

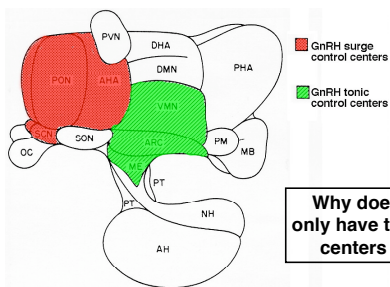
Animal Science 434

Lecture 8: The Onset of Puberty

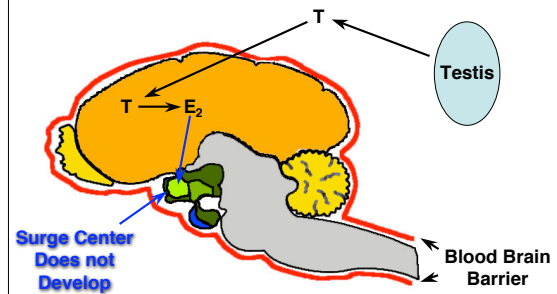
Development of Hypothalamus and GnRH Release Centers

Males and Females are Different!!!

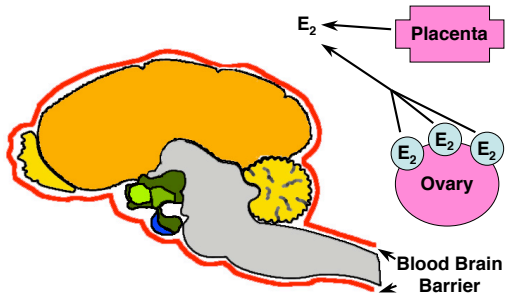
Hypothalamus GnRH Control Centers in the Female



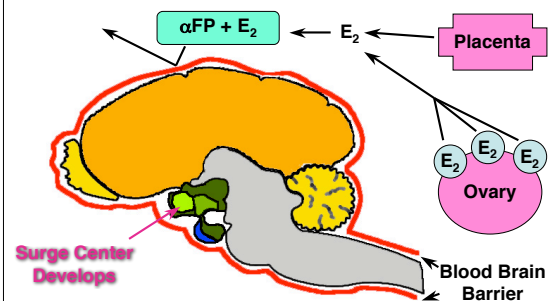
Male Brain Development



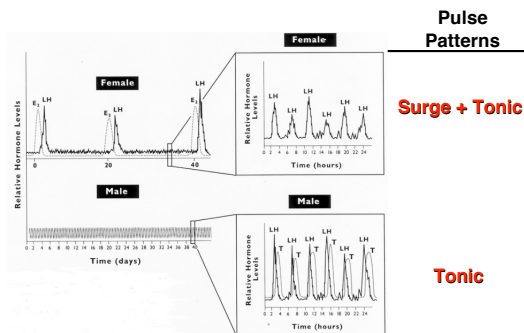
Female Brain Development



Female Brain Development



Fundamental Male and Female Differences



Puberty

The ability to accomplish reproduction successfully.

Puberty in the Female

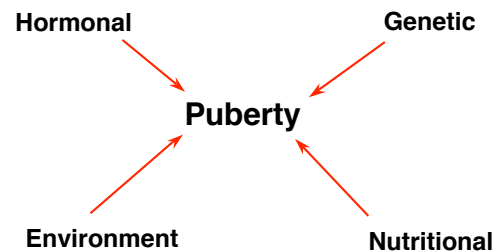
- Age at first estrus (heat)
- Age at first ovulation
- Age at which the female can support pregnancy

Puberty in the Male

- Age when behavioral traits are expressed
- Age at first ejaculation
- Age when sperm first appear in the ejaculate
- Age when sperm first appear in the urine
- Age when the ejaculate contains a threshold number of sperm

Average Age of Puberty (Range)

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)	18 mo (12-19)
Human	13 yr	12 yr
Canine	9 mo (5 - 12)	12 mo (6 - 24)
Feline	9 mo (8 - 10)	8 mo (4 -12)



Hormonal

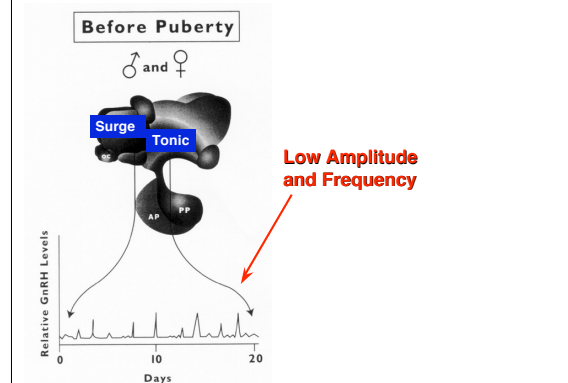
Role of GnRH Pulses

GnRH Pulses Determine Puberty

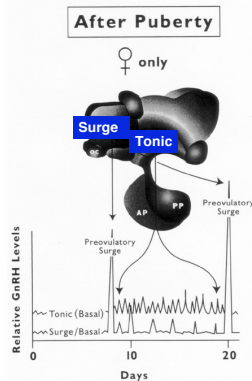
- **Prepubertal period**
 - » minimal GnRH release
 - » FSH and LH low
 - » minimal to no folliculogenesis or spermatogenesis
- **Puberty**
 - » increase in the pulse frequency and amplitude of GnRH release
 - » increase in FSH and LH pulses
 - » folliculogenesis and spermatogenesis occur

