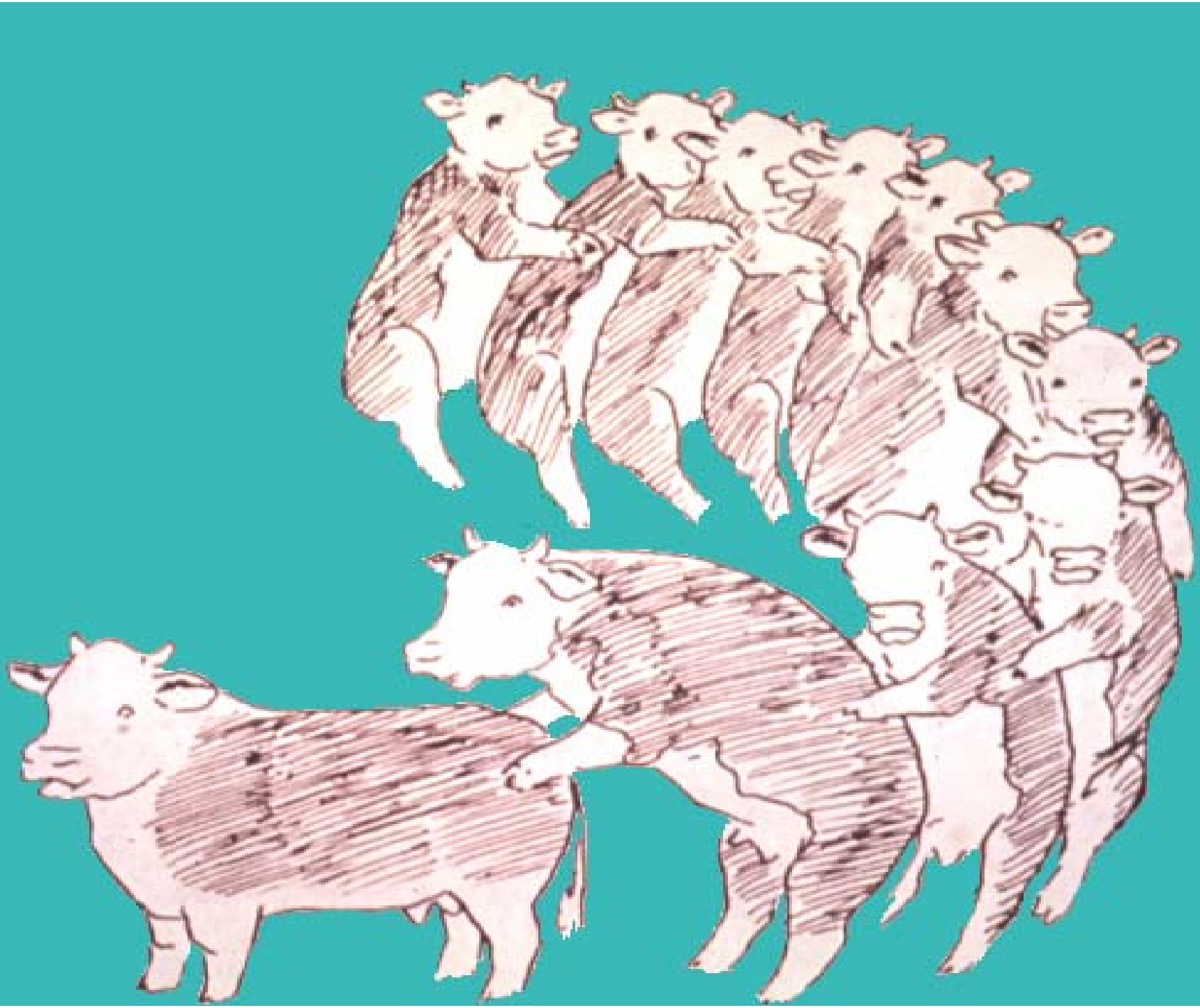
Estrous Synchronization Systems for Beef Heifers

Bob L. Larson, DVM, PhD, ACT

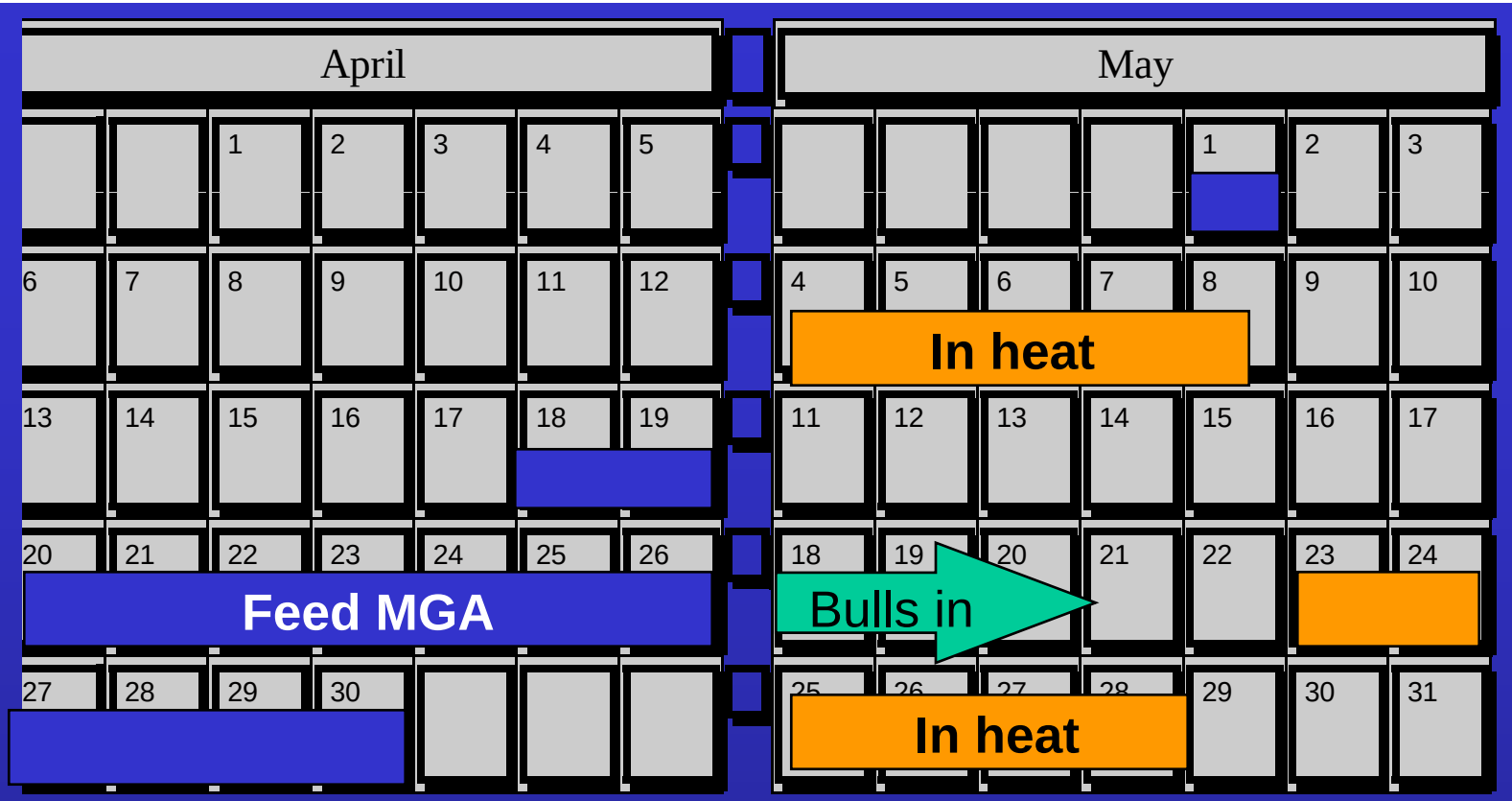


Progestogens

- Act to suppress estrus and ovulation
- First products used to attempt control of the estrous cycle
- MGA® and CIDR® insert are commercial examples

Progestogens

- MGA can be utilized alone - particularly if using natural service for breeding
- Treatment for 14 days or more reduces first-service conception rate at following estrus
- After feeding MGA for 14 days, bulls can be turned in with heifers 17 days later


