

PHYSIOLOGICAL PRINCIPLES UNDERLYING SYNCHRONIZATION OF ESTRUS

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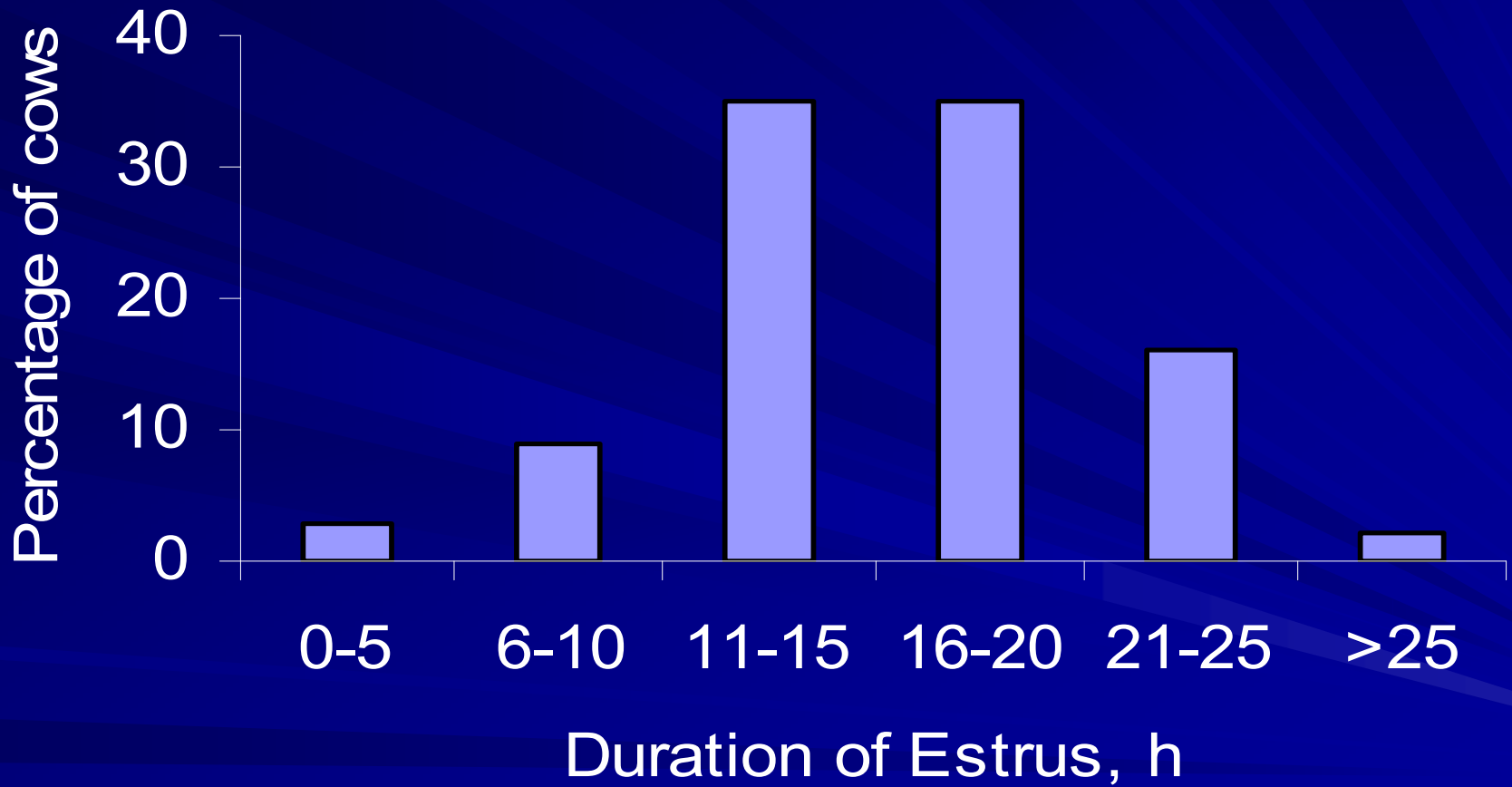
Overview

- Physiology of the bovine estrous cycle
- Hormones utilized for estrus synchronization
- Estrus synchronization products
- Hormonal management of the luteal phase
- Hormonal management of follicular waves
- Management considerations

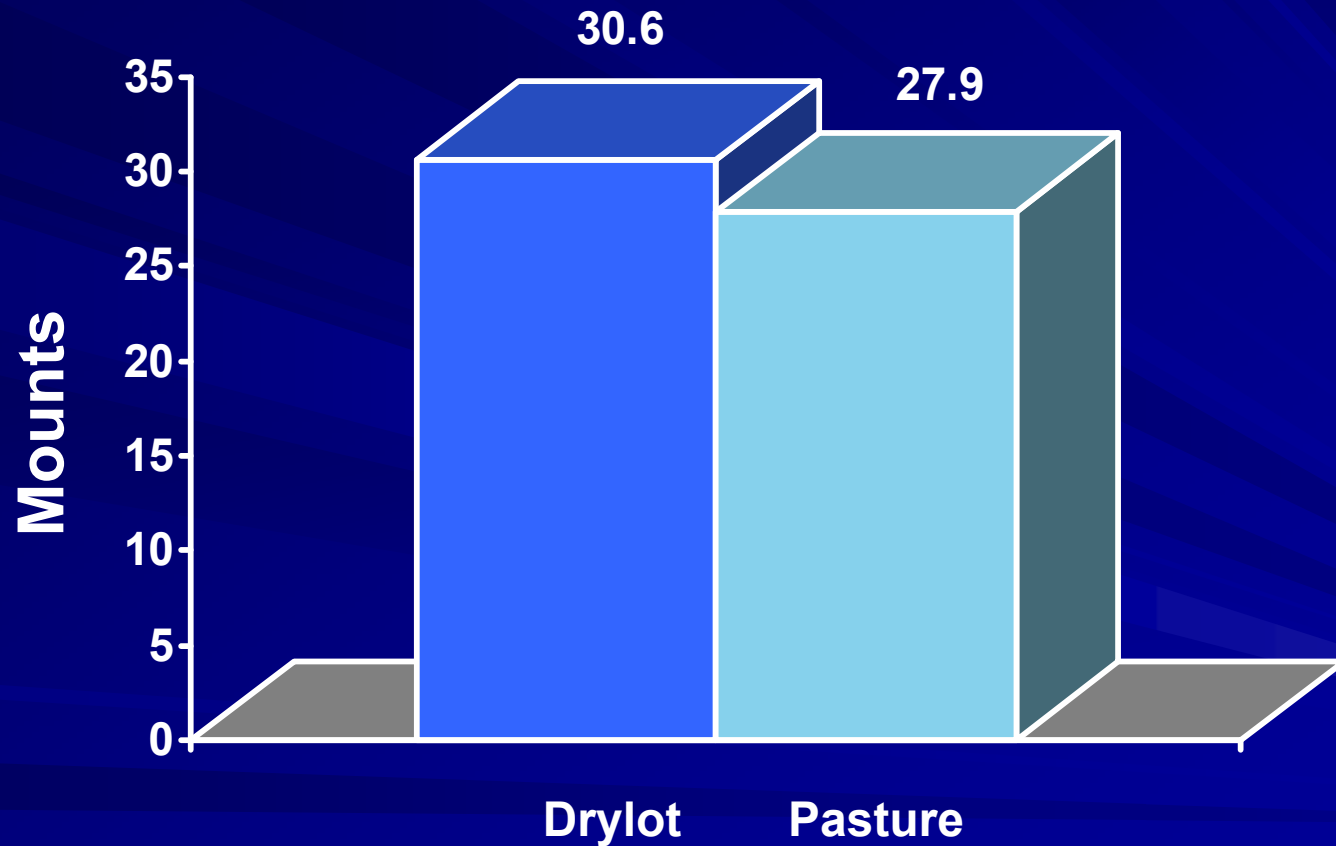
Characteristics of the Estrous Cycle

- Length of the estrous cycle
 - Average 21 days (range 17 to 24 days)
 - Two follicular waves – 17 to 20 days
 - Three follicular waves – 21 to 24 days
- Estrus (standing heat)
 - 12 to 18 hours (range 8 to 30 hours)
- Ovulation
 - Approximately 30 hours after the beginning of standing estrus

