

Understanding Postpartum Anestrus and Puberty

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Anestrus?

- Anestrus is the primary factor reducing reproductive efficiency in beef cow-calf operations.
- Anestrus can be defined as the lack or absence of the expression of estrus.
- Anestrus occurs annually; heifers are anestrus prior to puberty and anestrus occurs in cows after each calving.

Causes of Anestrus

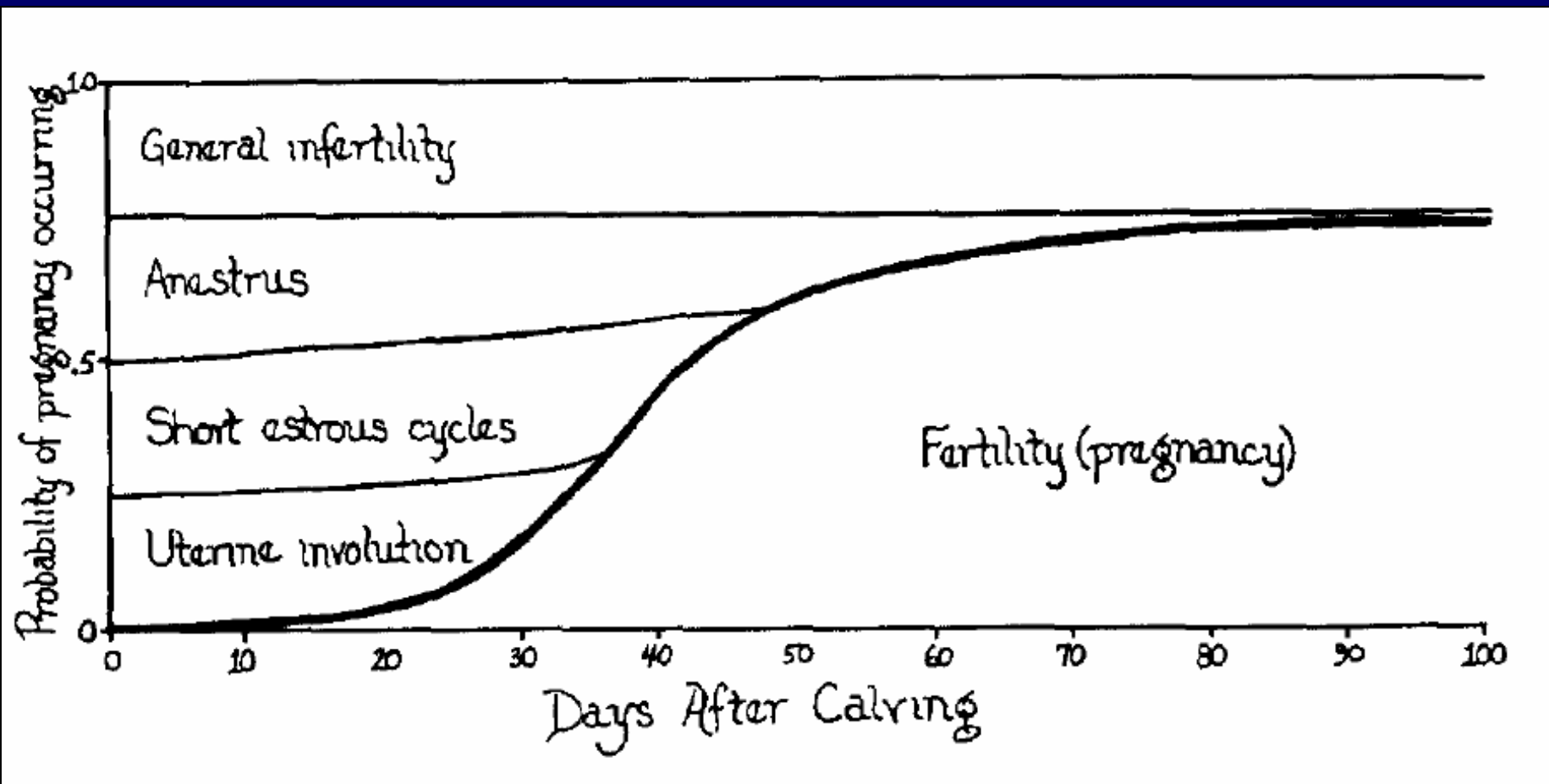
- Before puberty – (prepuberal anestrus)
- After calving – (postpartum anestrus)
 - Biological protection for dam and offspring
- Lactational
- Nutritional
 - If the environment is not suitable for the dam, why bring a competing calf into this environment
 - Every other year calving in harsh environments
- Seasonal (ewe, mare)
- Pregnancy

Factors Contributing to Infertility

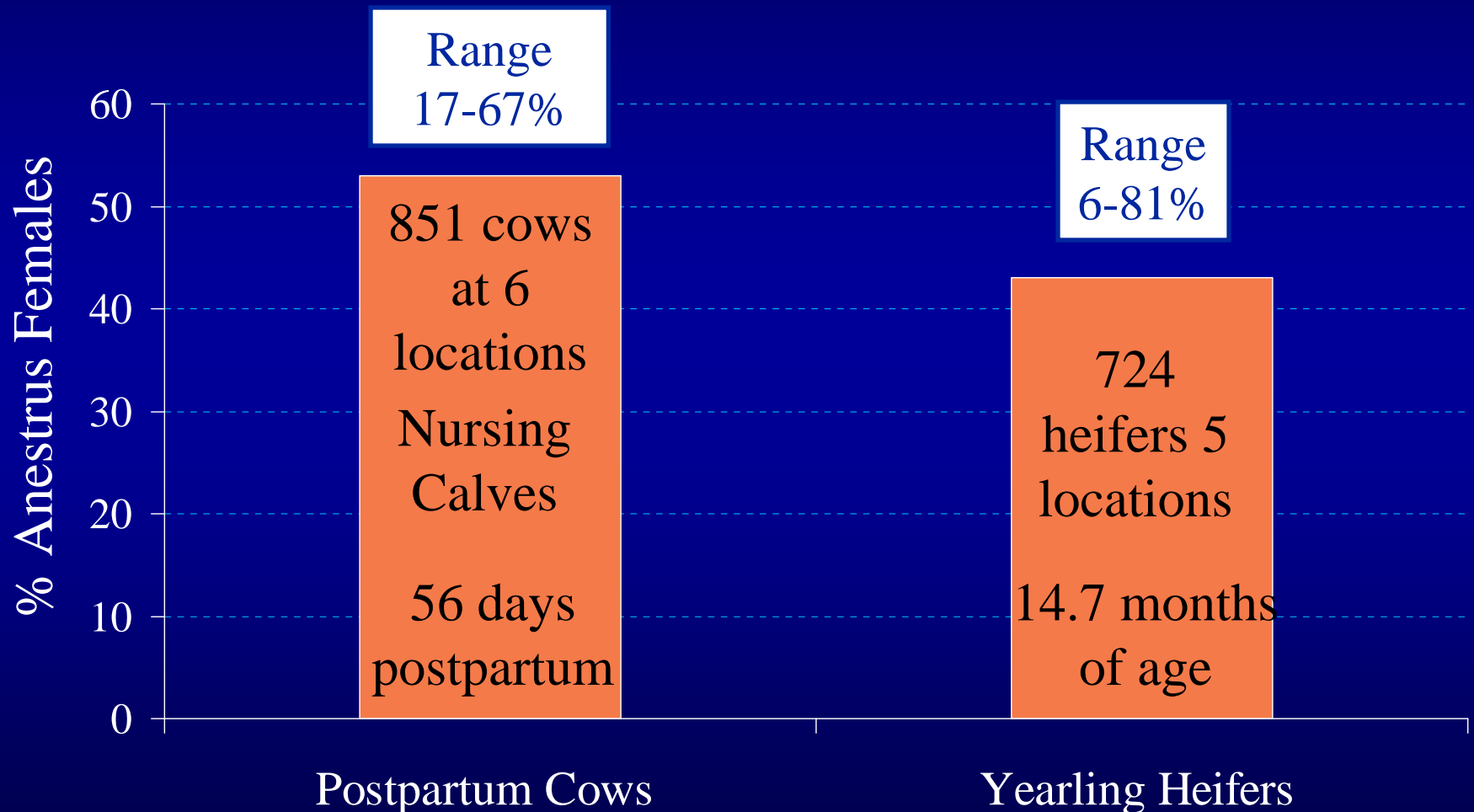
- General Infertility
 - Biological Ceiling
 - 25% to 30% effect
- Uterine Involution
- Short Estrous Cycles
- Anestrus
 - Potential for manipulation through management