April
May
1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18 19
20 21 22 23 24 25 26
27 28 29 30
1 2 3
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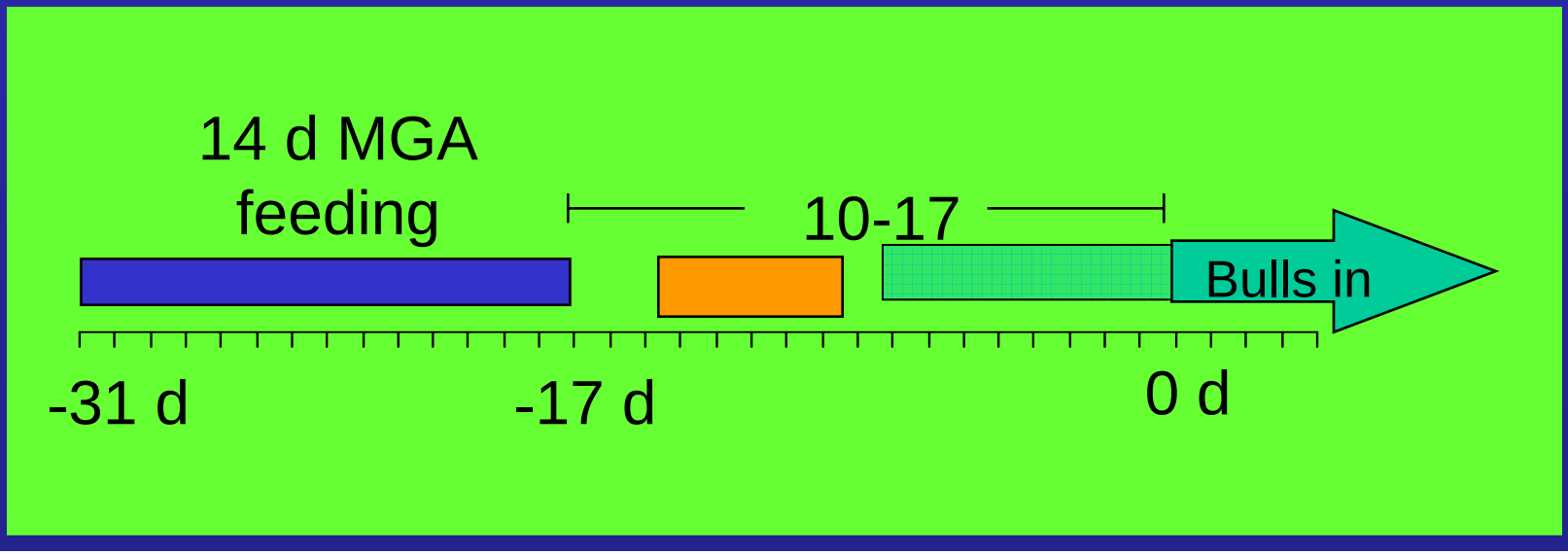
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31
In heat
Feed MGA
Bulls in
In heat

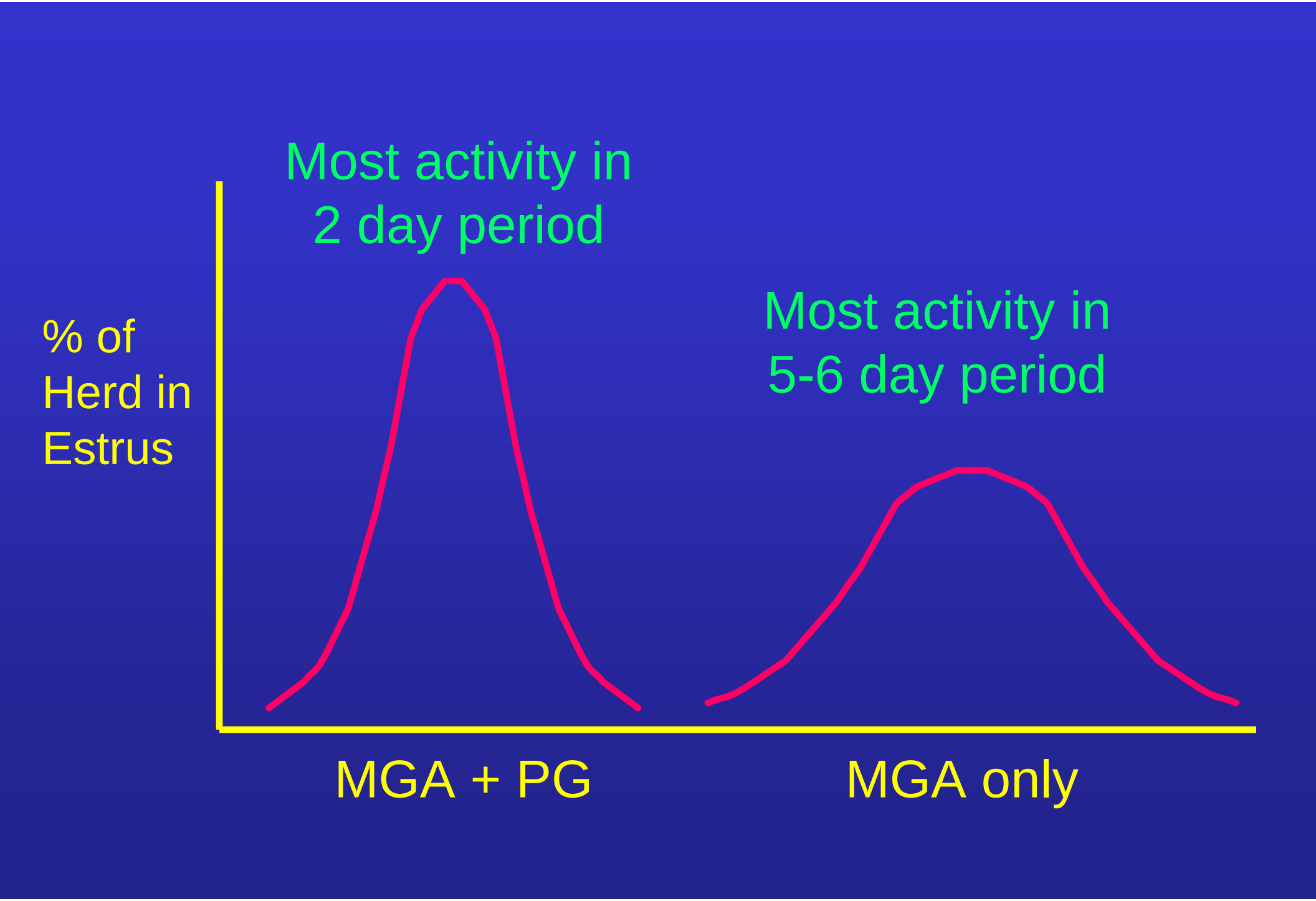

14 d MGA
feeding
10-17
Bulls in
-31 d
-17 d
0 d

Progestogens

- **Advantage** - Simple to implement, inexpensive, and heifers do not have to be handled
- **Disadvantage** - Not ideal for use with AI, but good strategy for use with natural service

Progestogens

- If treatment is 14 days or less - must combine with a luteolytic agent to successfully control time of estrus


Most activity in
2 day period
Most activity in
5-6 day period
% of
Herd in
Estrus
MGA + PG
MGA only

Progestogen plus prostaglandin

- Prostaglandin $F_{2\alpha}$ and its analogs cause luteolysis and a return to estrus when given during the luteal phase (d5 -17)
- Fertility of $PGF_{2\alpha}$-induced estrus is normal

Progestogen plus prostaglandin

- $PGF_{2\alpha}$ is more successful at causing luteolysis when given late (d 10 - 17) versus early (d 5 - 9) in the luteal phase.
- Synchrony of estrus is tighter when cattle are at a similar stage of the estrous cycle (similar stage of follicular wave) when treated with $PGF_{2\alpha}$

Effect of Day of Cycle When PG is Injected

Stage of Cycle When Injected with PG	P_4 on Day of PG Injection	Estrus Response w/n 5 d of PG	Time to Estrus After PG (h)	1st Service Conception Rate
Early Diestrus (d 5-7)	2.78 ng/mL[a]	43%[a]	59.3[a]	56.8%[a]
Day-5		10%		
Day- 6		50%		
Day-7		71.4%		
Mid Diestrus (d 8-11)	5.18 ng/mL[b]	83.6%[b]	70.5[b]	62.1%[a,b]
Day 8-10		82%%		
Day 11		88.9%		
Late Diestrus (d12-15)	5.22 ng/mL[b]	100%[c]	72.0[b]	78.3%[b]