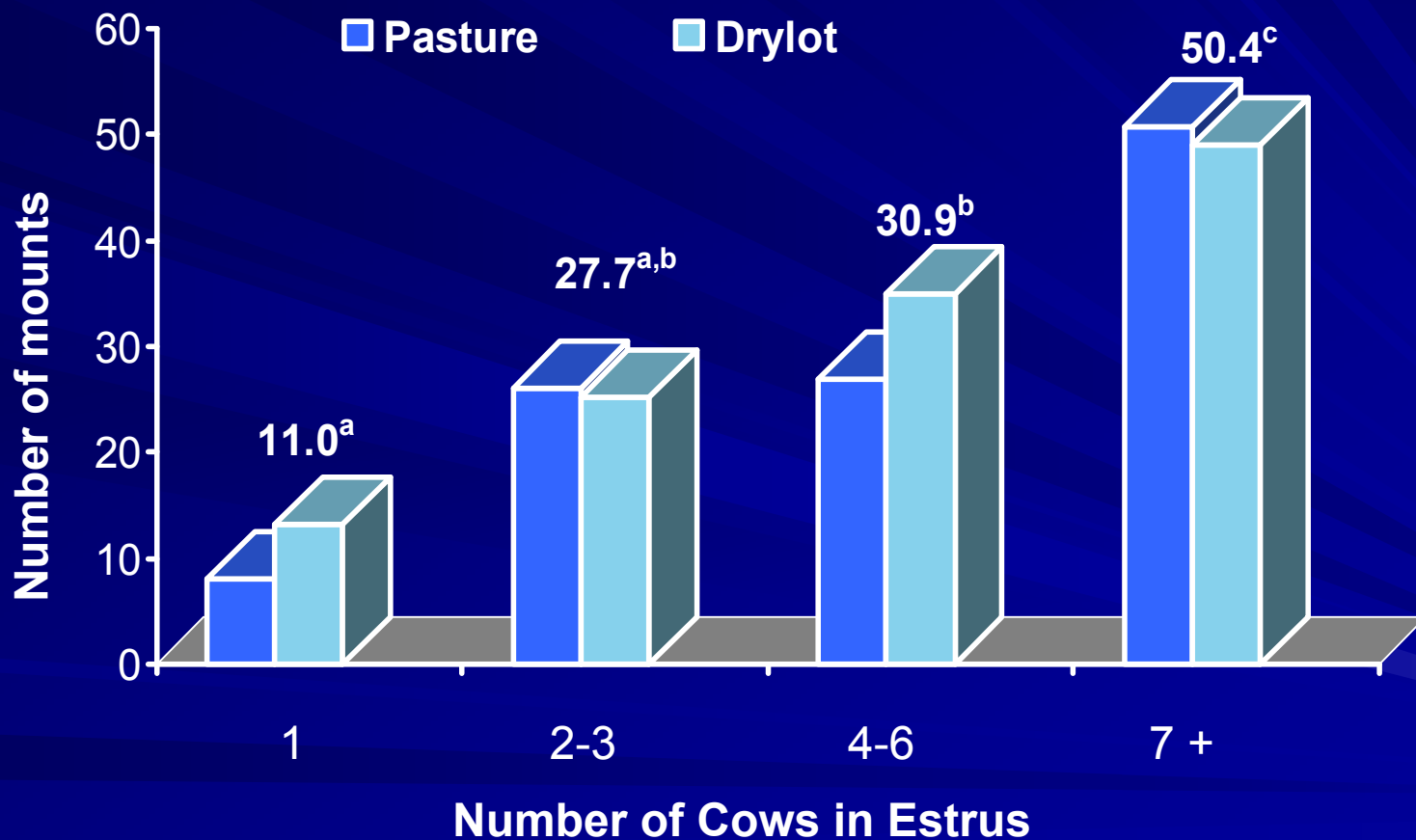
Duration of Estrus



Influence of confinement area on the number of mounts per estrus ($P > 0.5$)



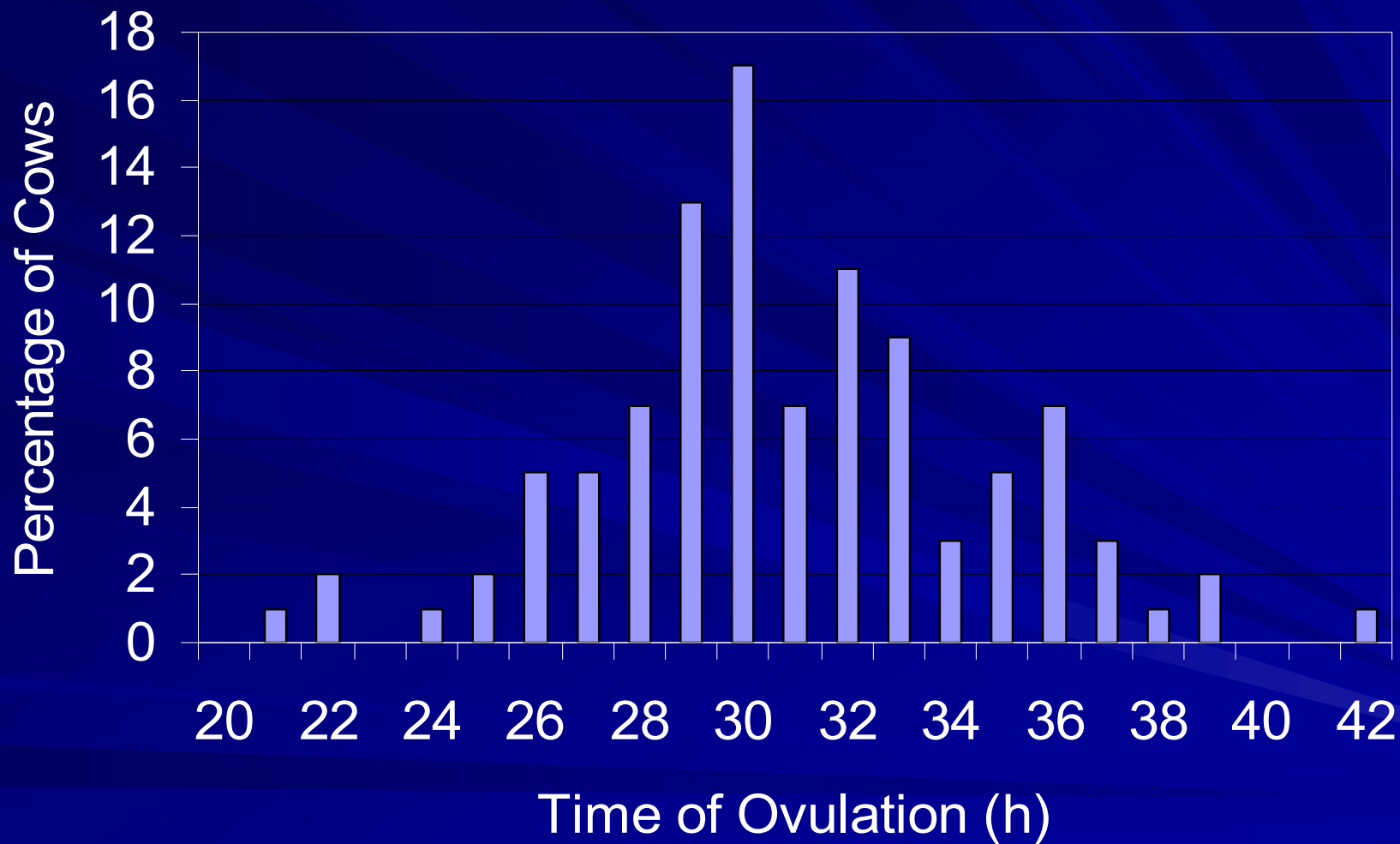
Influence of the number of cows in estrus on number of times cows are mounted in drylot or pasture