Relationship of Fertility to Time After Calving



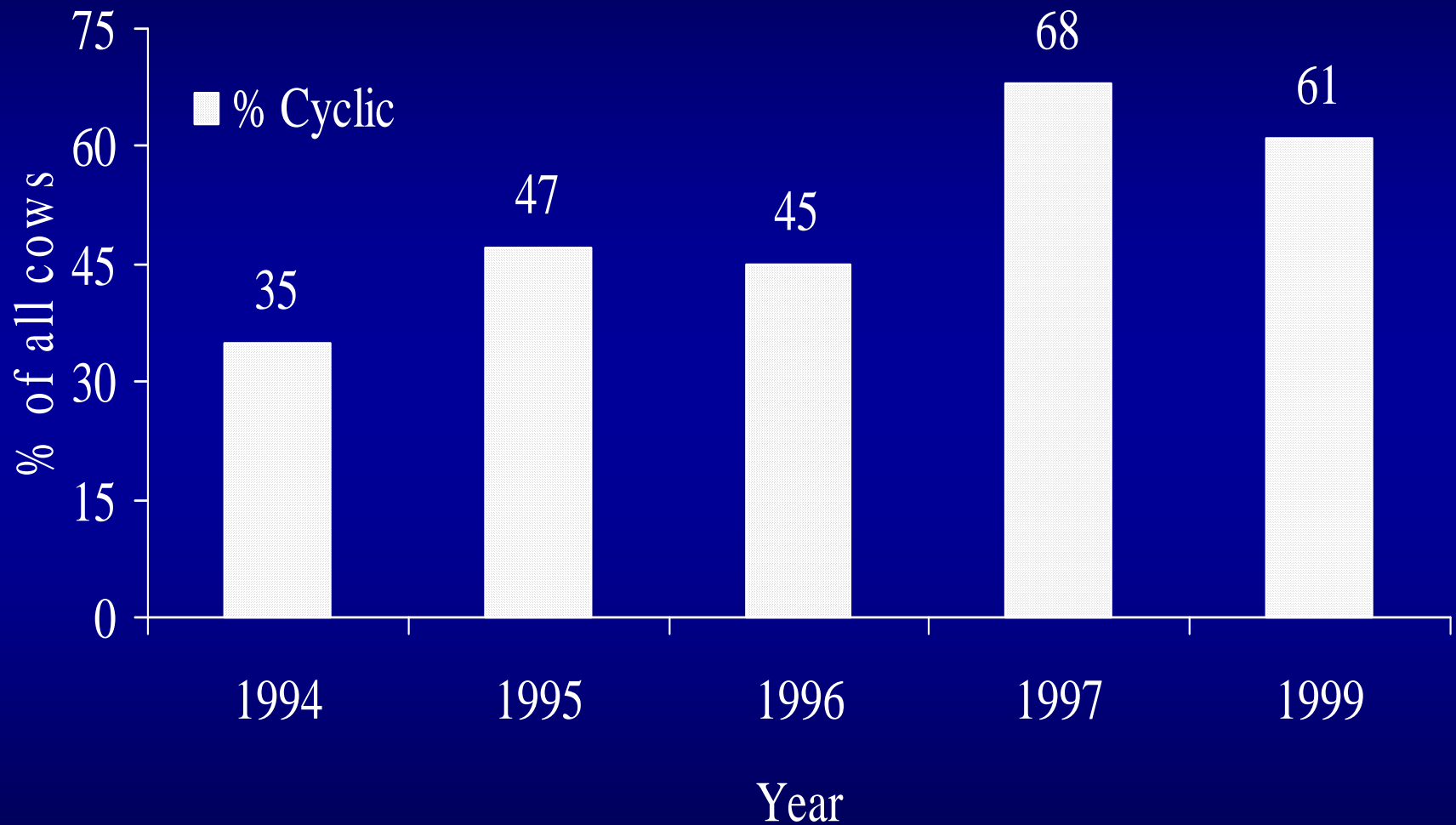
Incidence of Anestrus* in US Beef Cattle at Start of Breeding Season



*Based on blood samples for progesterone

Lucy et al., 2001

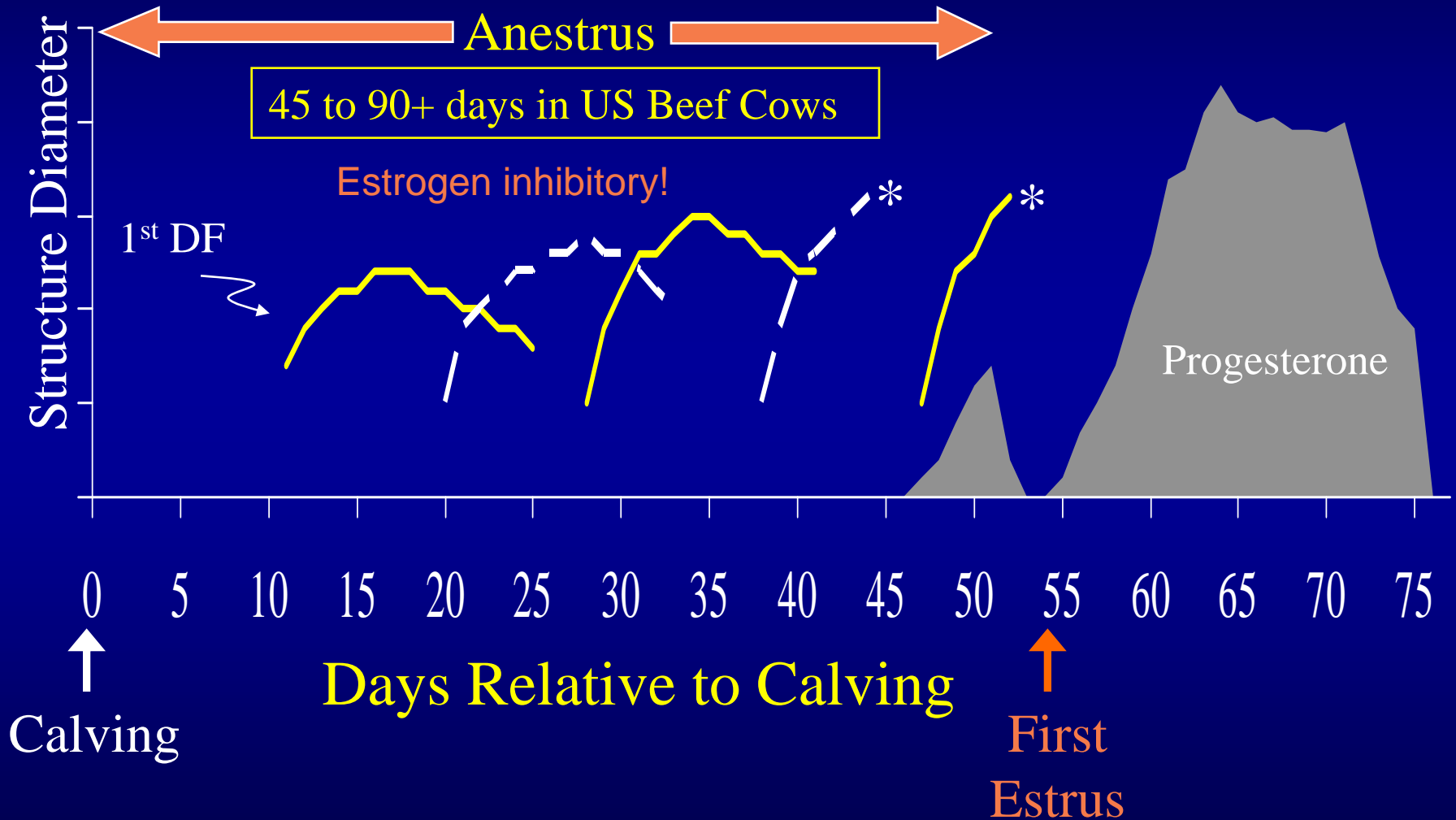
Percent of Cows Cyclic by Year (~ 60 d postpartum)