[a,b,c] Means in columns not followed by the same letter differ (P<0.05)

Watts and Fuquay: Therio 23:655, 1985

Progestogen plus prostaglandin

Colorado System of MGA / PG

- **Females are synchronized initially by feeding MGA for 14 days**
- **$PGF_{2\alpha}$ is administered during the luteal phase of the subsequent cycle**

MGA / PG

- **MGA does not affect the life-span of the CL - it regresses 17 days after the previous estrus**
- **MGA in the feed keeps the serum levels of progestogen high enough to prevent ovulation and estrus**

MGA / PG

- **Heifers on d 0 through d 3 of the cycle when MGA is started = normal cycle**
- **Heifers on d 4 through d 20 of the cycle when MGA is started = long cycle**

All heifers in heat 2 to 6 days after the last day of MGA feeding

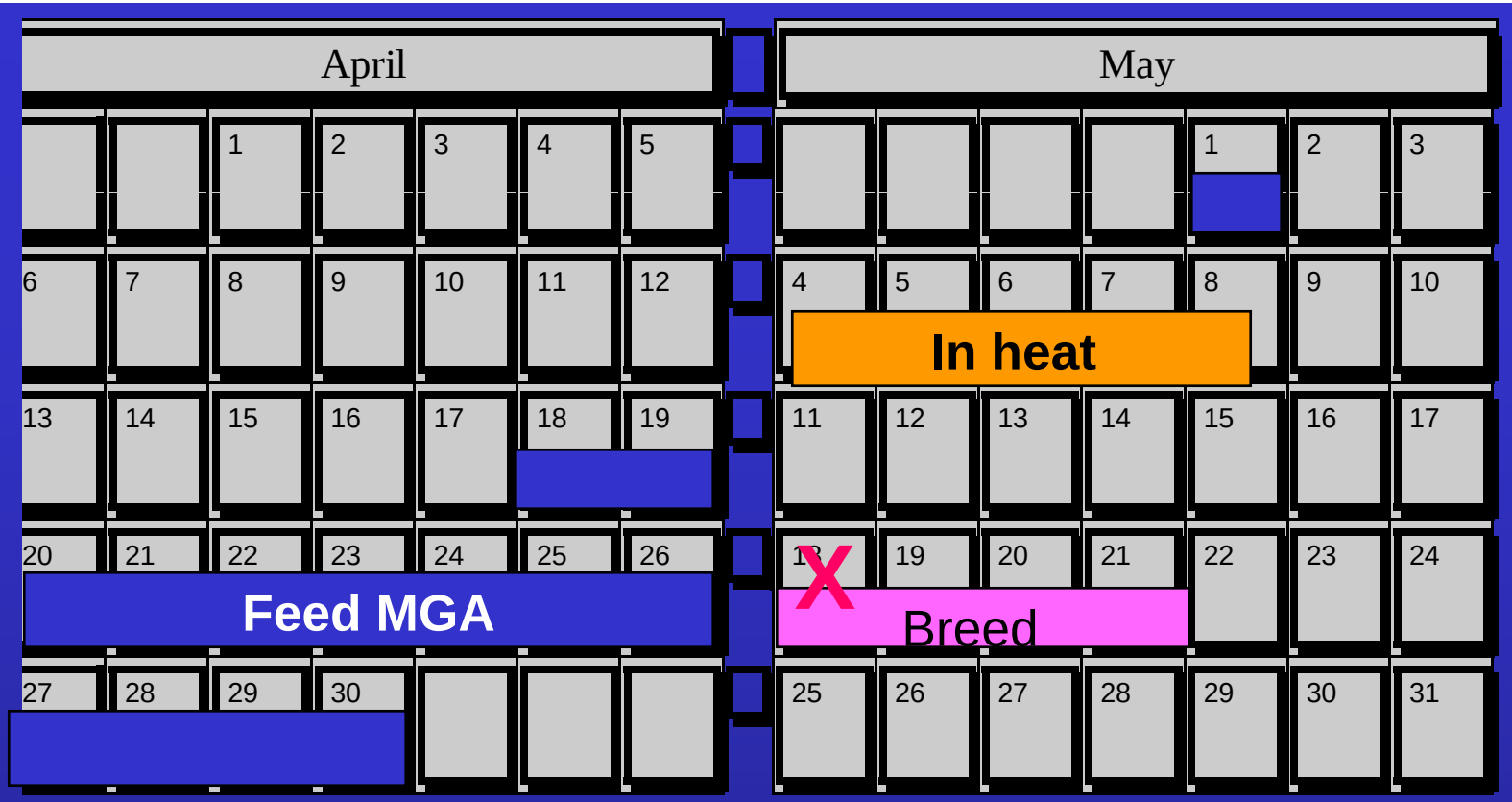
MGA / PG

- **All heifers will be on day-11 through day-15 of the estrous cycle when $PGF_{2\alpha}$ is injected**
- **Heifers will begin to exhibit estrus about 48 hours after $PGF_{2\alpha}$ and most activity will end by 32 hours later**

(sooner than with PG treatment alone)