^{a,b} superscripts differ $P < 0.07$

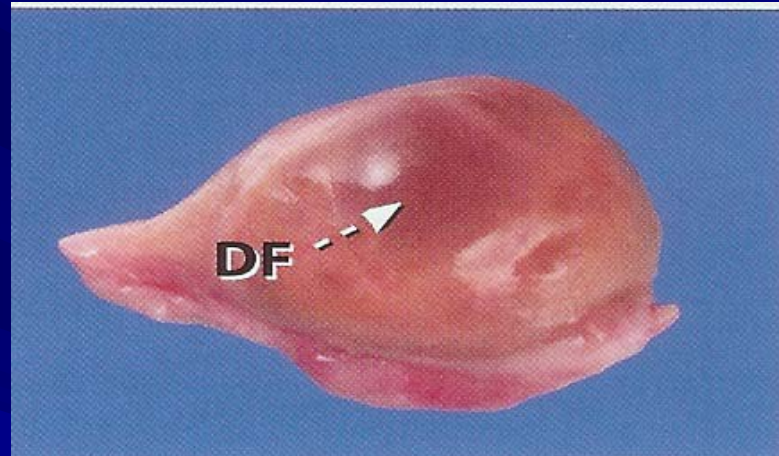
^{b,c} superscripts differ $P < 0.002$

Variation in Ovulation Time



Ovarian Structures

- Graffian follicle

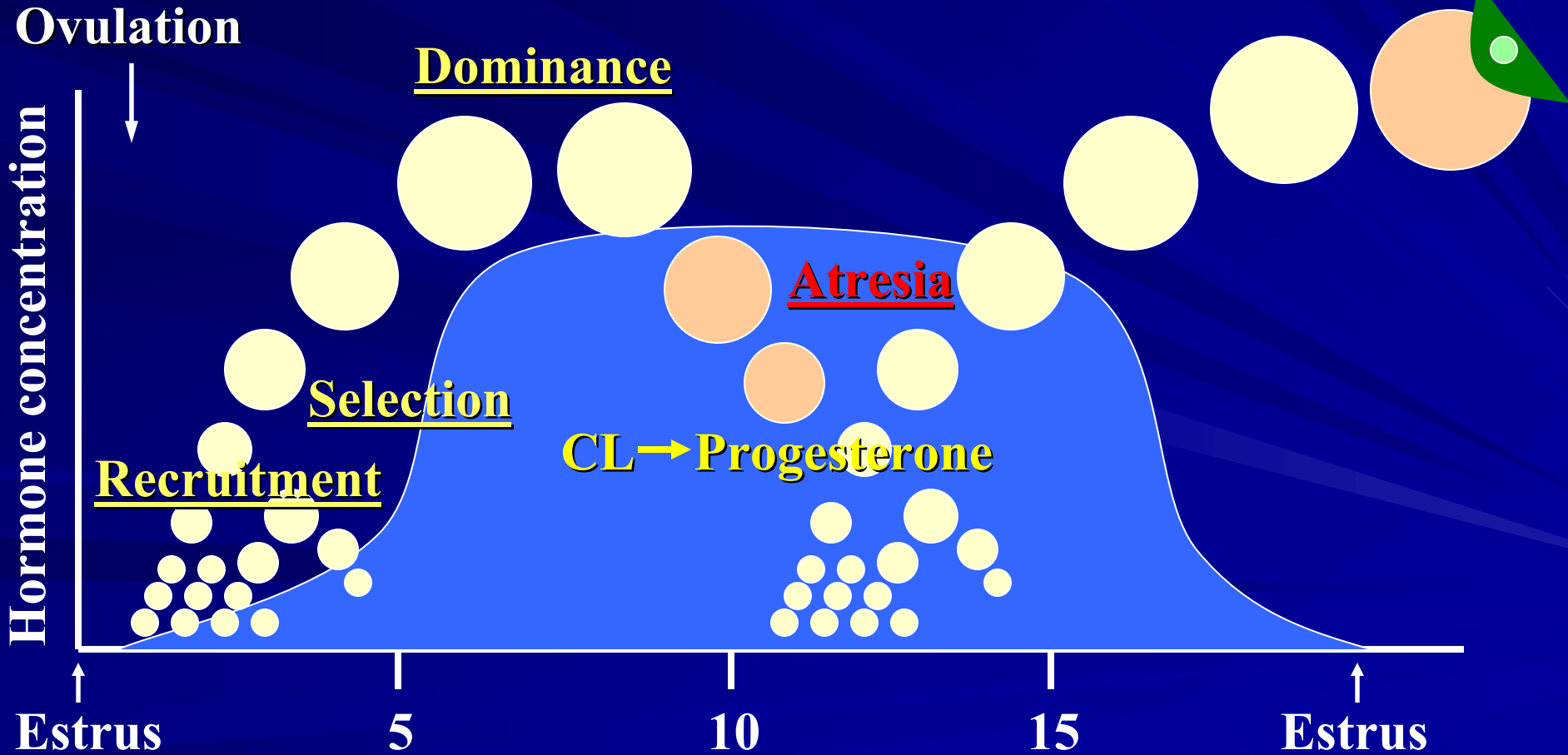


- Corpus luteum



The Estrous Cycle

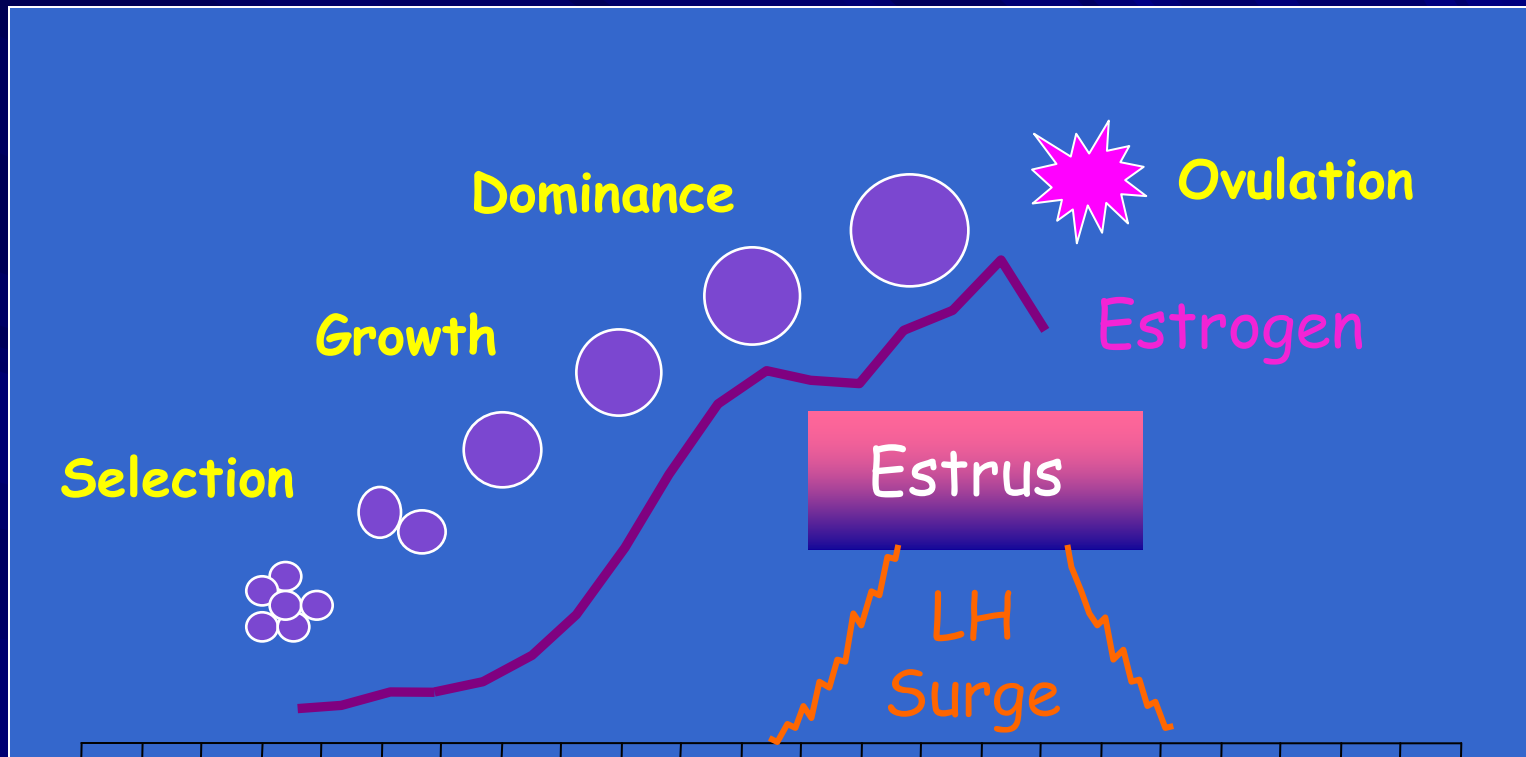