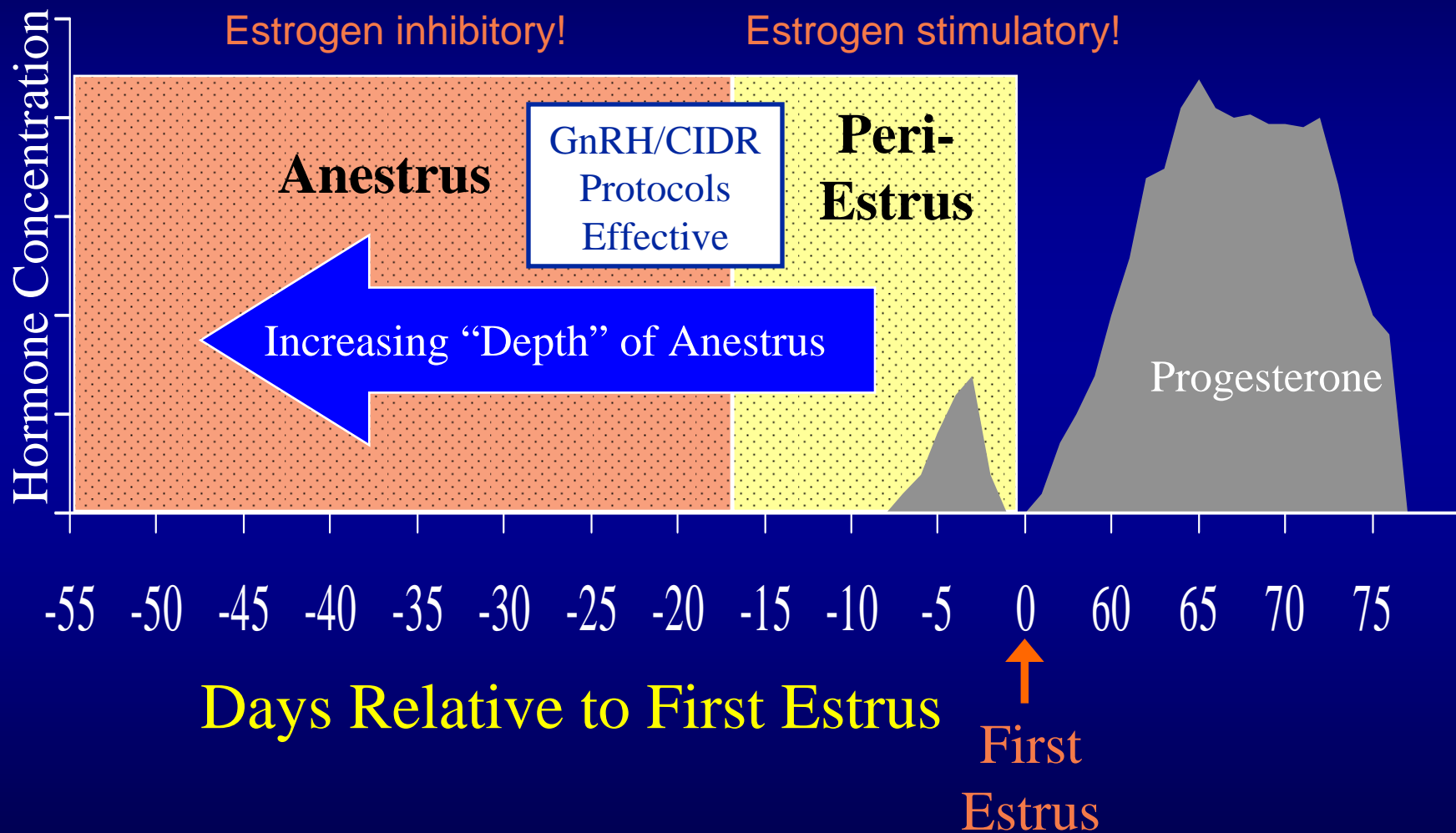
(Jackson Branch of the OSU Ag Experiment Station, Jackson, OH)

What Is Anestrus Physiologically?

Postpartum Anestrus in Beef Cows



“Depth” of Postpartum Anestrus in Beef Cows



Factors Regulating the Length of Anestrus

- Presence of the calf
 - Initiates anestrus
- Body Condition Score (BCS)
- Parity
- Days Since Calving
- Other factors include dystocia, health, and calving season (fall vs. spring)

Presence of the Calf

Presence of the Calf

- Presence of the calf initiates anestrus
 - Establishes the negative feedback of estrogen on the hypothalamus
 - Results in low LH pulse frequency
 - Exact mechanisms unknown but both the physical contact of the calf (nursing) and the mere presence of the calf at side are involved
- Short-term calf removal (48 h) has been shown to be an effective method to induce estrus
 - GnRH/CIDR synch protocols appear to mimic this response

Stevenson et al., 1994

- Is it presence of calf, nursing, or other?
- Four treatments:
 - Mastectomized, calf weaned at birth
 - Mastecomtized, calf restricted to non-inguinal contact (head and neck of cows – restricted by pen and panel barriers)
 - Mastectomized, unrestricted calf presence
 - Udder intact, unrestricted calf presence

Stevenson et al., 1994

- Results
 - Unrestricted presence of calf prolonged anestrus in both intact and mastectomized cows
 - A cow must receive stimuli resembling normal suckling to prolong anestrus whether intact or mastectomized

Presence or Absence of the Bull

- Bull effect
- Presence of male (boar, ram)
- Several studies indicate a positive response to bull exposure
 - Intact
 - Sterilized
 - Androgenized cows or steers
- Does putting the bull with the cows at the beginning of the breeding season have the same effect?

MANAGEMENT PRACTICES TO OVERCOME PROBLEMS WITH PUBERTY AND ANESTRUS

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Postpartum Anestrus

Biostimulatory effect of bulls (MSU & Others)

- ◆ Presence of bulls accelerates resumption of estrous cycles; decreasing length of anestrus.
- ◆ *In bos taurus & indicus cows*

Table 1. The biostimulatory effect of bulls in primiparous and multiparous cows (adapted from Custer et al., 1990; and Stumpf et al. 1992, respectively).

Variable	Primiparous cows			Multiparous cows		
	NE	BE	diff	NE	BE	diff
Postpartum interval to anestrus, d	82 ± 9 ^a	64 ± 6 ^b	18	58 ± 2 ^a	44 ± 2 ^b	14

^{a,b} Means that lack a common superscript differ ($P < 0.05$).

Postpartum Anestrus

What we know about the biostimulatory effect of bulls (MSU)

1. Caused by pheromone(s) produced by bulls (Berardinelli and Joshi, 2005b).
2. Does not appear to work before 35 d after calving in suckled cows (Fernandez et al., 1993).

Postpartum Anestrus

What we know about the biostimulatory effect of bulls (MSU & Others)

3. Works better as time after calving increases after 35 d (Berardinelli and Joshi, 2005a).
4. Bulls > 18-mo-old and “androgenized” cows have same affect as mature bulls (Cupp et al., 1990; Burns and Spitzer, 1992).

Postpartum Anestrus

What we know about the biostimulatory effect of bulls (MSU)

5. Intermittent exposure does not work (Fernandez et al., 1996).

6. Twelve hour-exposure does work (Berardinelli and Joshi, 2005b).

Postpartum Anestrus

What we know about the biostimulatory effect of bulls (MSU & Others)

7. Fence-line contact under certain conditions will work (Fike et al., 1996; Berardinelli and Tauck, 2007).
8. Continuous exposure to bulls urine does not work (Tauck et al., 2006)

Recent bull exposure observations

(Berardinelli, 2007)

- ◆ ...it appears to enhance pregnancy when used in conjunction with GnRH- and progesterone-based estrous synchronization protocols that incorporate fixed-time AI (Berardinelli and Tauck, 2007; Tauck and Berardinelli, 2007).
- ◆ ...effect of bulls not only increases the number of suckled cows that begin cycling before the breeding season, but that AI pregnancy rates are significantly improved by the biostimulatory effect of bulls.