MGA / PG

- **A timed-insemination 72 hours after the $PGF_{2\alpha}$ injection is acceptable in some situations (know limits)**
- **A second $PGF_{2\alpha}$ injection 11 days after the first for heifers that don't respond is recommended in some situations**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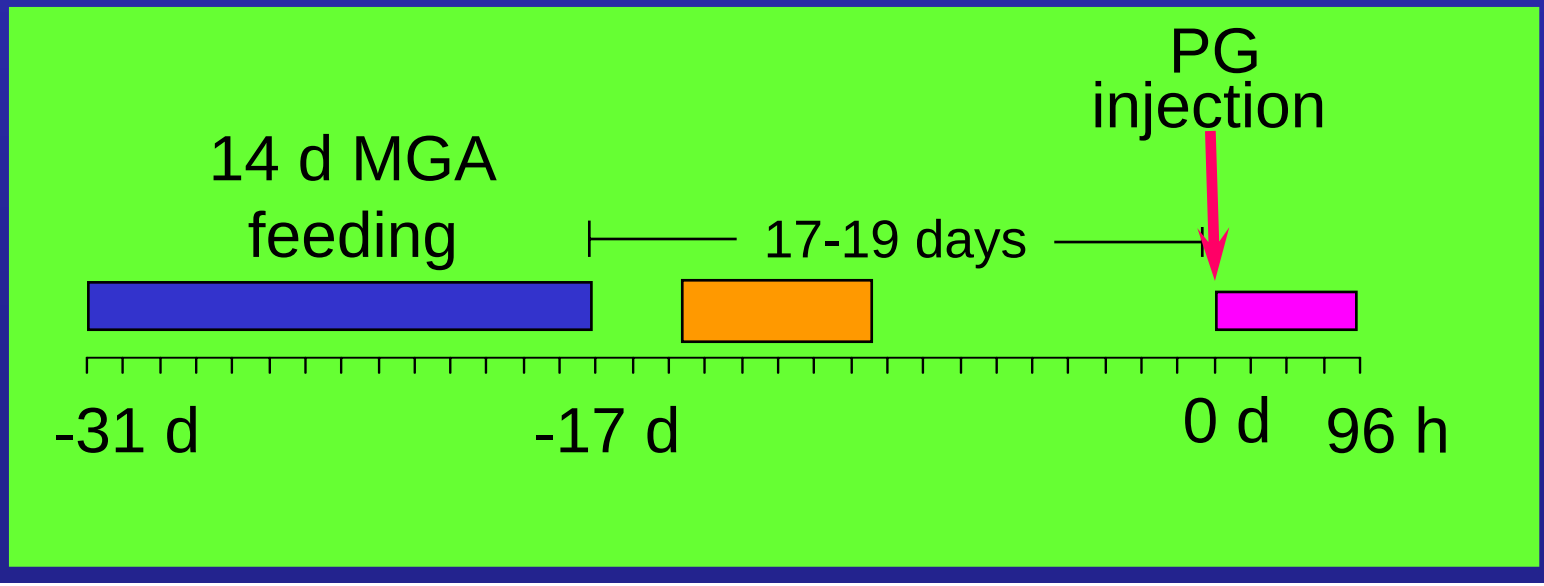
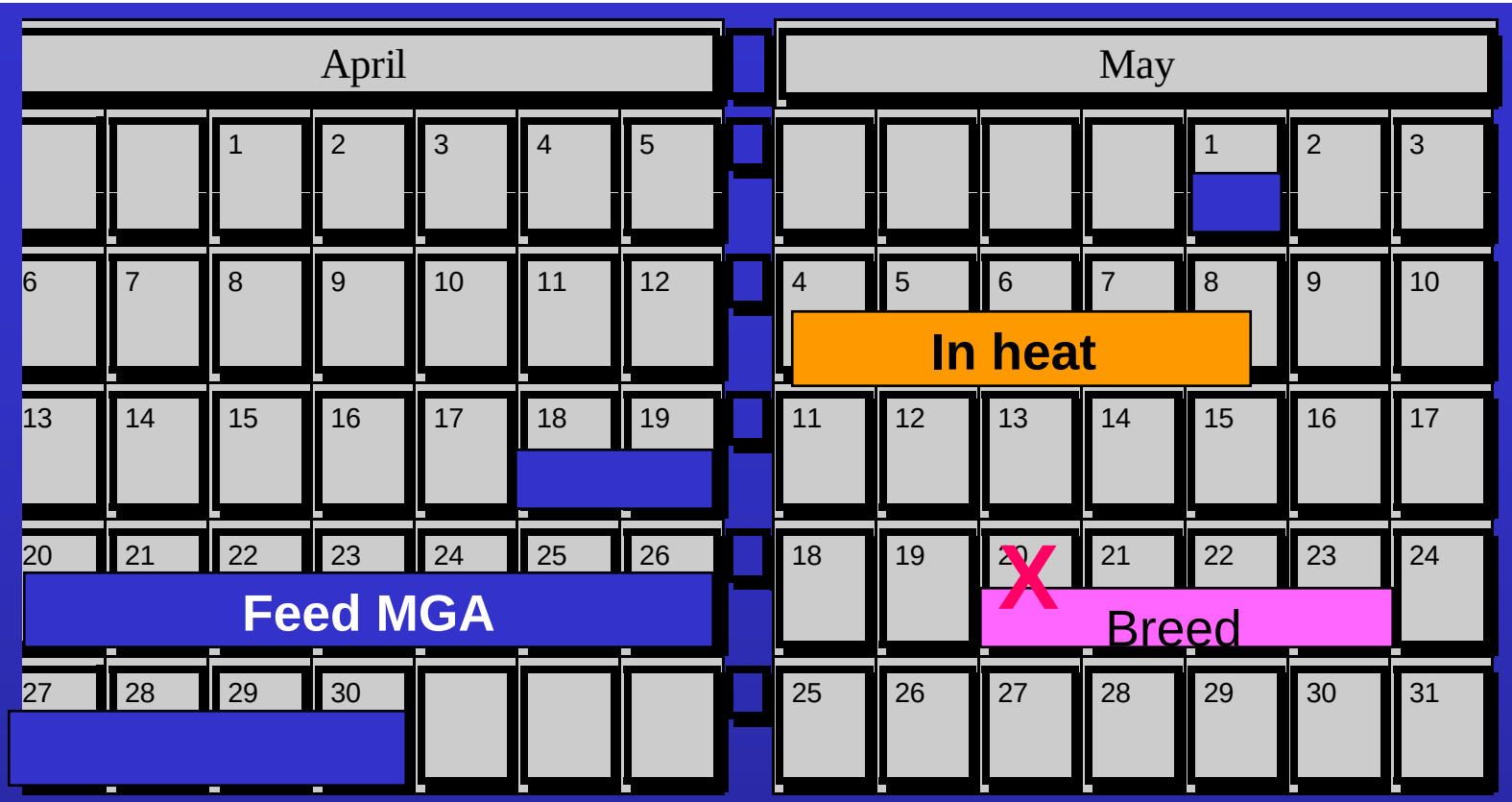
31
In heat
Feed MGA
X
Breed


PG
injection
14 d MGA
feeding
17-19 days
-31 d
-17 d
0 d
96 h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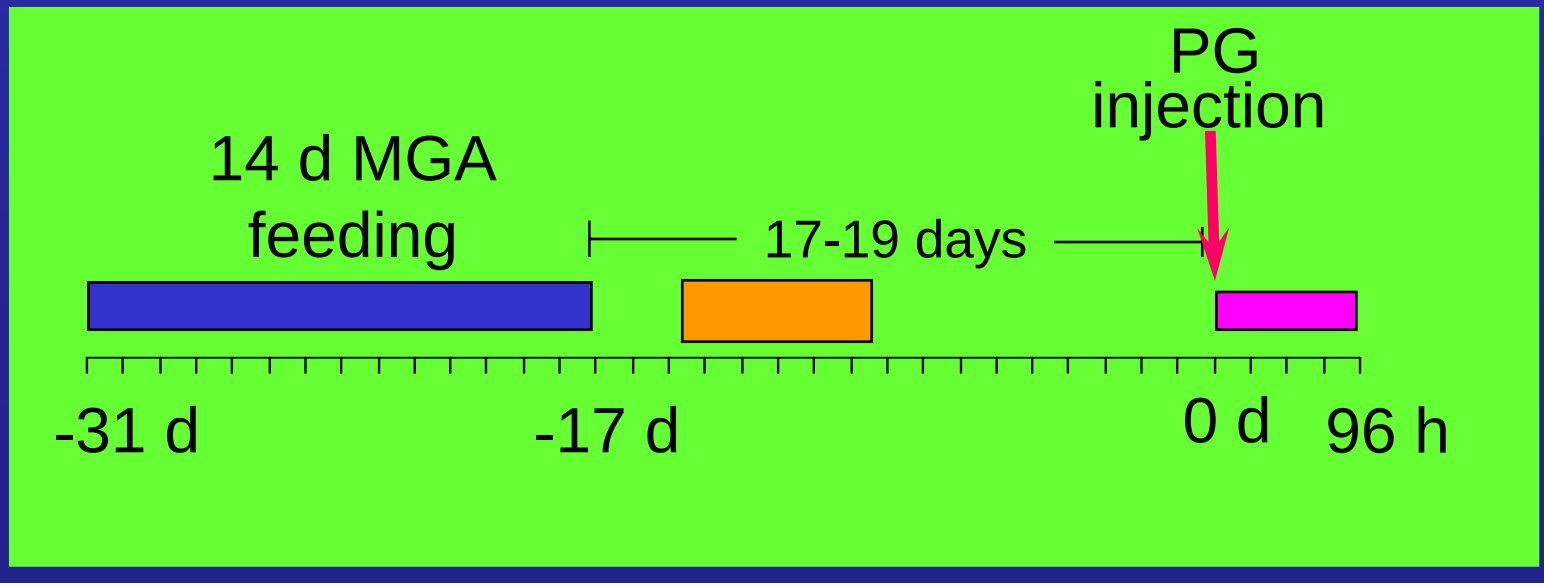
In heat
Feed MGA
X
Breed


PG
injection
14 d MGA
feeding
17-19 days
-31 d
-17 d
0 d
96 h

MGA / PG

- **Advantages**

  Less expensive than 2 injections of PG

  Heifers only have to be handled twice

  Use of progestogen will induce puberty in some heifers

MGA / PG

- **Disadvantages**

  Critical that heifers consume **.5 mg** of MGA **every day** of 14 day feeding period

  MGA feeding begins 31 days prior to start of breeding season, therefore prior planning is essential