Ovulation



Stages of the Estrous Cycle

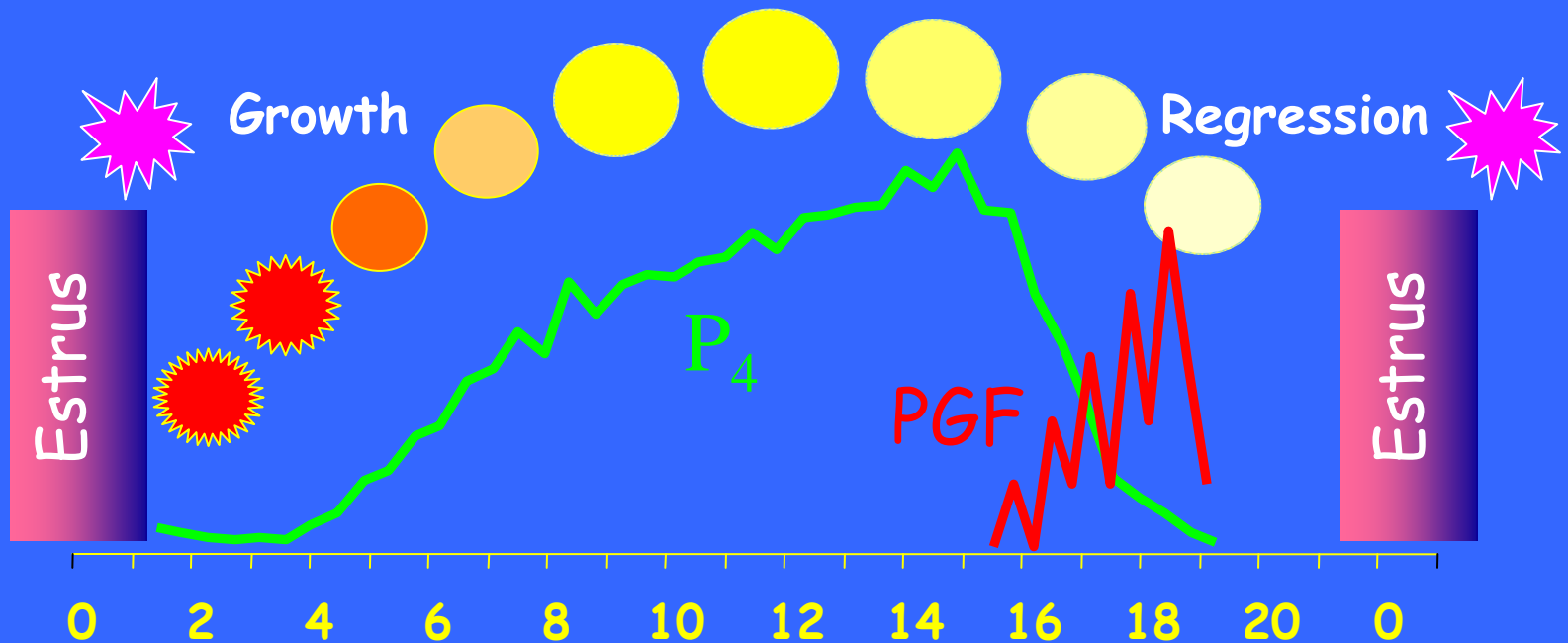
- Follicular Phase
- Estrus
- Luteal Phase

Follicular and Estrus Phases



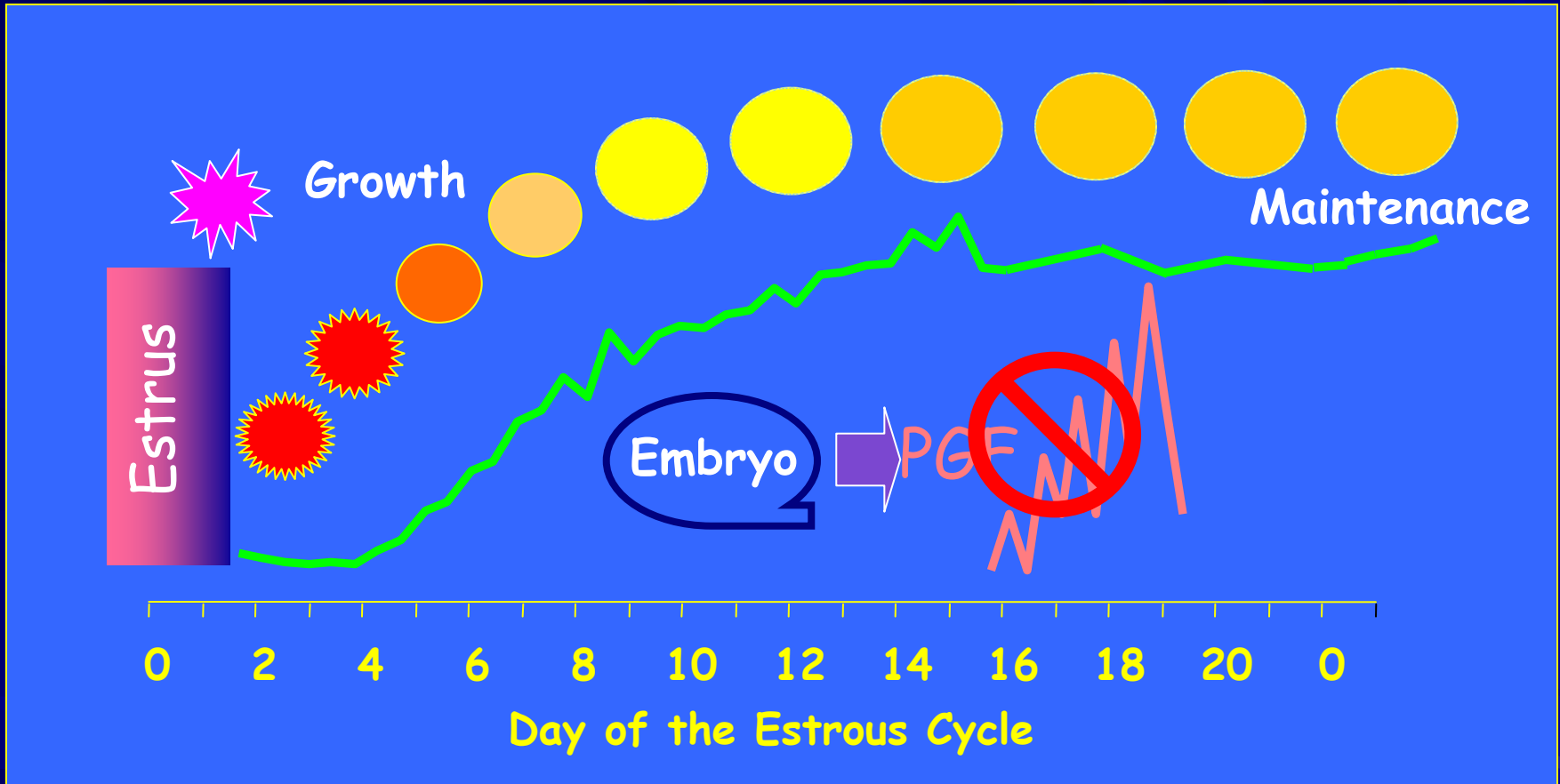
- Maturation of the preovulatory follicle
- Estrous behavior
- Ovulation (induced by the LH surge)