Body Condition

Body Condition Score (BCS)

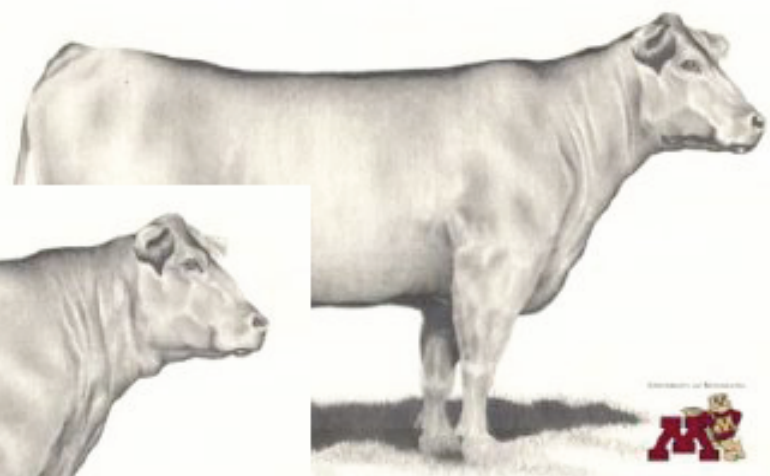
- Body Condition Score is an estimate of the degree of fatness of an animal
 - 1 = emaciated
 - 9 = extremely obese
- Estimate of available energy stores



BCS 1



BCS 3



BCS 5



BCS 7



BCS 9



Uses of Nutrients and Energy

Unnecessary energy reserves (BCS > 6)

Estrous cycles

Additional energy reserves (BCS = 4-5)

Lactation

Pregnancy

Basic energy reserves (fat)