Progestogen plus luteolytic dose of PGF_{2a}

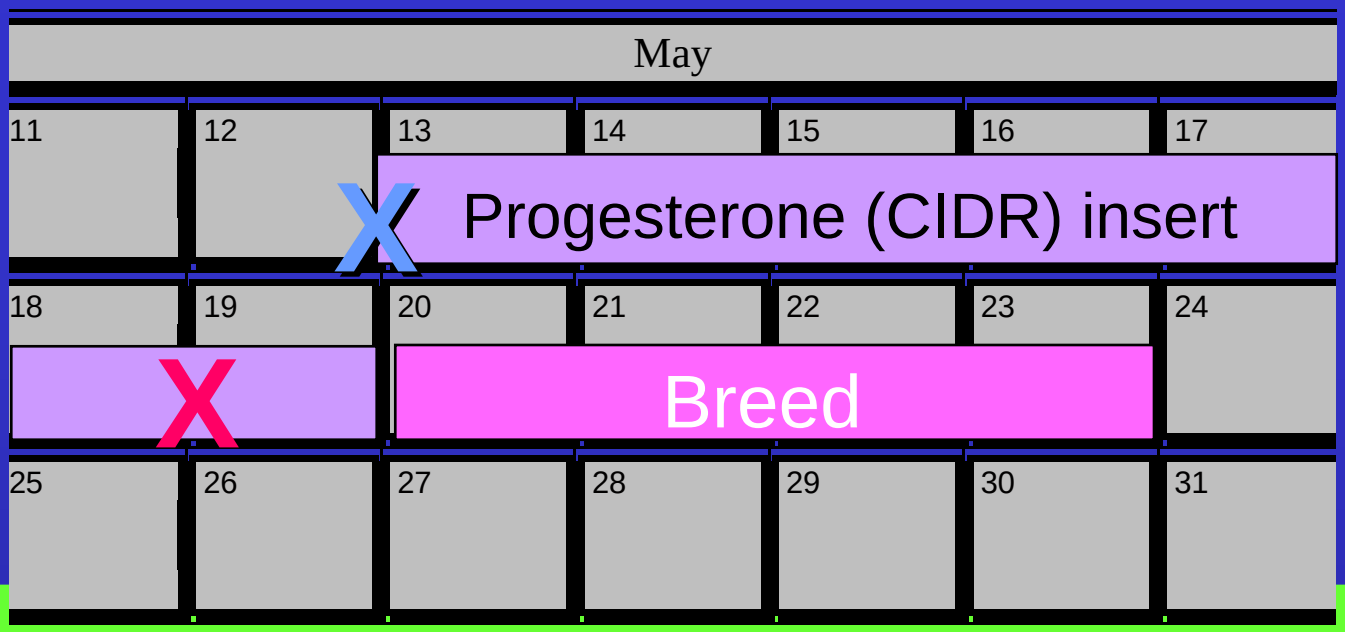
CIDR®

- **Prostaglandin F2a is luteolytic when administered during diestrus**

Synchronization Systems

CIDR®

- Progesterone does not affect the life-span of the CL - it regresses 17 days after the previous estrus
- Progesterone released by the insert in the vagina keeps the serum levels of progestogen high enough to prevent ovulation and estrus


May
11
12
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14
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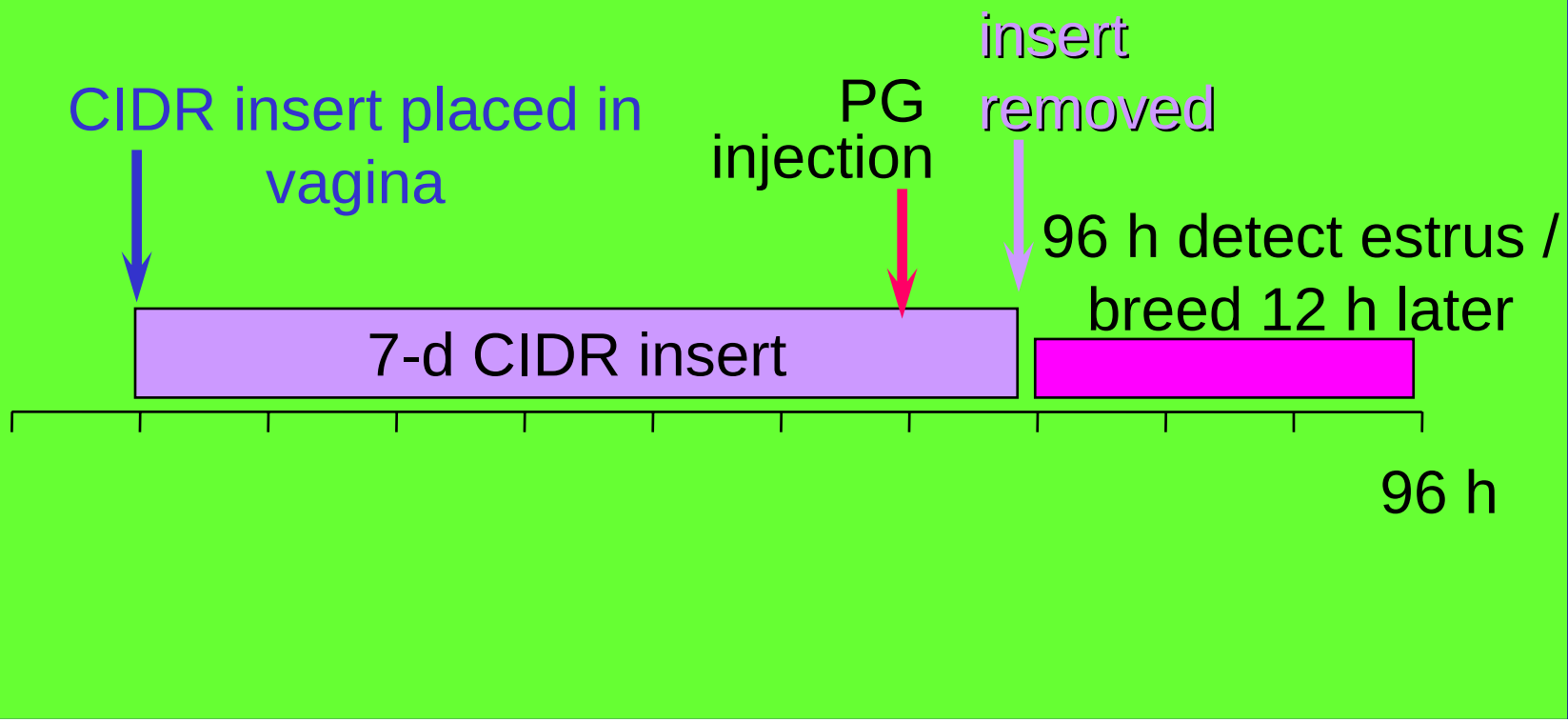
16
17
Progesterone (CIDR) insert
18
19
20
21
22
23
24
Breed
25
26
27
28
29
30
31


CIDR insert placed in vagina
PG injection
insert removed
96 h detect estrus / breed 12 h later
7-d CIDR insert
96 h