Luteal Phase



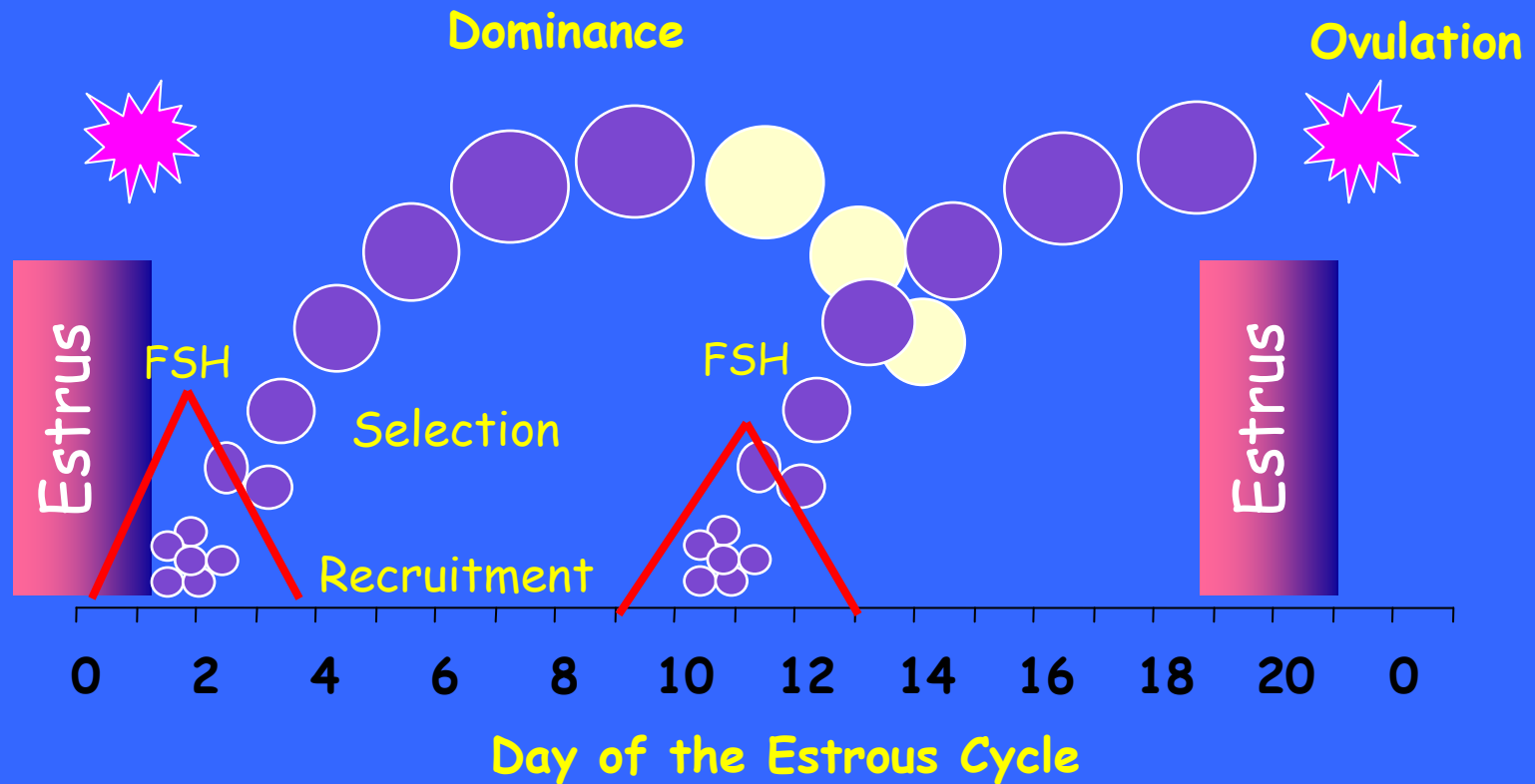
- P₄ = Progesterone – CIDR and MGA
- PGF = Prostaglandin F – Lutalyse, ProstaMate, In Synch, Estrumate, estroPLAN

Corpus Luteum and Pregnancy

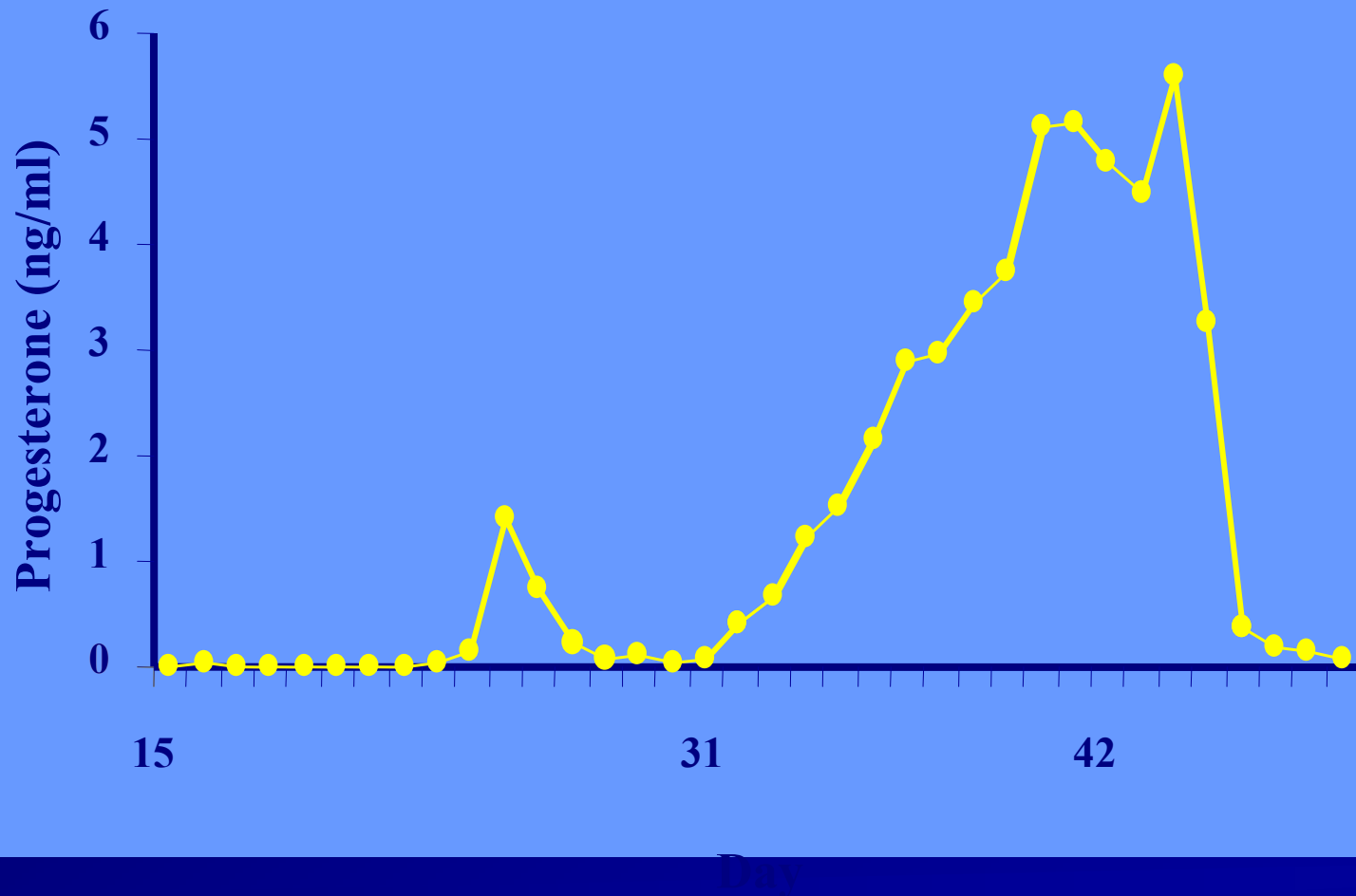


- Maternal recognition of pregnancy – day 15 to 16
- Caution – PGF can induce abortion in pregnant cows