Growth

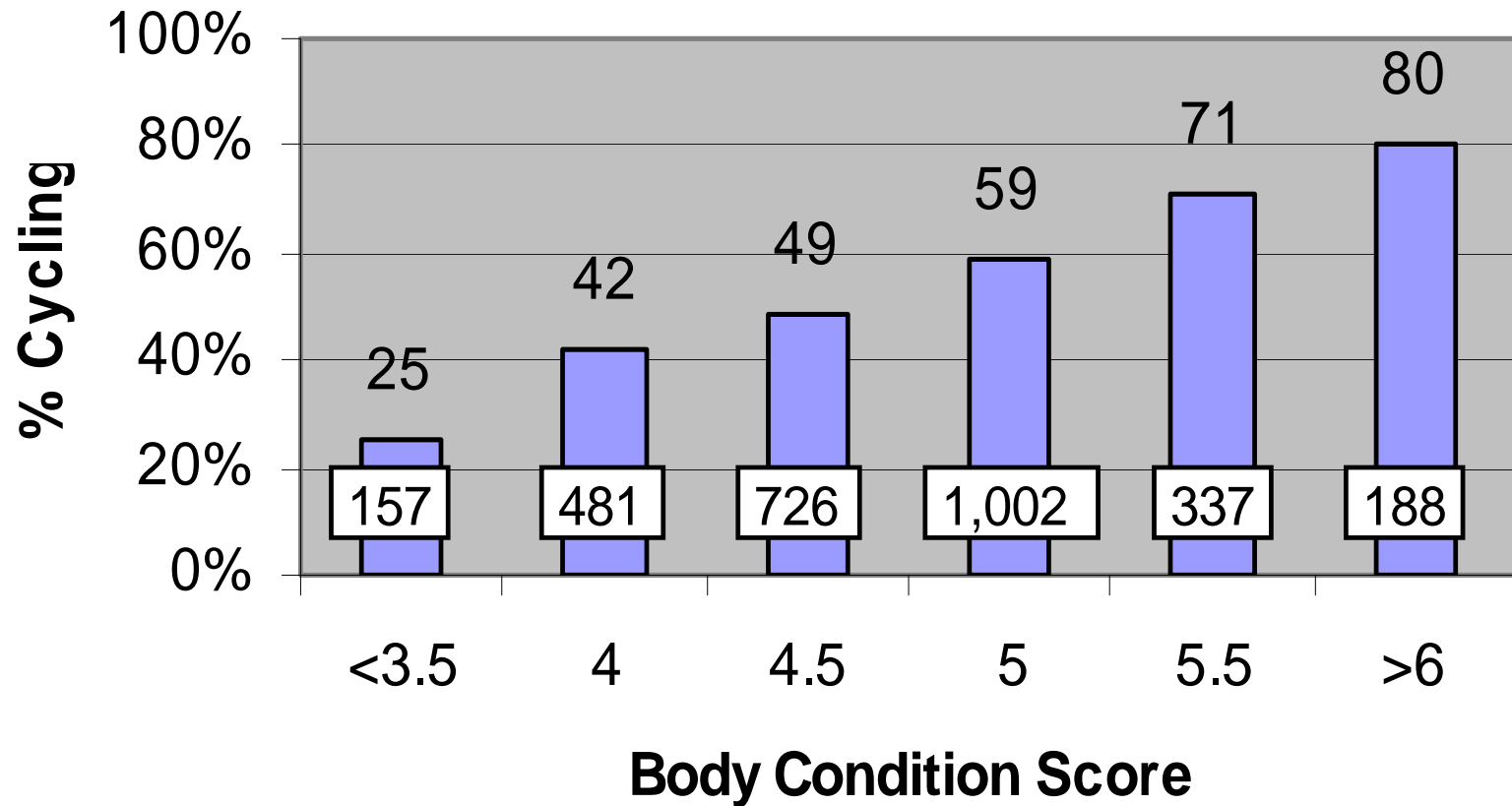
Activity

Basal Metabolism

Nutrients

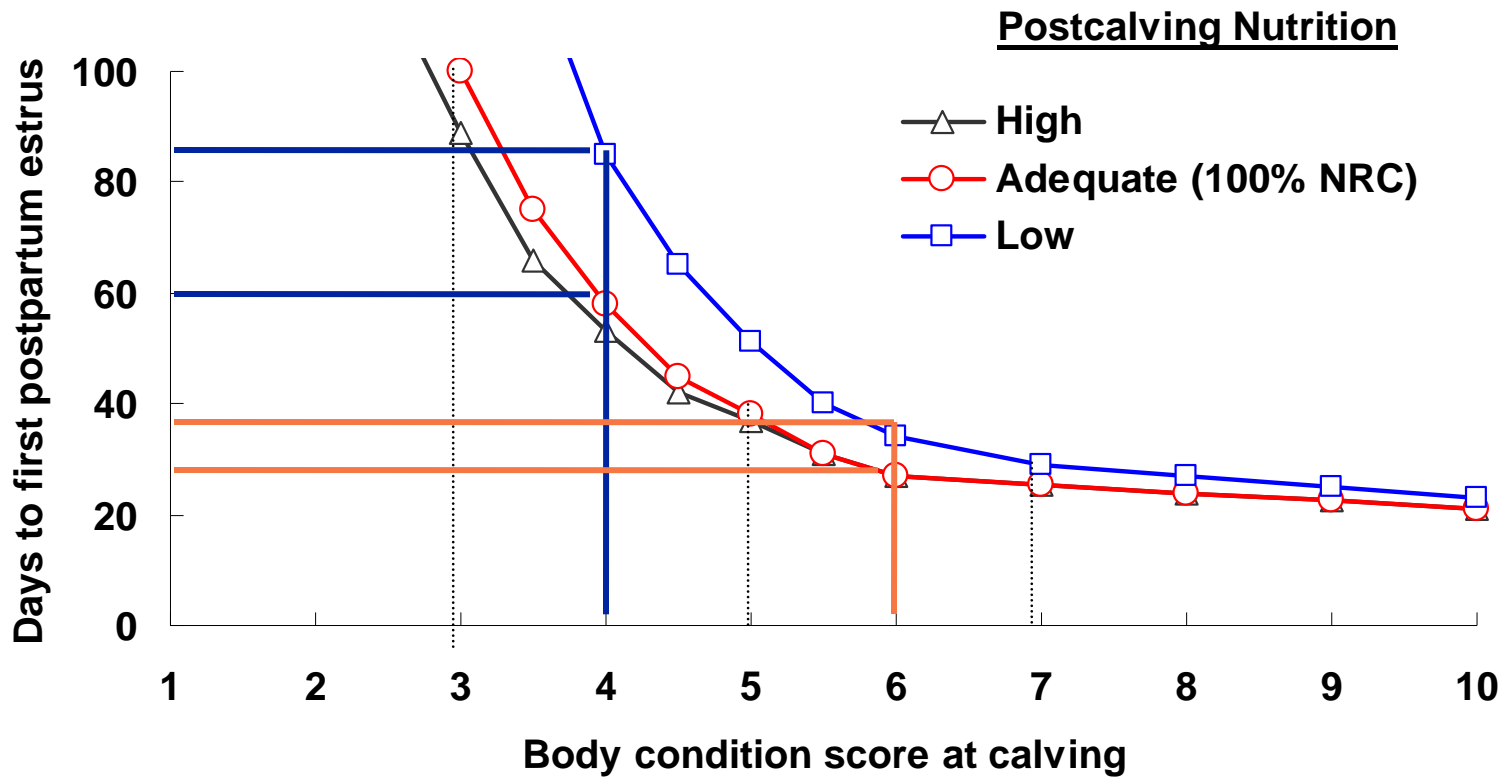


Influence of BCS at Calving on Anestrus



Source: Stevenson et al., 2003

Interaction of BCS at Calving and Postcalving Nutrition



Source: Short, 1990

Parity

- Young cows (2 year old suckled cows) simply require 20-30 more days to resume estrous cycles
- Recommendation has always been to calve first parity cows 20-30 days before the mature cow herd

– Stevenson et al., 2003

Parity	Days PP	Percent Cyclic
1	86	55
2	68	64

Uses of Nutrients and Energy

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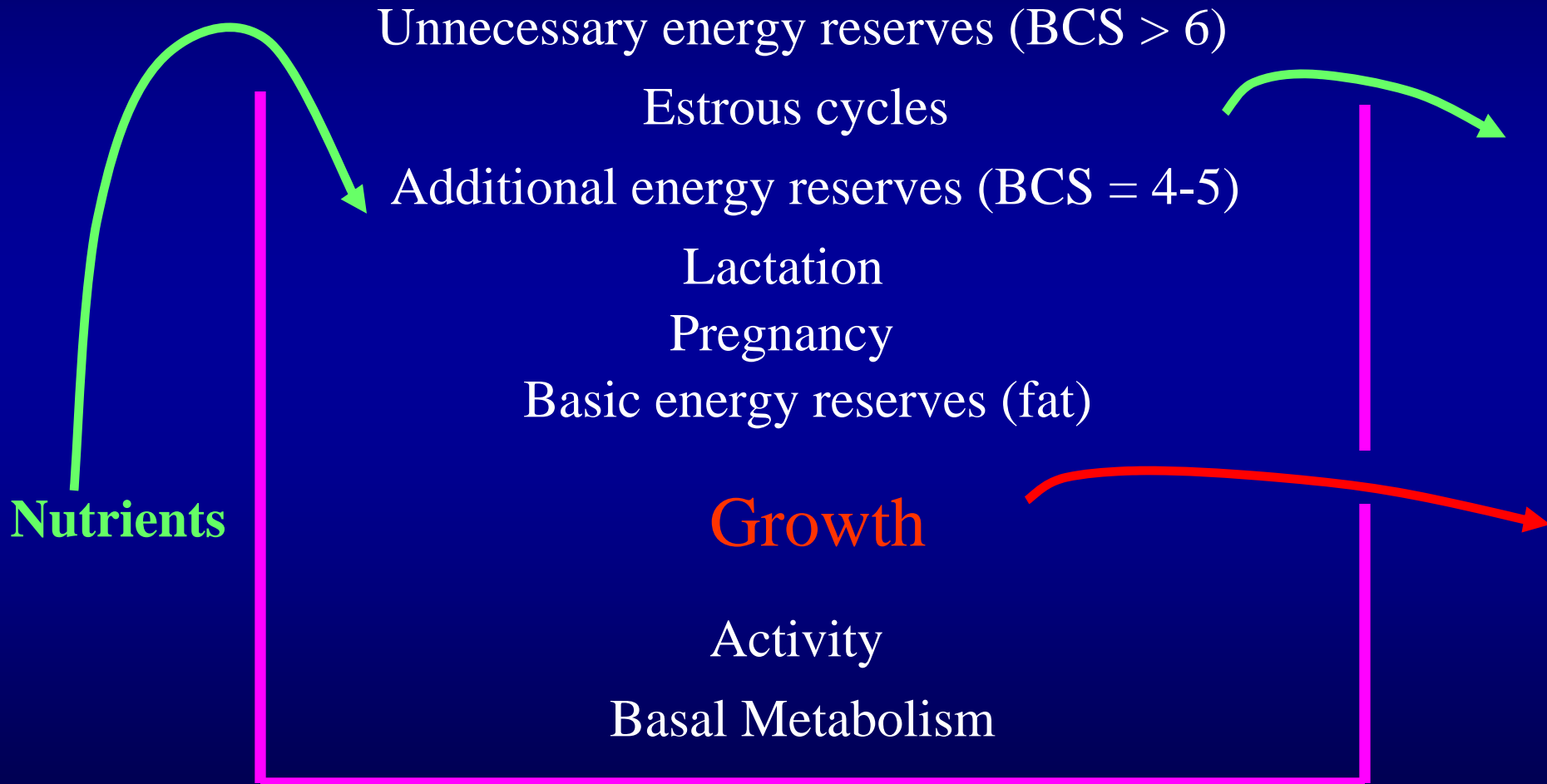
Basic energy reserves (fat)

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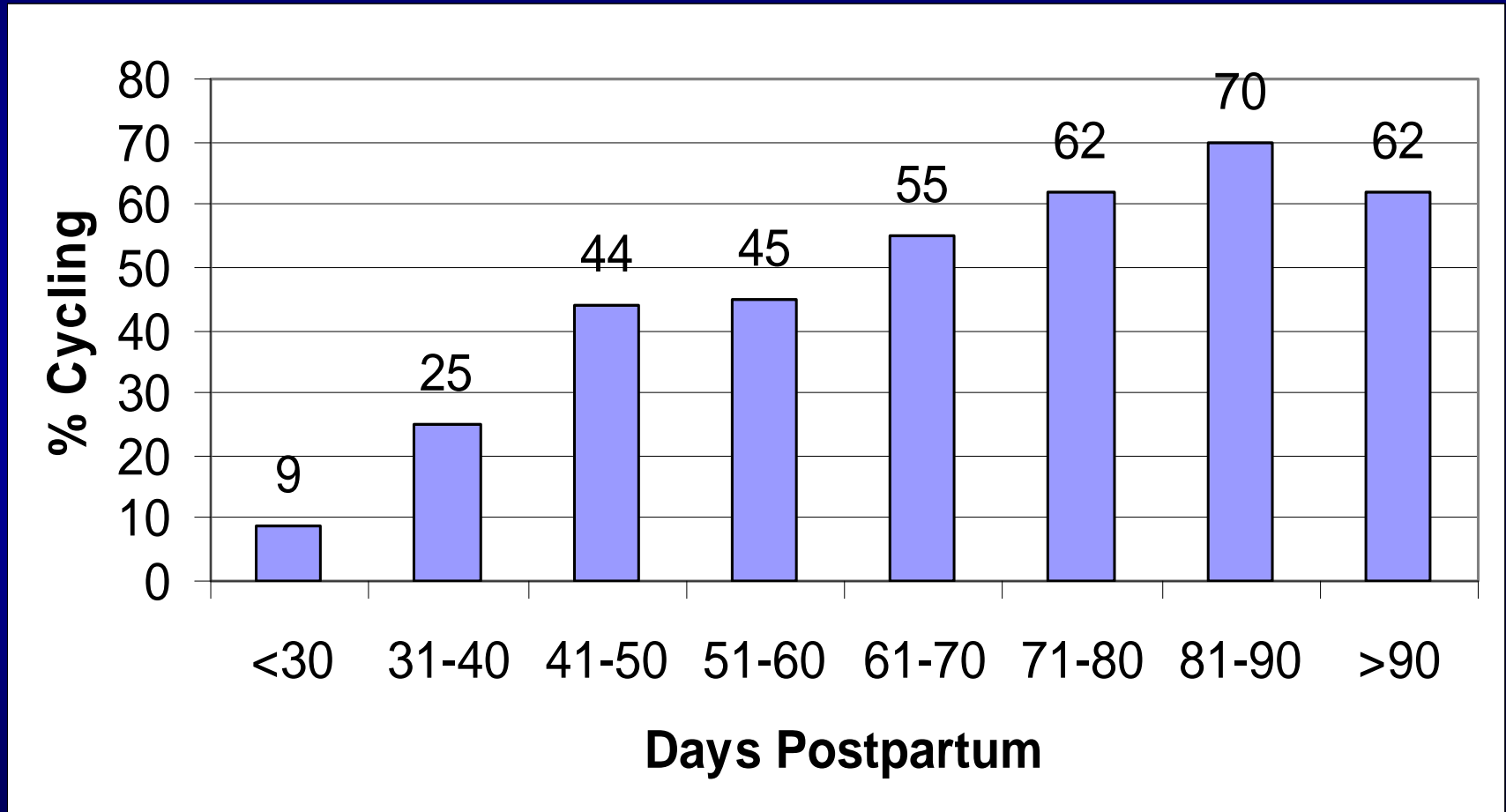
Activity