Synchronization Systems

CIDR®

- **Advantages**

  Use of progestogen will induce puberty in some heifers

Synchronization Systems

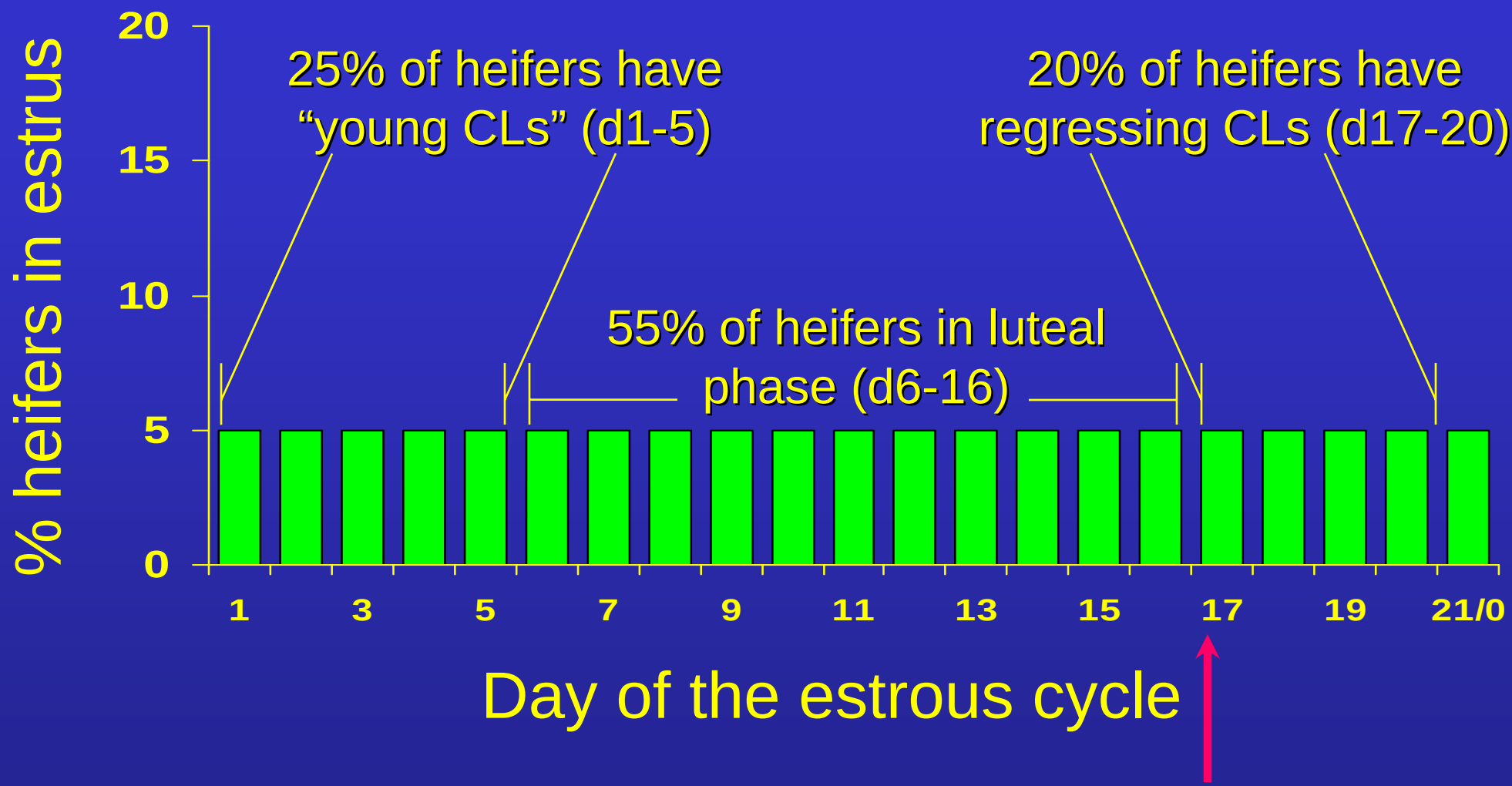
CIDR®

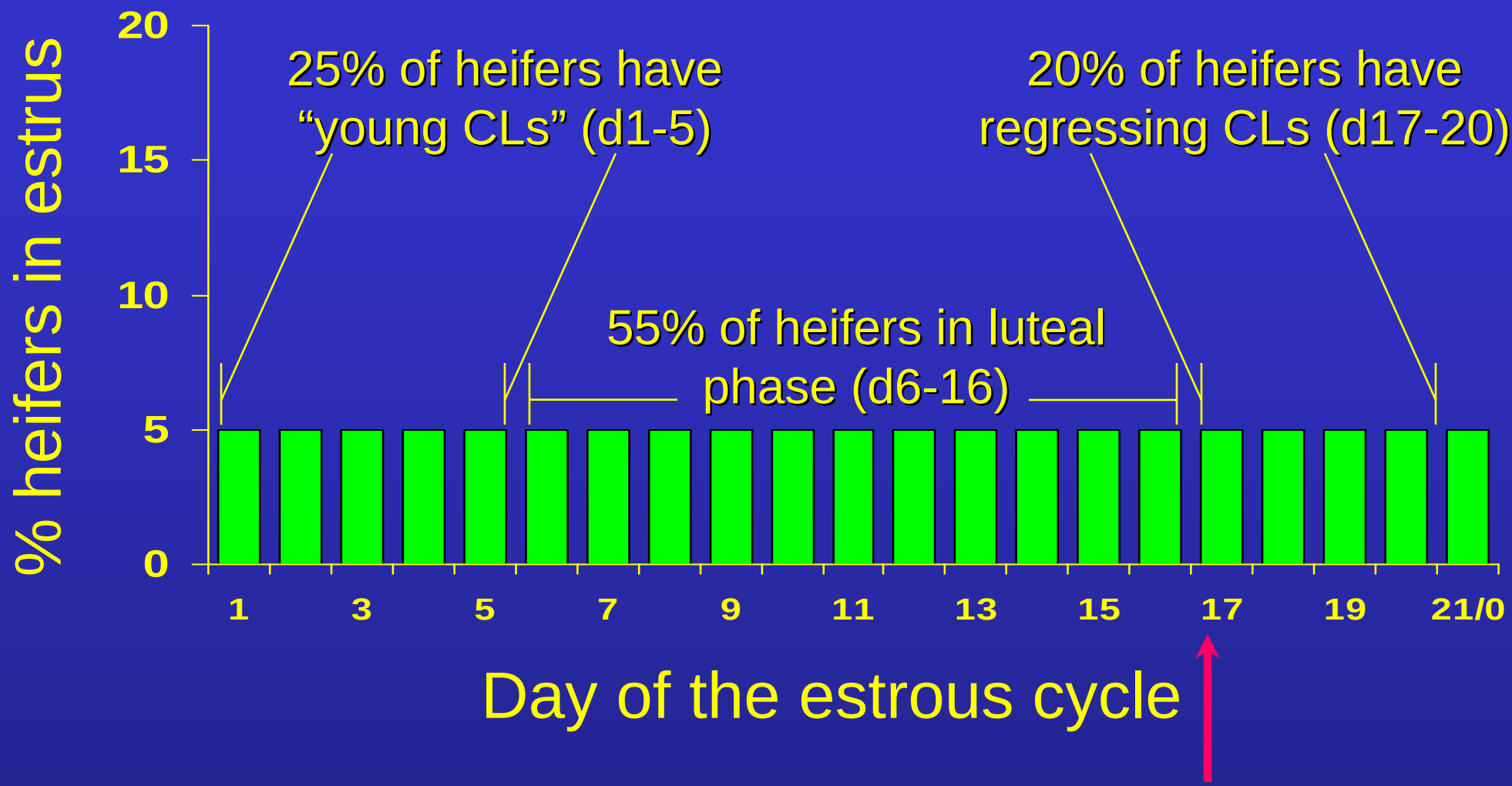
- **Disadvantages**

  Relatively expensive protocol

Prostaglandin $F_{2\alpha}$ Alone

- Lutalyse® and Estrumate® are commercially available
- $PGF_{2\alpha}$ is effective as a luteolytic agent during the luteal phase of the cycle


% heifers in estrus
20
15
10
5
0
25% of heifers have
“young CLs” (d1-5)
20% of heifers have
regressing CLs (d17-20)
55% of heifers in luteal
phase (d6-16)
1
3
5
7
9
11
13
15
17
19
21/0
Day of the estrous cycle
natural regression of
CL occurs about d-17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55% of heifers in luteal
phase (d6-16)
1
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5
7
9
11
13
15
17
19
21/0
Day of the estrous cycle
natural regression of
CL occurs about d-17