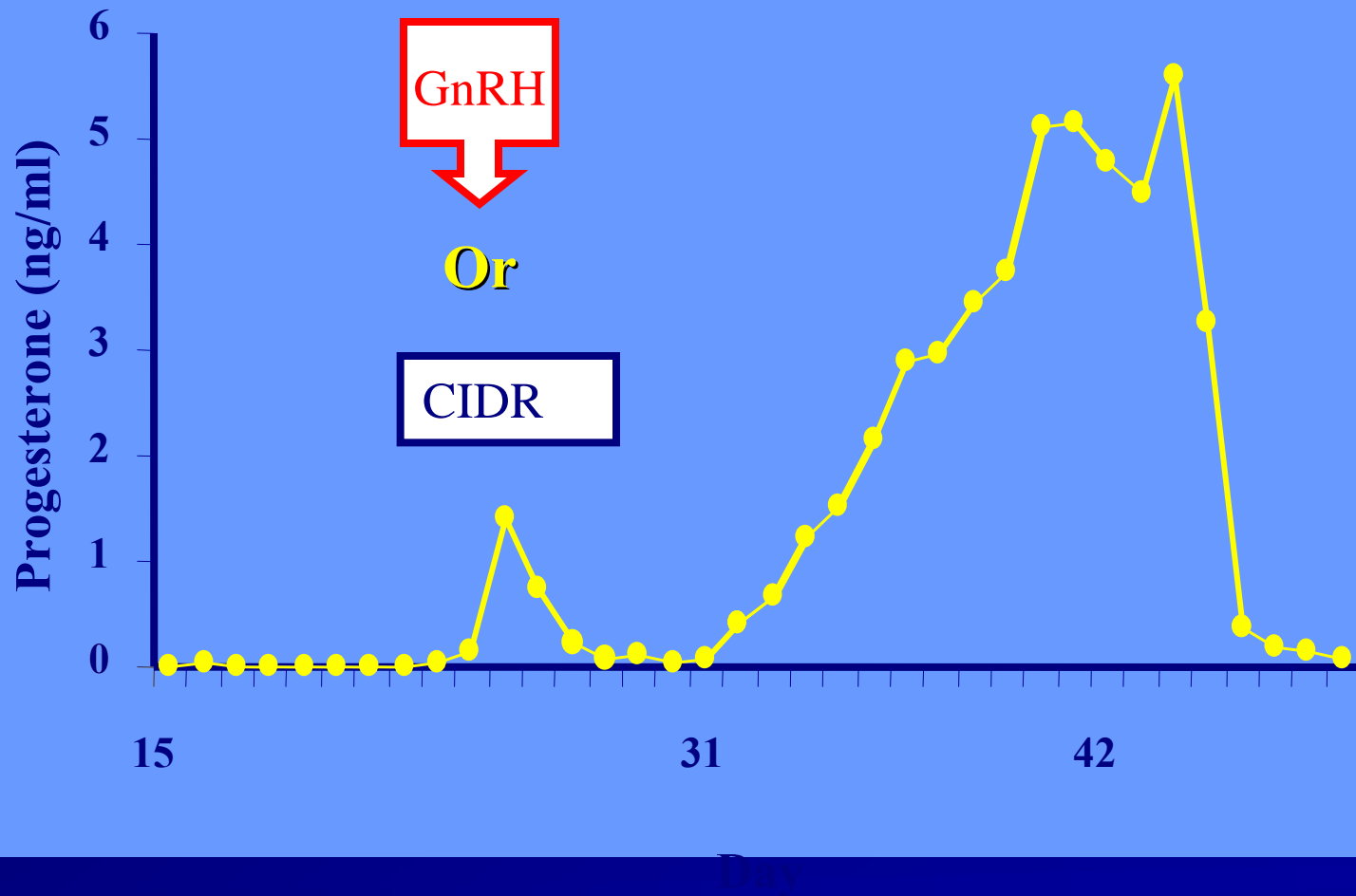
Physiology of Follicular Waves



Problem of Anestrus!



Problem of Anestrus!



Hormones utilized in Estrus Synchronization Protocols

- Progesterone/Progestins
- Prostaglandin $F_{2\alpha}$
- GnRH

Progesterone

Biological Functions

- Inhibit estrus/ovulation
- Preparation for pregnancy
- Maintenance of pregnancy

Progestins/Progesterone

Role in Synchronization

- Inhibit estrus/ovulation
- Induce cyclicity
- Dominant follicle turnover

Prostaglandin $F_{2\alpha}$

Biological Function

- Luteal regression in nonpregnant animals

Role in Synchronization

- Induce premature luteal regression

Gonadotropin Releasing Hormone (GnRH)

Biological Function

- Control secretion of LH
- Induces gonadotropin surge

Role in Synchronization

- Induce ovulation
- Synchronize follicular waves

Estrus Synchronization Products

Progestins

- Melengestrol Acetate
- EAZI-BREED CIDR

Prostaglandin $F_{2\alpha}$

- Lutalyse
- ProstaMate
- In Synch
- Estrumate
- estroPLAN

Estrus Synchronization Products

GnRH

- Cystorelin
- Fertagyl
- Factryl
- OvaCyst

Hormonal management of the luteal phase

- Progestins
- Prostaglandin $F_{2\alpha}$

Role of Progestins in Estrus Synchronization

- Synchronization of estrus in
 - beef heifers & cows
 - dairy heifers & cows
- Advances onset of puberty in heifers
- Advances return to estrus after calving in
COWS

Progestins

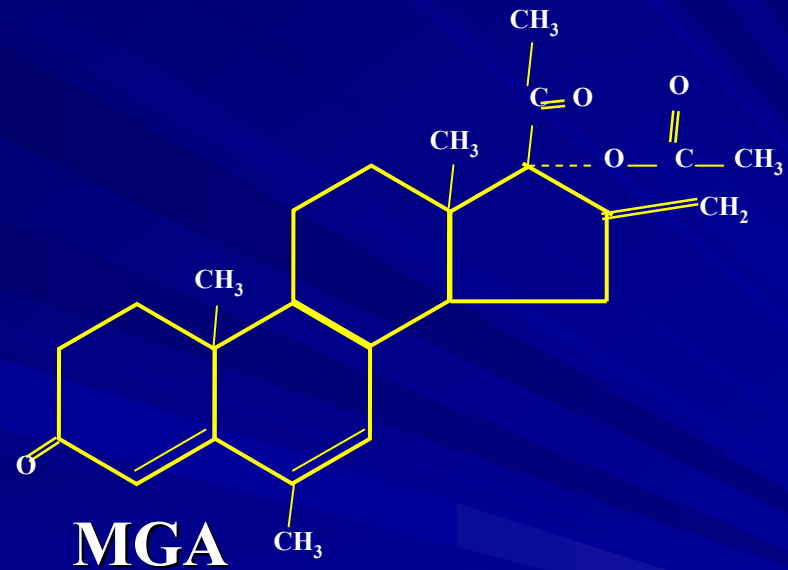
- Melengestrol Acetate - MGA
- Controlled Internal Drug Release
- CIDR





Progesterone

Pregn-4-ene-3, 20-dione

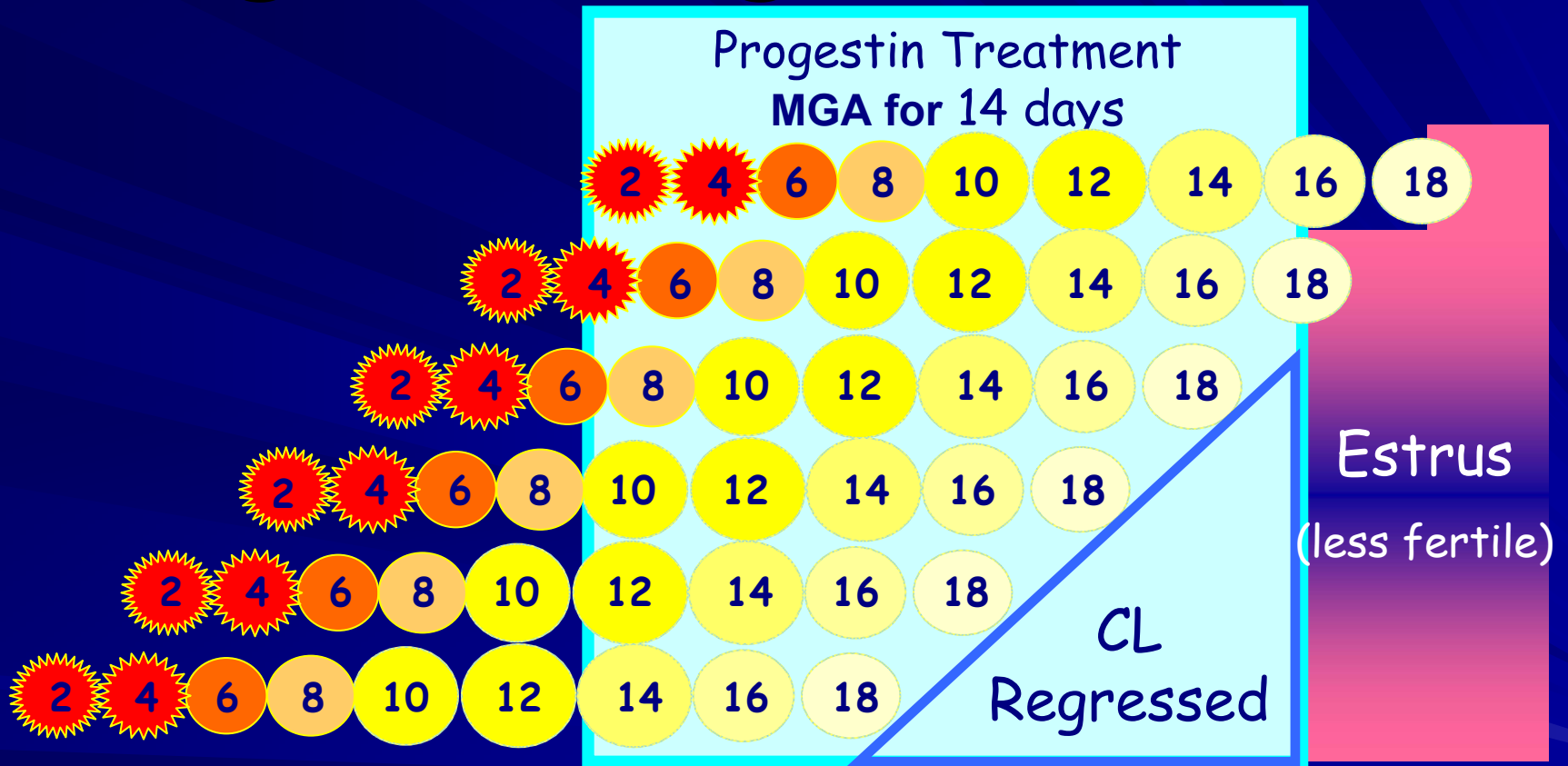


MGA

(melengestrol acetate)

