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University of Idaho
AVS 222 (Instructor: Dr. Amin Ahmadzadeh)

THE ONSET OF PUBERTY

Chapter 6

Puberty is defined in both the male and female as ***the ability to accomplish reproduction successfully (acquiring reproductive competence).***

I. Definitions of Puberty in the Female

A**. Age at first estrus**

- Visual signs of sexual receptivity
- *May not reflect acquisition of full reproductive capability*

B**. Age at first ovulation**

C. **Age at which females can support pregnancy**

- Acquisition of a proper body size (*adipose tissue*), body composition, and metabolic status
- It is important from management point of view **i**n farm animals

II. Definitions of Puberty in the Male

A. Age at first sexual behavioral activities

- Mounting and erection (*Not sperm production yet*)

B. Age at first ejaculation

- Development of muscles, nerves, accessory glands

C. Age at first ejaculation with spermatozoa

D. Age when the ejaculate contains enough sperm cells to accomplish fertilization

III. Age of Puberty

Species	Male	Female
Bovine	11 Mo (7-18)	11 Mo (9-24)
Ovine	7 Mo (6-9)	7 Mo (4-14)
Porcine	7 Mo (5-8)	6 Mo (5-7)
Equine	14 Mo (10-24)	14 Mo (12-19)

Adapted from Dr. Senger

IV. The Key to Initiation of Puberty (Figures 6-3 & 6-4)

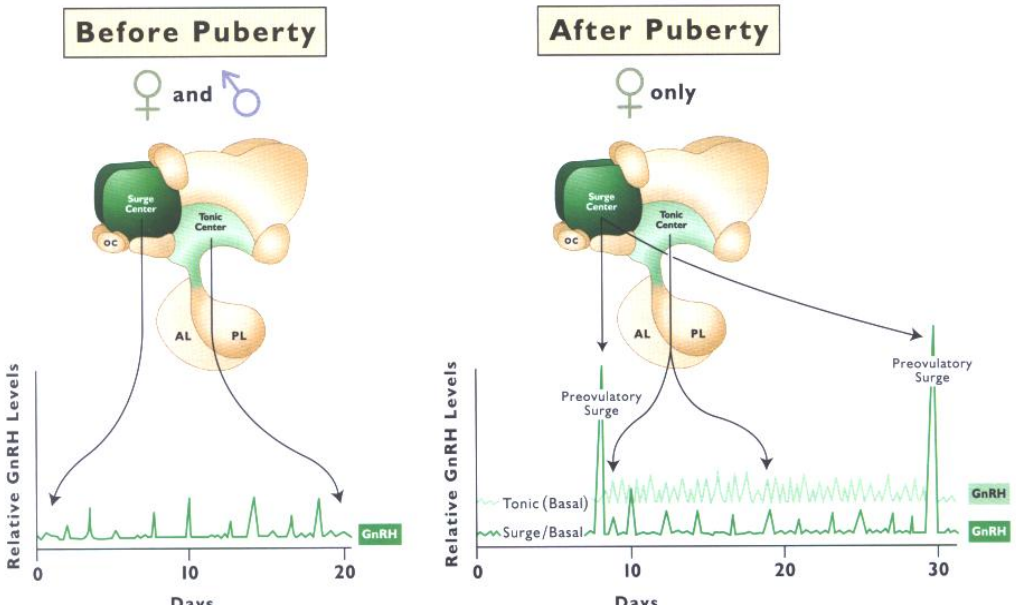
A. Prepubertal Period

- Females have **low ovarian estradiol** and **high hypothalamic sensitivity to estradiol negative feedback**
- Low negative feedback to estradiol results in **low frequency GnRH pulses**

B. Pubertal Period

- **Decreased sensitivity to gonadal estradiol**
- Release of **GnRH in high frequency pulses and high amplitude** from hypothalamic neurons
- High GnRH secretion and thus **increased LH and FSH release** for initiation of **follicular growth in the female** or **initiation of spermatogenesis in the male**
- **High GnRH pulses and amplitudes needed for preovulatory LH surges DO NOT occur unless hypothalamic sensitivity to gonadal estradiol DECREASES.**