Basal Metabolism



Influence of Days Since Calving

Influence of Days Since Calving on Anestrus

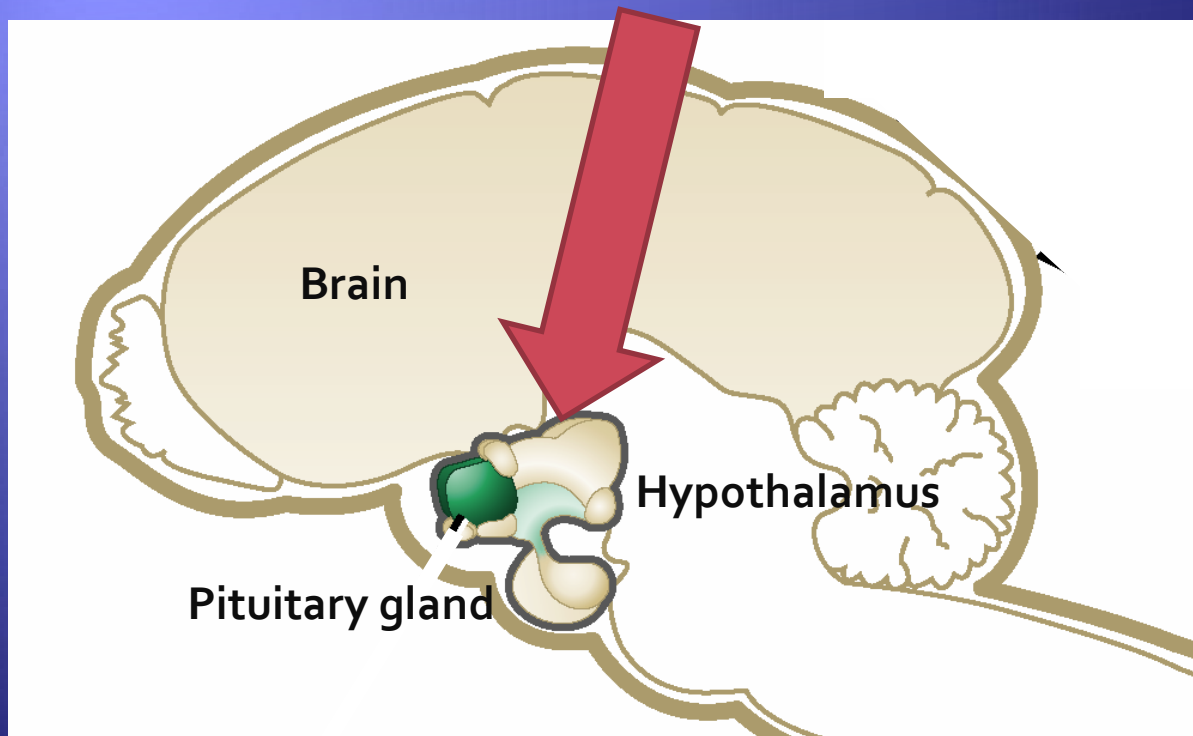


Source: Stevenson et al., 2003

Regulation of Anestrus

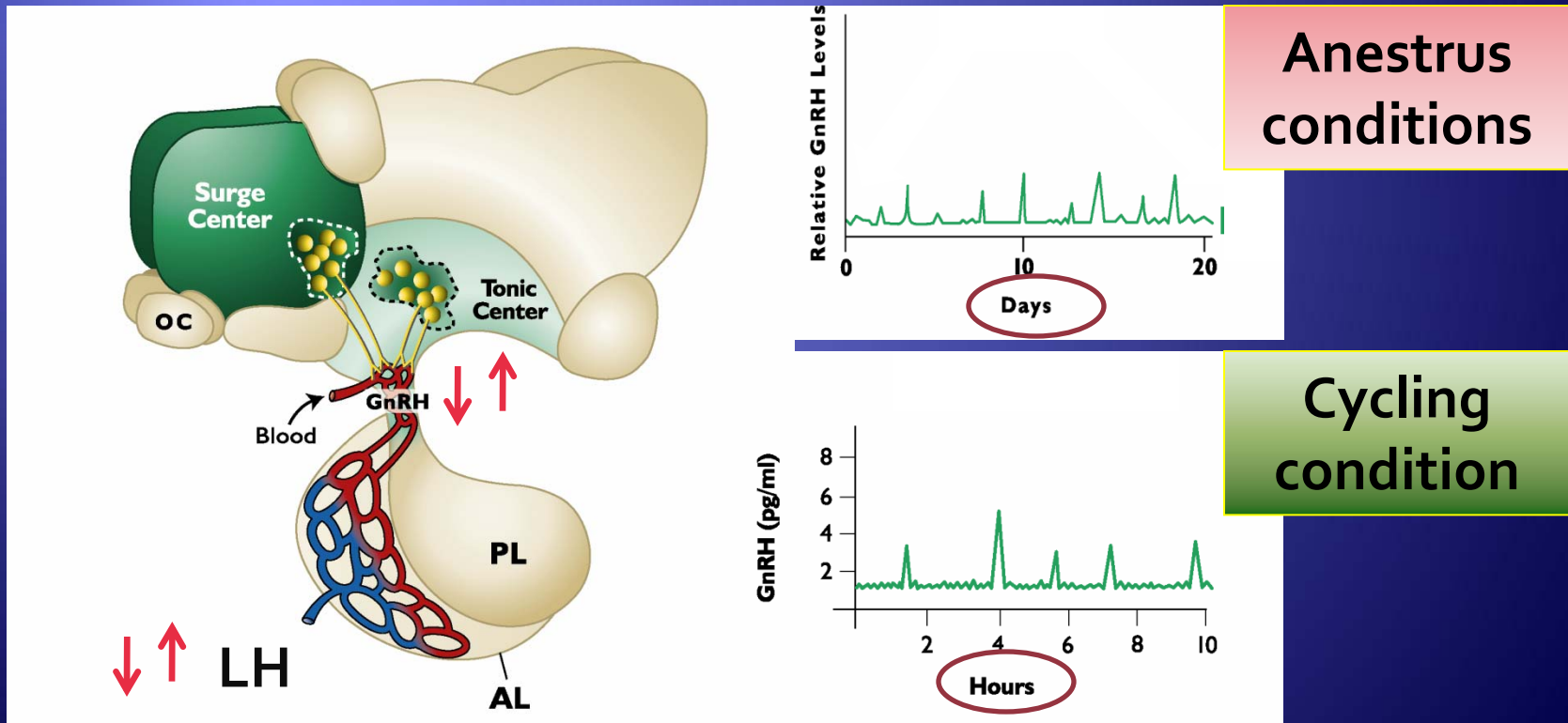
Introduction

Hypothalamic-Pituitary Axis (HP): Control Unit for Reproduction (Adapted from Senger, 2003)