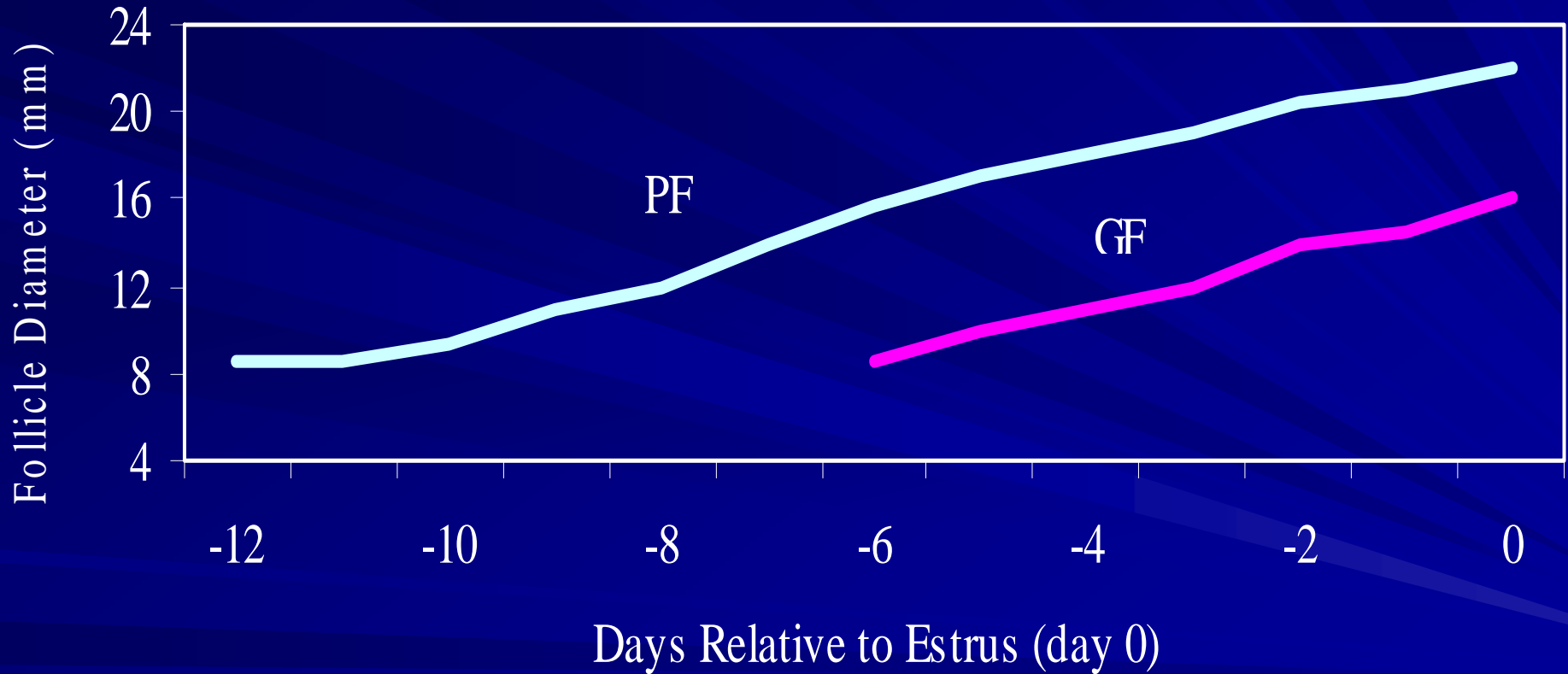
6-methyl-17-alpha-acetoxy-16-methylene-pregn-4, 6-diene-3, 20-dione

Inhibition of Ovulation Following Long-term Progestin Treatment



Persistent Follicles

Persistent Follicle (PF) vs. Growing Follicle (GF)

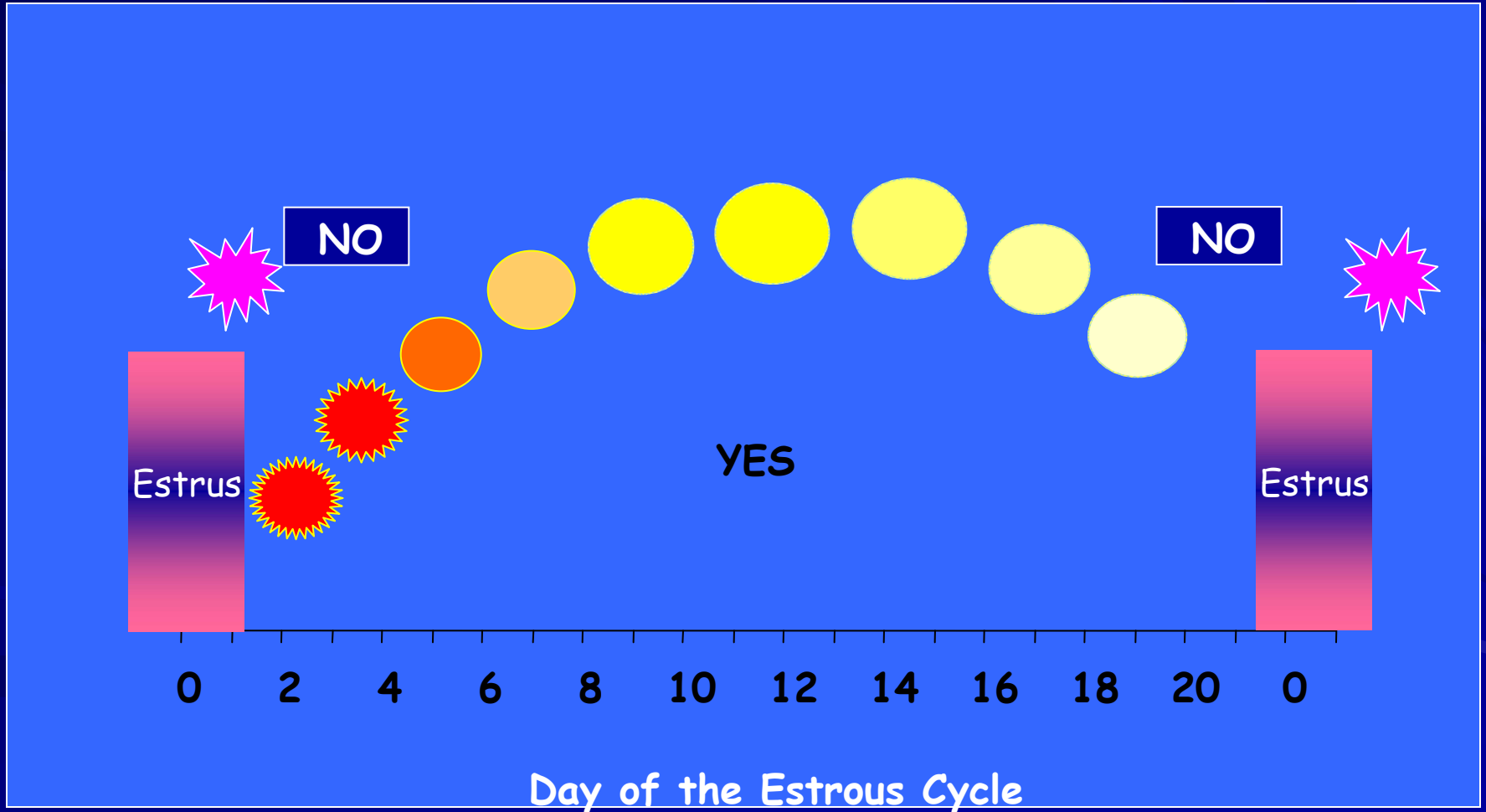


Prostaglandin $F_{2\alpha}$ (PGF)

(Lutalyse, ProstaMate, Estrumate, In Synch, estroPLAN)

- Causes CL regression
- No effect on noncycling cattle
- No induction of cyclicity
... No Jump-start
- Effective days 6 to 16 of the estrous cycle (day 0 = estrus)