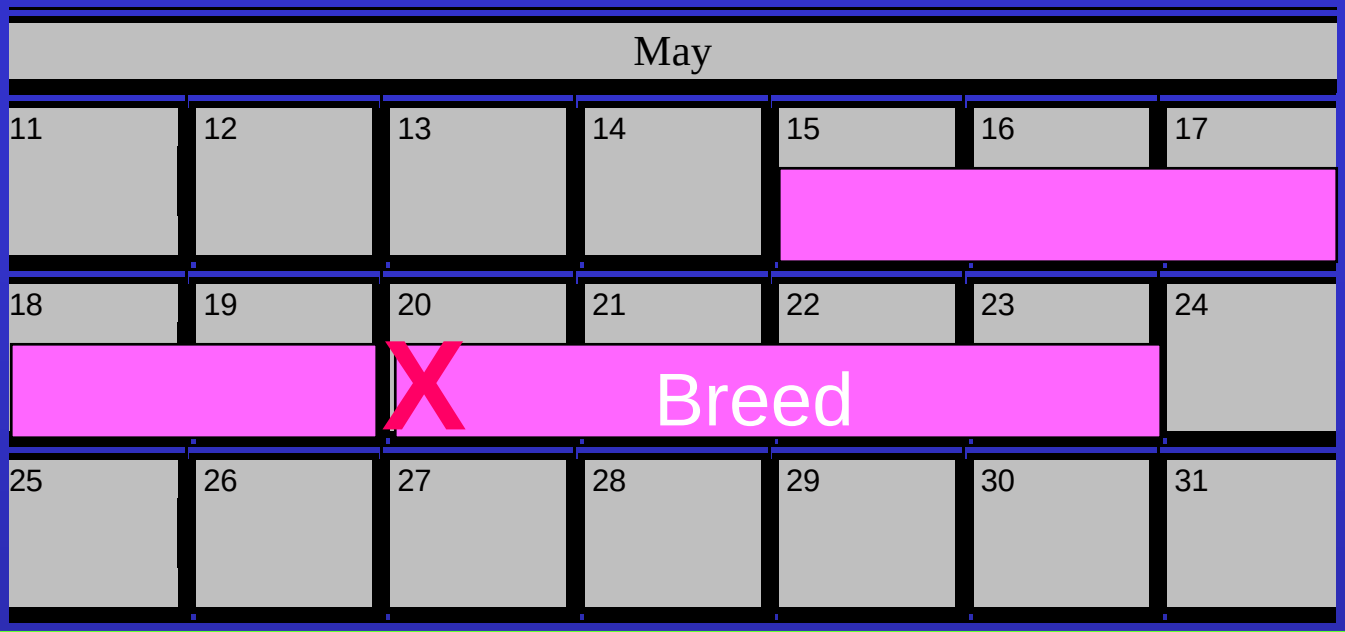
Prostaglandin $F_{2\alpha}$ Alone

Several strategies can be used to synchronize estrus at a time that is convenient for the producer

Prostaglandin $F_{2\alpha}$ Alone:

I. Detect estrus for 5+ days followed by PG

- Observe for estrus behavior for 5 + days - breed 12 hours after first being detected in estrus
- All remaining heifers should be in diestrus or proestrus and will respond to PG



PG injection if not bred previously

5 d detect estrus / breed 12 h later

96 h detect estrus / breed 12 h later

-5 d

0 d

96 h

Prostaglandin $F_{2\alpha}$ Alone:

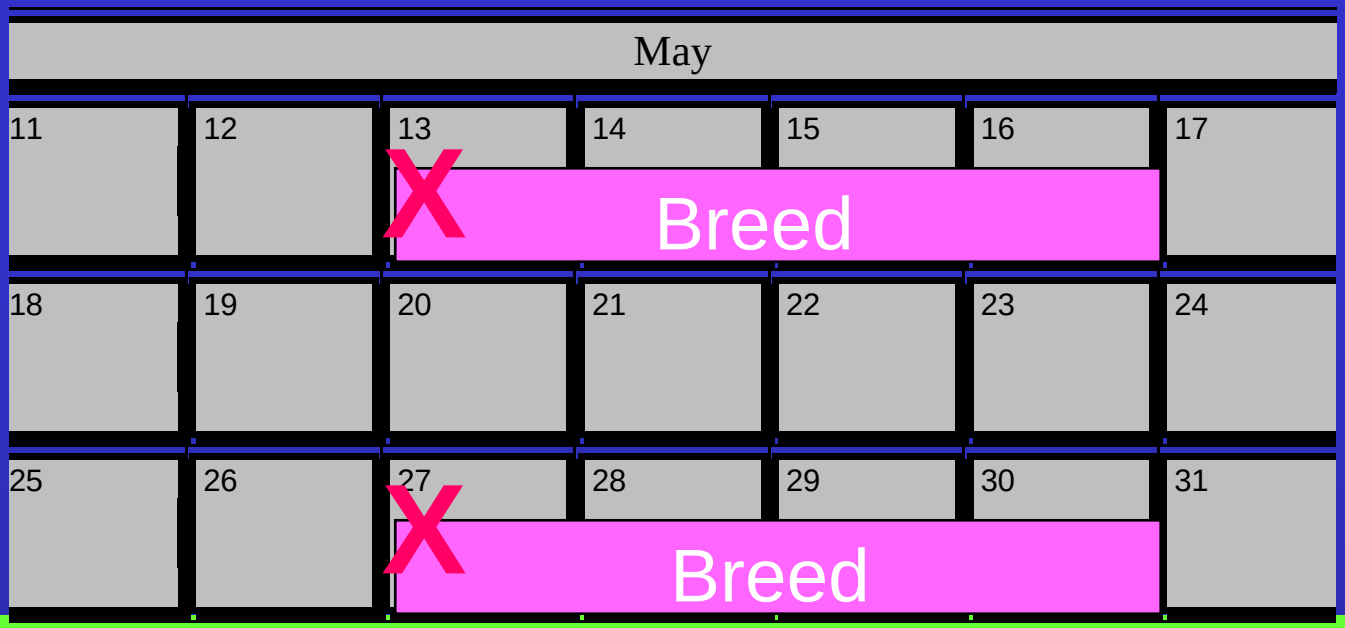
I. Detect estrus for 5+ days followed by PG

- **Advantage** - heifers are handled a minimum of times and a minimal amount of $PGF_{2\alpha}$ is used
- **Disadvantage** - time and labor committed to estrous detection and AI is at least 9 days

Prostaglandin $F_{2\alpha}$ Alone:

II. Inject PG twice, 11 to 14 days apart, detect estrus and breed for 4 days after each treatment

- 75% of cycling heifers should be in estrus following first PG injection
- Remaining cycling heifers should respond to second PG injection



PG injection

96 h detect estrus / breed 12 h later

PG injection

96 h detect estrus / breed 12 h later

-14 to -11 d

96 h

0 d

96 h

Prostaglandin $F_{2\alpha}$ Alone:

II. Inject PG twice, 11 to 14 days apart, detect estrus and breed for 4 days after each treatment

- **Advantage** - the second injection allows a second opportunity to breed heifers missed after the first injection
- **Disadvantage** - time commitment is still substantial

Prostaglandin $F_{2\alpha}$ Alone:

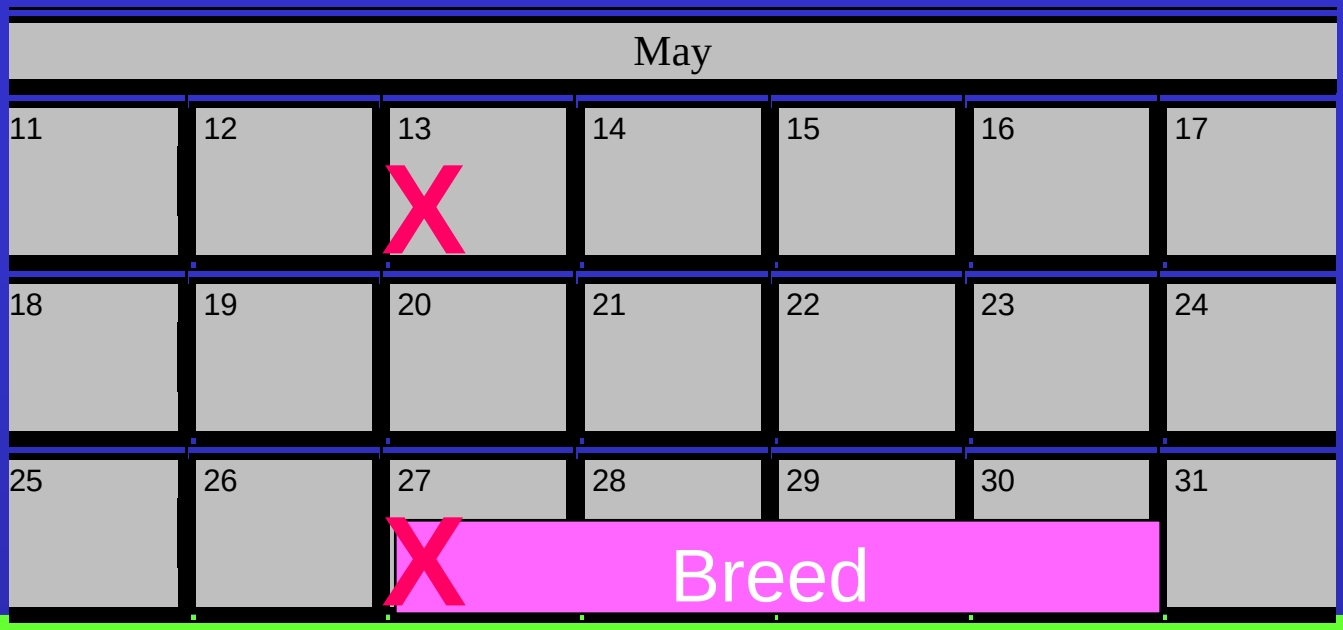
III. Inject PG twice, 11 to 14 days apart, detect estrus and breed for 4 days after last treatment only