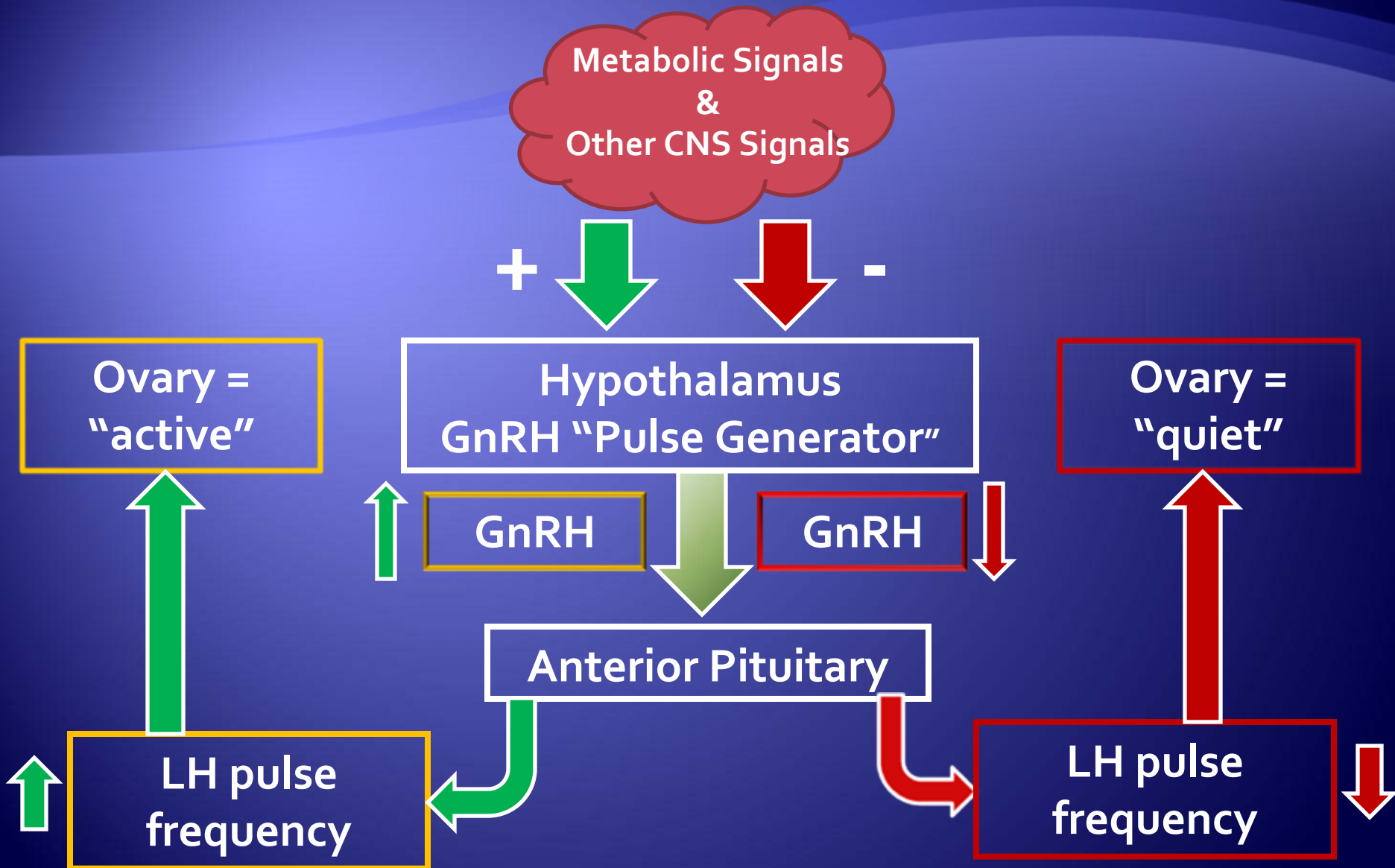


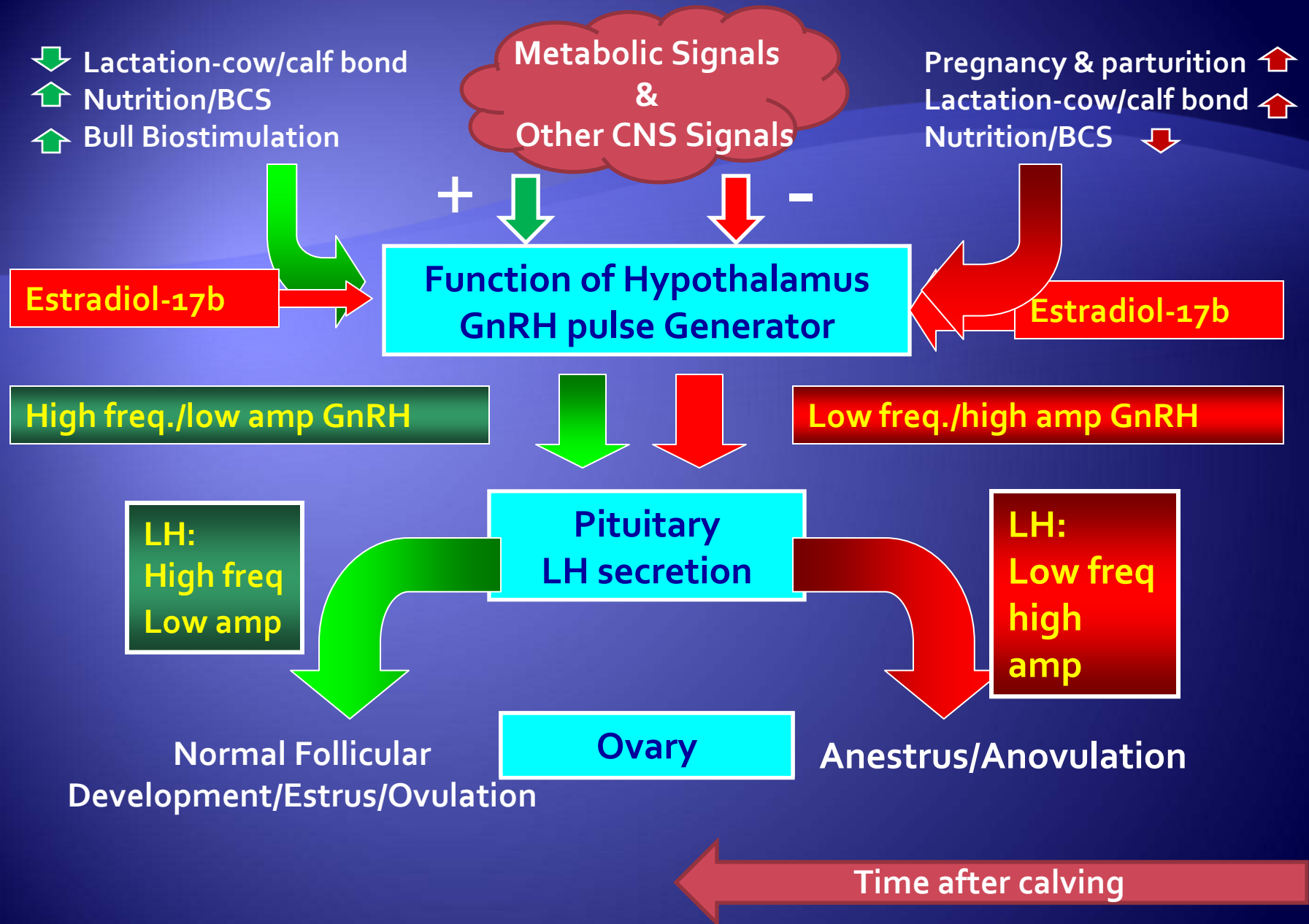
Introduction

General Physiological Mechanism for Anestrus : Hypothalamic-Pituitary Axis (Adapted from Senger, 2003)