PGF_{2a} – Effect of stage of the cycle



Hormonal management of follicular waves

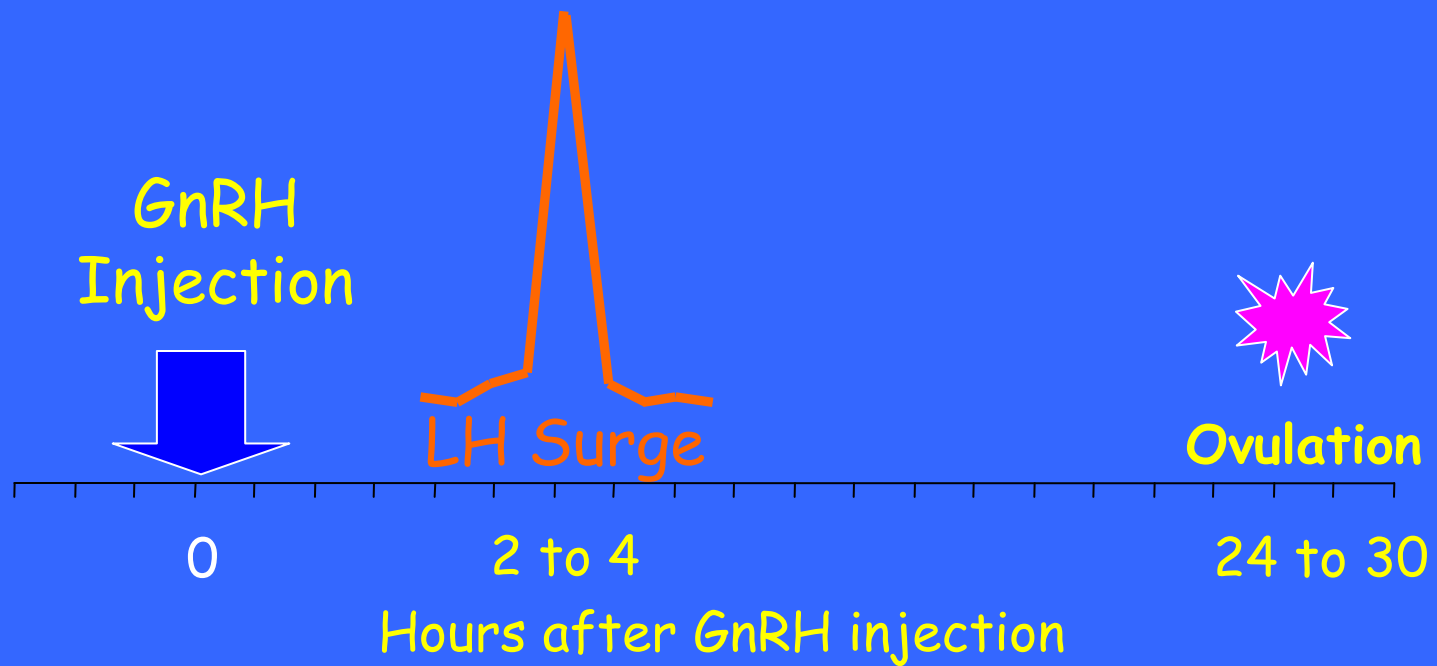
- GnRH – Induces dominant follicle to ovulate
- Estradiol – dominant follicle turnover (↓FSH)
- Progesterone – dominant follicle turnover (↓LH)

GnRH

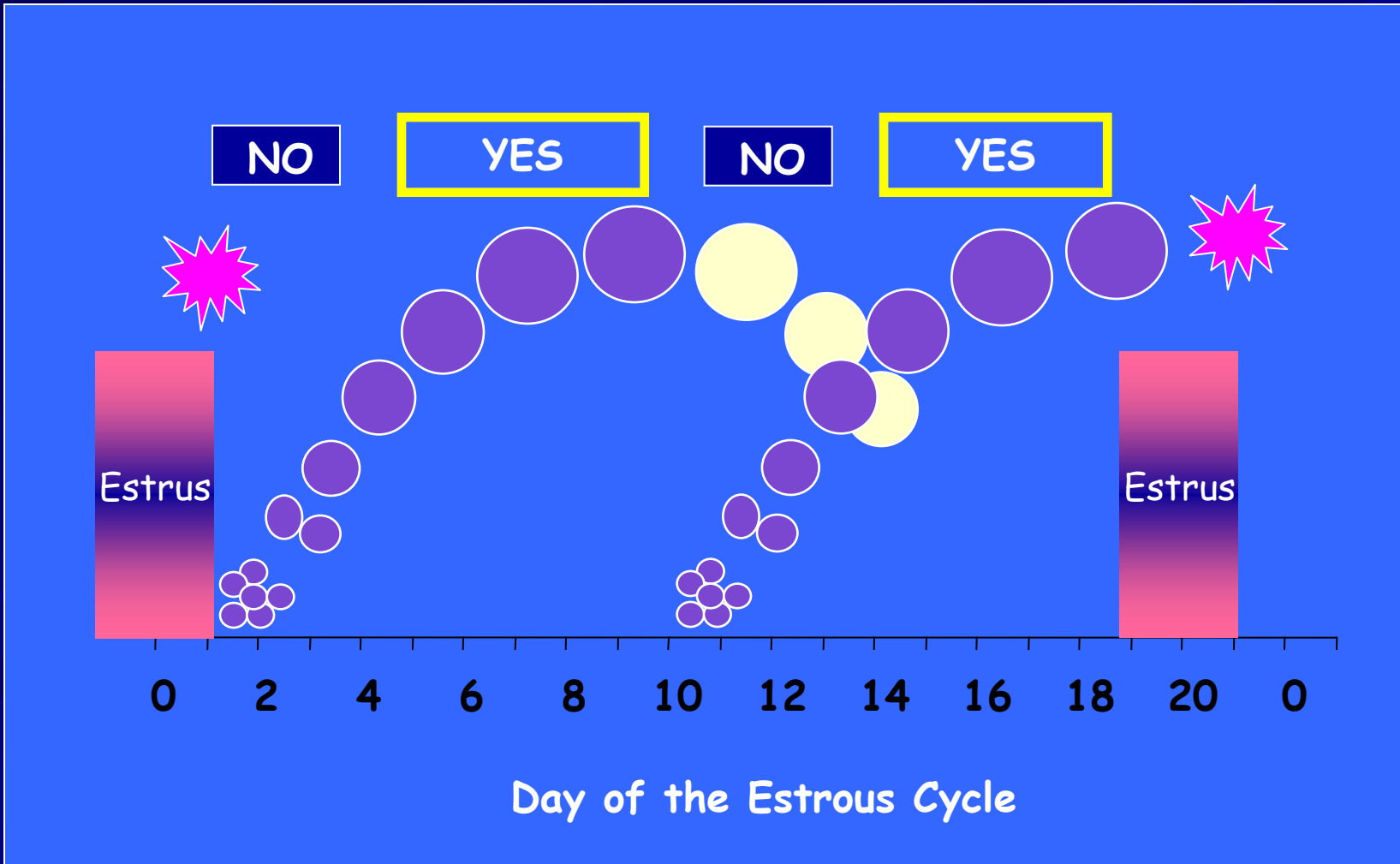
(Cystorelin, Factrel, Fertagyl, Ovacyst)

- Induces ovulation
- Synchronizes follicular waves
- Induces formation of a CL

GnRH – Induced Surge of LH



GnRH-Induced Ovulation During a Follicular Wave



**Management considerations
for selecting heifers and cows
for synchronization of estrus**

Before you start an estrous synch and AI program – Heifers

What has the pregnancy rate of your heifers
been over the past few years?

Have your heifers received growth promoting
implants?

Have you selected an appropriate target
weight?

Heifers-contd.

Have your heifers attained 65% of their mature body weight?

What proportion of your heifers have a reproductive tract score of ≥ 4 ?

Before you start an estrous synch and AI program – Postpartum Cows

What has the pregnancy rate in your cows been over the past few years?

What is the current length of your breeding season?

Postpartum Cows – contd.

What proportion of your cows are cycling by the start of the breeding season?

What was the body condition score of your cows at calving?

Postpartum Cows – contd.

What is the current body condition score of your cows?

How many days postpartum will your cows be when estrus synchronization is initiated?

Postpartum Cows and Heifers

How much time can you devote to estrus detection?

Considering your handling facilities, how many cows can you breed in an hour?