- No estrous detection or breeding is done after the first injection
- All heifers, regardless of whether or not they responded to the first injection are given the second injection

Prostaglandin $F_{2\alpha}$ Alone:

III. Inject PG twice, 11 to 14 days apart, detect estrus and breed for 4 days after last treatment only

- Heifers that respond to first injection will be on day 6 to 14 at the time of the second injection
- Non-responding heifers will be on day 10 to 19 at the time of the second injection



PG injection

PG injection

96 h detect estrus / breed 12 h later

-14 to -11 d

0 d

96 h

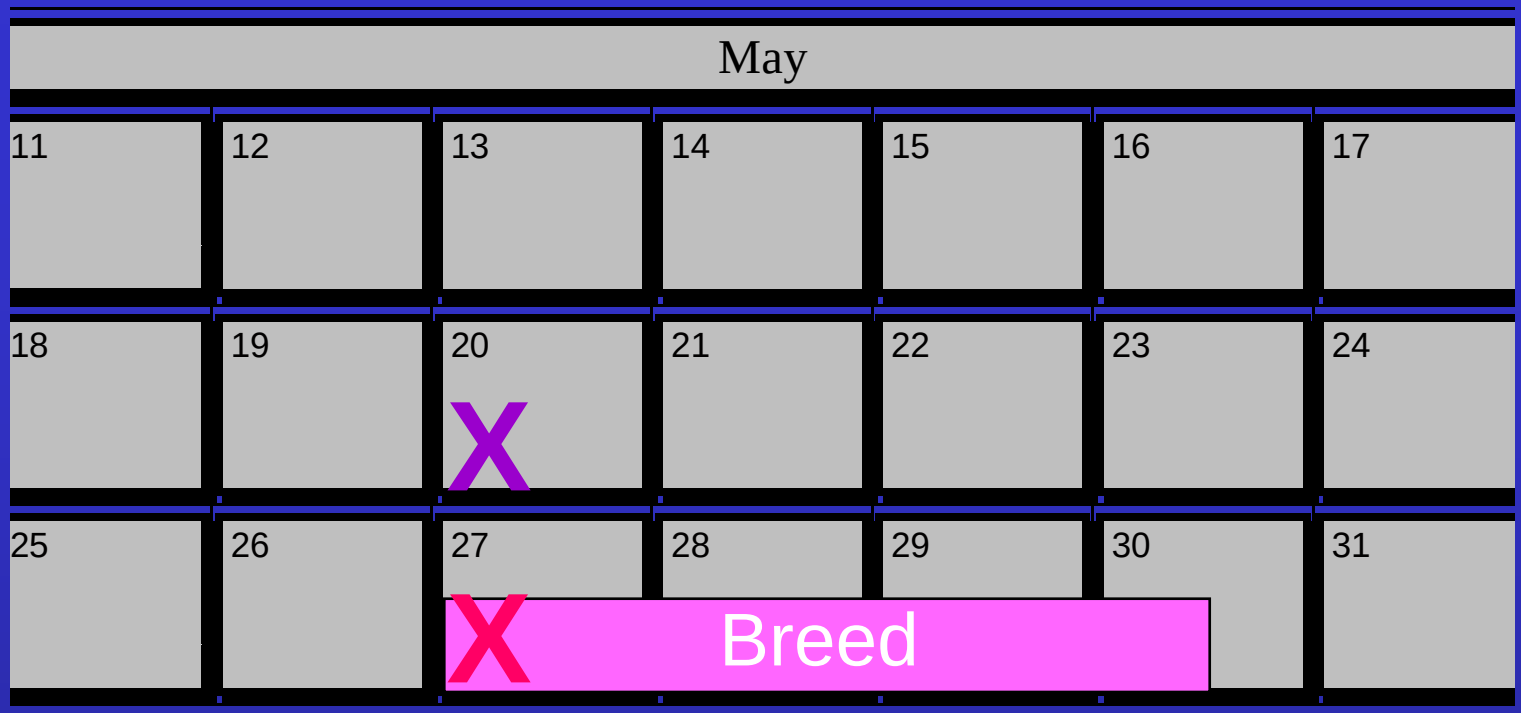
Prostaglandin $F_{2\alpha}$ Alone:

III. Inject PG twice, 11 to 14 days apart, detect estrus and breed for 4 days after last treatment only

- **Advantage** – only 4 days are required for estrous detection and AI
- **Disadvantage** - Increased cost, labor and management from handling all heifers 3 times
- **Disadvantage** - Although sound theoretically, has not been as successful in my hands as other systems

GnRH plus $PGF_{2\alpha}$ (Ov-Sync)

- Newest protocol developed
- GnRH injection is followed 7 days later by an injection of $PGF_{2\alpha}$
- Poor results with heifers - only advisable for cows


May
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X
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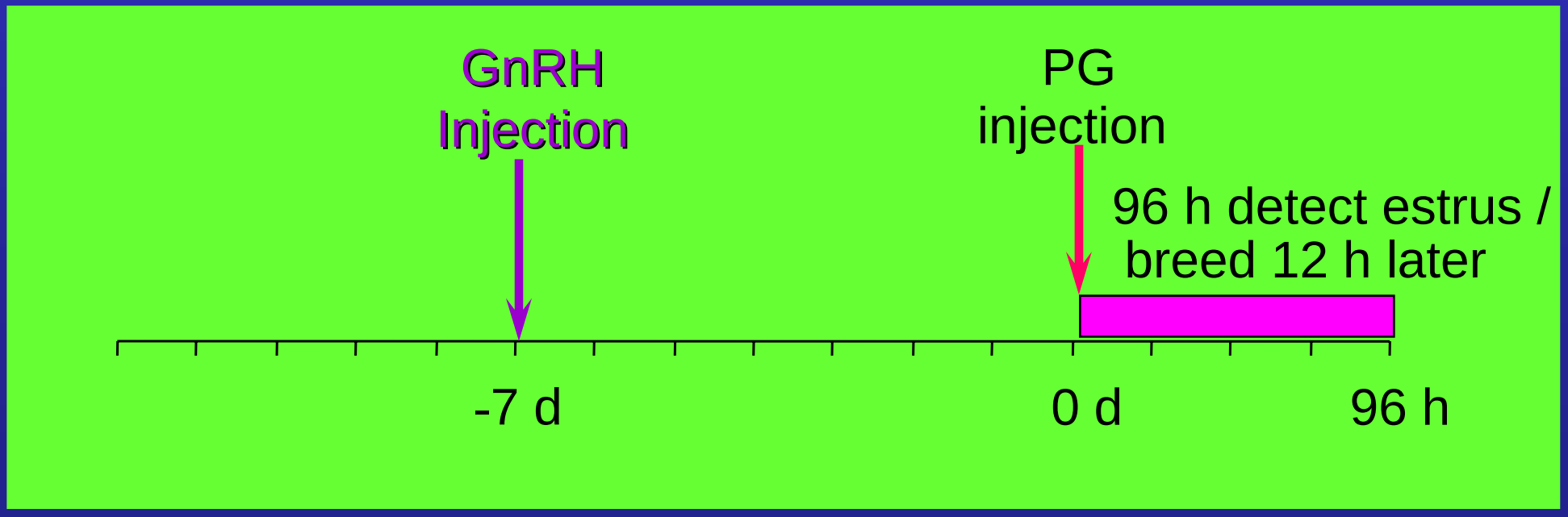
30
31
X
Breed


GnRH
Injection
PG
injection
96 h detect estrus /
breed 12 h later
-7 d
0 d
96 h

Keys to Success

- Plan ahead - many weeks prior to breeding season
- Have heifers in good condition and at proper weight
- Have reasonable expectations