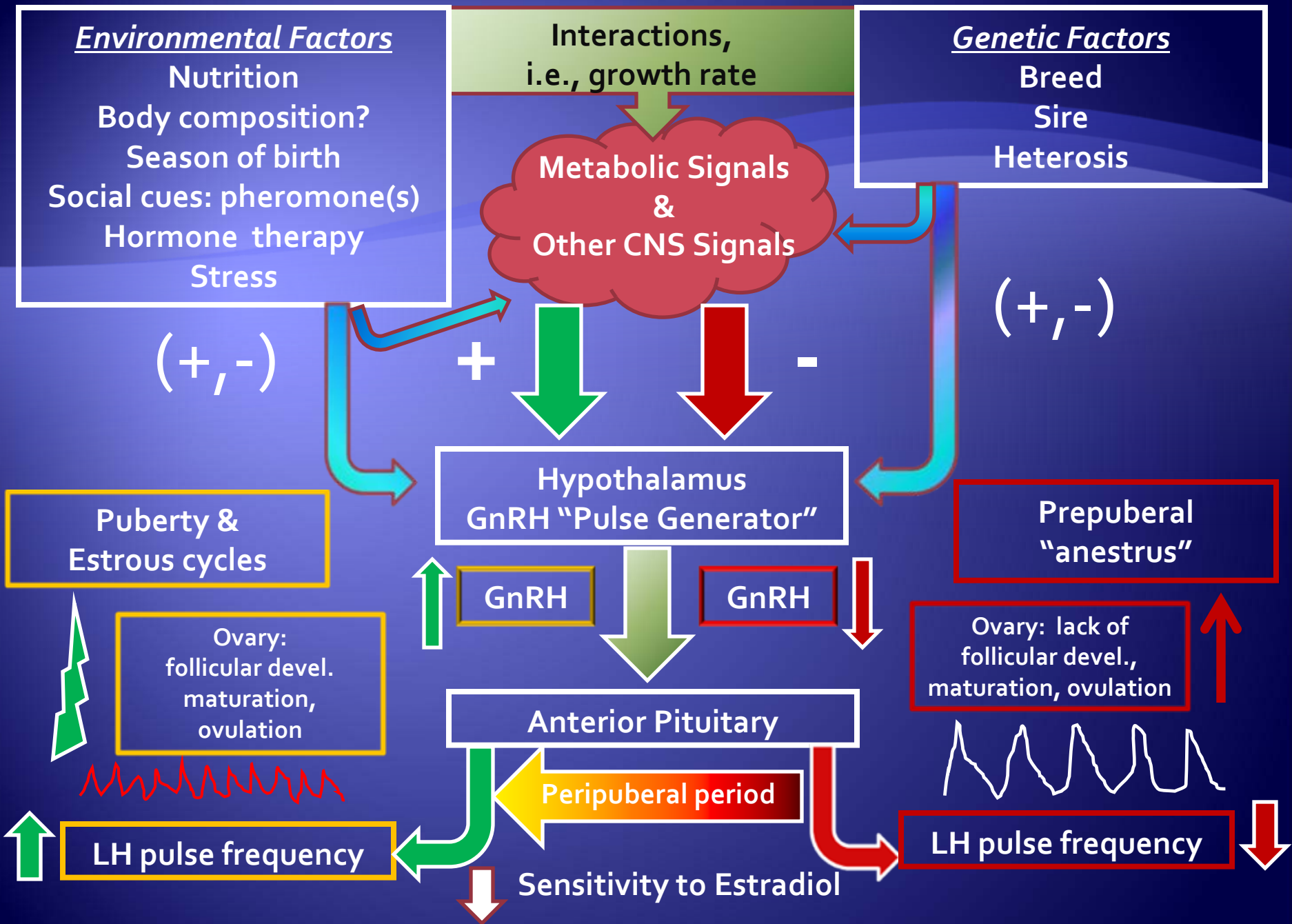
"Basics" of System: Cycling vs. Anestrus



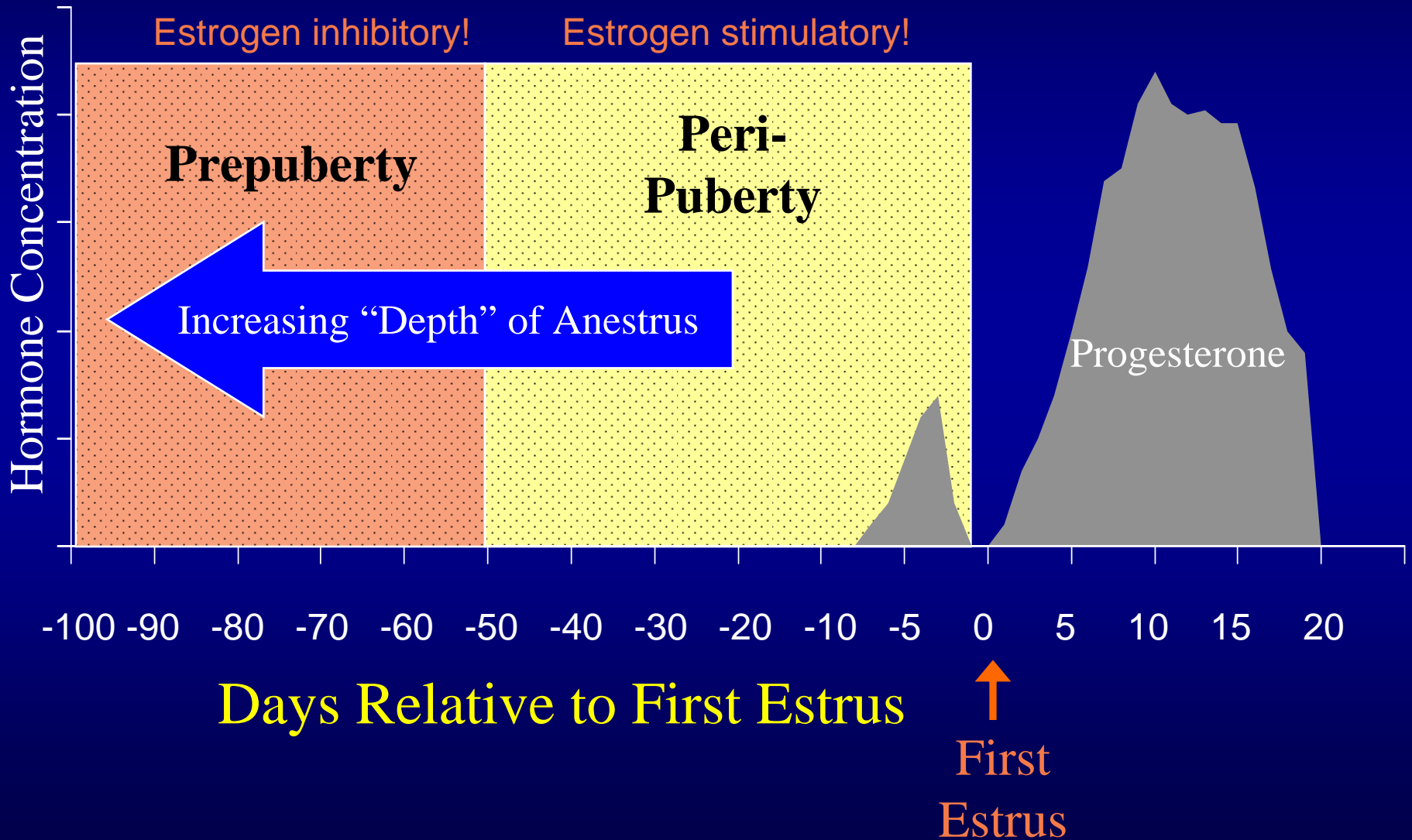


Puberty

- Puberty is the occurrence of estrus and ovulation followed by the formation of a CL that leads to an estrous cycle of normal length.
- To **MAXIMIZE** fertility, heifers need to reach puberty by 12-13 months of age.



“Depth” of Puberty in Heifers



Summary

- Anestrus is the major factor regulating reproductive efficiency.
- Induction of estrus in anestrus cows is essential to maintaining a high reproductive rate.
- Estrus synchronization protocols for anestrus females **MUST** include a progestin (CIDR, MGA, or GnRH).
- **Bottom Line: Adequate nutrition will solve a high percentage of anestrus problems – both cows and heifers**