Figure 6-3. Changes in Hypothalamic Secretion of GnRH Before and After Puberty



Remember these facts:

A. Before puberty: Release of GnRH in high frequency pulses and high amplitude from hypothalamic neurons is very low due to high sensitivity of hypothalamus to gonadal estradiol

B. Fact: High LH pulses and amplitudes and thus preovulatory LH surges do not occur unless hypothalamic sensitivity to gonadal estradiol decreases

C. During puberty: High GnRH secretion (due to decreased sensitivity to gonadal estradiol) and thus LH and FSH release for initiation of follicular growth in the female or initiation of spermatogenesis in the male

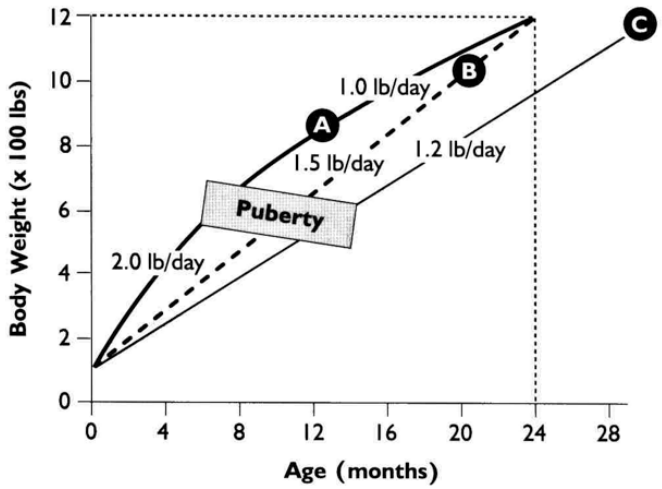
V. Factors Impacting the Development of Hypothalamic GnRH neurons

A. Genetics and Breed (see table 6-2)

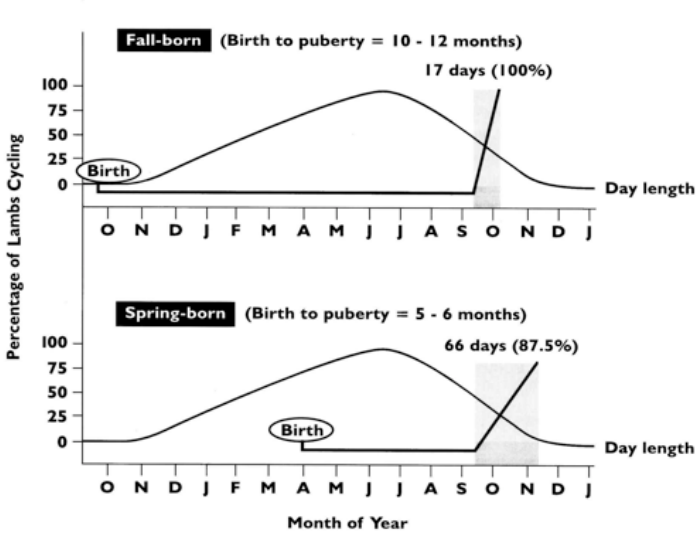
Species	Average Age at Puberty (Months)	
	Female	Male
Cattle		
Holstein	8.5	9.0
Brown Swiss	11.6	8.8
Angus	12.4	9.8
Hereford	13.0	10.8
Brahman	19.0	17.0
Swine		
Meishan	3.1	3.0
Large White	6.3	5.8
Yorkshire	7.0	6.5
Sheep		
Rambouillet	9.2	
Finnish Landrace	8.6	

B. Body Size and Composition

- Degree of fatness and body weight (see figure 6-6)
  - Body growth, shifts in nutrient requirements, and energy balance send metabolic signals
- Metabolic signals (see figure 6-5 and 6-7)
  - **Insulin, Glucose, and Fatty acids** may influence GnRH neurons activity



C. Environmental factors

- Season/Photoperiod **(Long-day or short-day length i.e Sheep/Goats & Horses)**
- Presence of the opposite sex AND social interaction (see figure 6-8 & 6-9)

Seasonality and Puberty: