES

Heifer Synchronization

Presentation and video developed for the Dairy Workers' Training Module: Reproductive Skills, 2022.

Presentation and video editing by:
Tina Kohlman | Regional Extension Dairy Educator
UW Madison Extension
Fond du Lac, Sheboygan, Ozaukee, and Washington Counties

Heather Schlesser | Extension Dairy Educator
UW Madison Extension
Marathon County

Ryan Sterry | Regional Extension Dairy Educator
UW Madison Extension
Pierce, St. Croix, Polk, and Barron Counties

Photo credit: A. Bjurstrom

DAIRY WORKERS'

TRAINING MODULE 2

REPRODUCTIVE SKILLS

Heifer AI Synchronization Protocols

DAIRY WORKERS' TRAINING MODULES

At University of Wisconsin-Madison Division of Extension, we are working to integrate accessibility into our web, video, and audio content. If you experience accessibility barriers using web, audio, or video content, or would like to request complete captions or other alternative formats, please contact accessibility@extension.wisc.edu. You will receive a response within three business days.

An EEO/AA employer, Extension provides equal opportunities in employment and programming, including Title VI, Title X, and the Americans with Disabilities Act (ADA) and Section 504 of the Rehabilitation Act requirements.

Photo credit: A. Bjurstrom

DAIRY WORKERS'

TRAINING MODULE 2

REPRODUCTIVE SKILLS

Heifer AI Synchronization Protocols

DAIRY WORKERS' TRAINING MODULES

Resources:
Chenoweth, P.J., J.D. Champagne, and J.F. Smith. Managing herd bulls on large dairies. Sixth Western Dairy Management Conference Proceedings, http://wdmc.org/2003/Managing%20Herd%20Bulls%20on%20Large%20Dairies.pdf, 2003.
DAIREXNET: Reproductive management systems for artificial insemination of dairy heifers. https://dairy-cattle.extension.org/reproductive-management-systems-for-artificial-insemination-of-dairy-heifers/. 2019.
Dairy Cattle Reproduction Council, Reproductive Management Strategies for Dairy Heifers-Synchronization Protocols, https://www.dcrcouncil.org/protocols/, 2018.
Diskin MG, Sreenan JM. 2000. Expression and detection of oestrus in cattle. Animal Reproduction Department, Teagasc, Athenry, Co. Galway, Ireland. Reprod. Nutr. Dev. 40: 481-491
Fricke, P. Strategies for Optimizing Reproductive Management of Dairy Heifers, DAIREXNET, https://dairy-cattle.extension.org/strategies-for-optimizing-reproductive-management-of-dairy-heifers/, 2019.
Gooch CA, 2013. Flooring considerations for dairy cows. Department of Biological and Environmental Engineering, Cornell University.
Graves, W. Dairy herd synchronization programs. https://extension.uga.edu/publications/detail.html?number=B1227&title=Dairy%20Herd%20Synchronization%20Programs. 2017.
Graves, W. Improving dairy heifer reproductive management. https://extension.uga.edu/publications/detail.html?number=B1235&title=Improving%20Dairy%20Heifer%20Reproductive%20Management. 2015.
Hoffman, P. Raising Dairy Replacements, 2003.
O'Connor, M.L. Heat detection and timing of insemination for cattle. https://extension.psu.edu/heat-detection-and-timing-of-insemination-for-cattle.. 2016.
USDA-FDA. The Cattle Estrous Cycle and FDA-Approved Animal Drugs to Control and Synchronize Estrus-A Resource for Producers, https://www.fda.gov/animal-veterinary/product-safety-information/cattle-estrous-cycle-and-fda-approved-animal-drugs-control-and-synchronize-estrus-resource-producers, 2019.

Photo credit: A. Bjurstrom

DAIRY WORKERS'

TRAINING MODULE 2

REPRODUCTIVE SKILLS

Heifer Synchronization

DAIRY WORKERS' TRAINING MODULES