Hormonal Changes in the Female

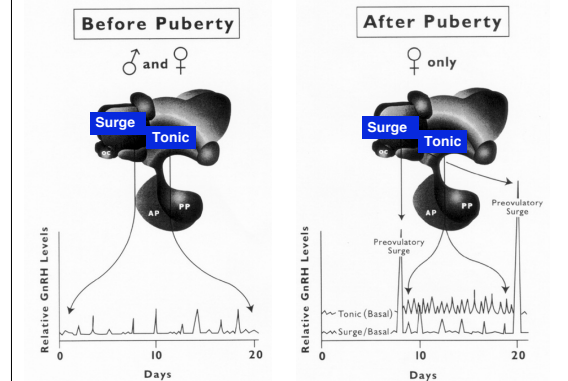
Changes in GnRH Secretion With Puberty

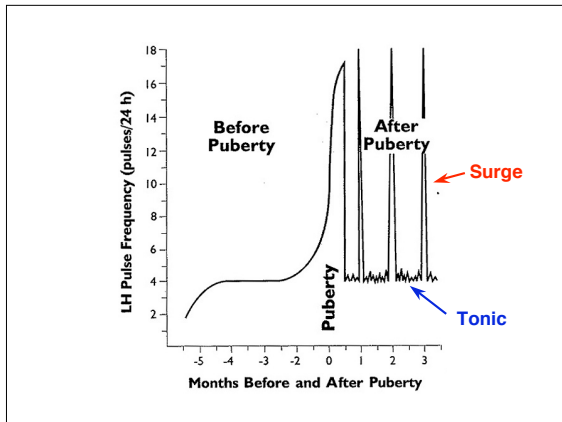


Changes in GnRH Secretion With Puberty



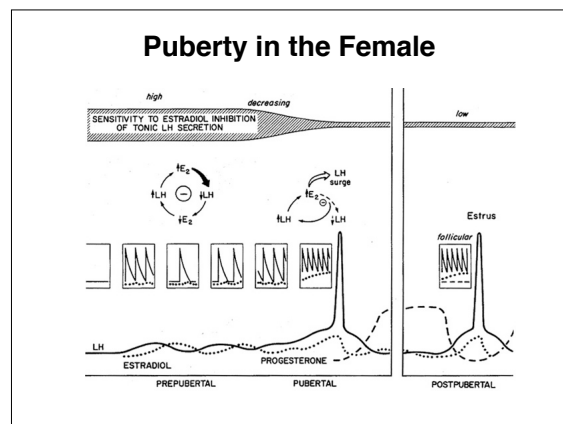
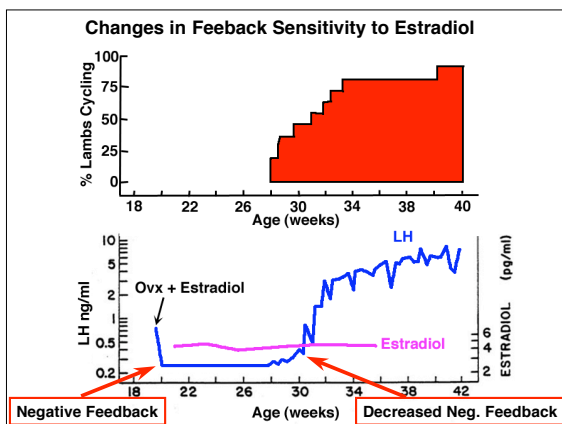
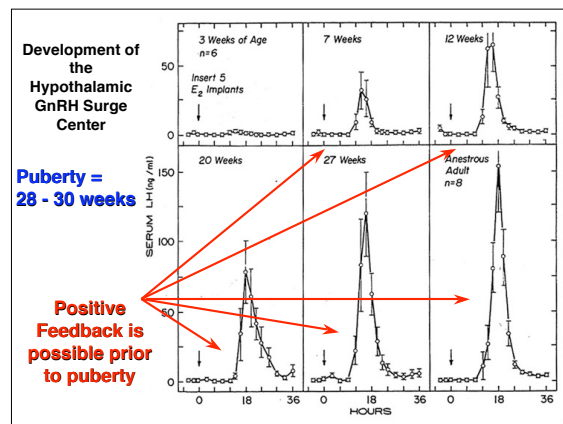
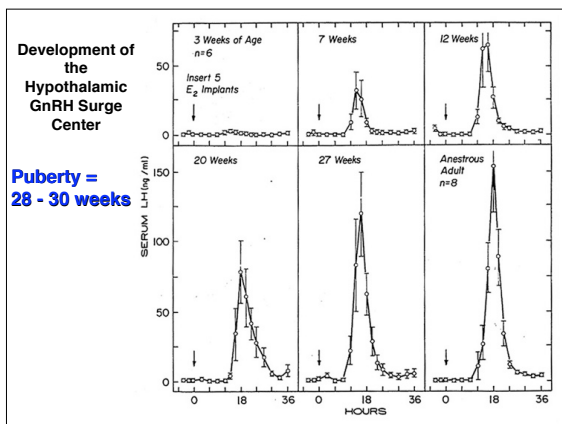
Changes in GnRH Secretion With Puberty



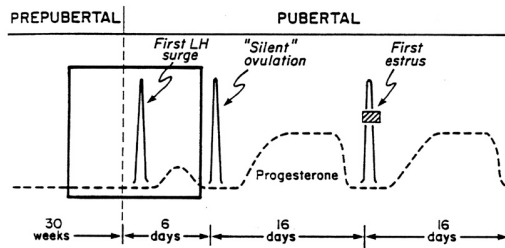


Potential Regulators of GnRH Pulses at Puberty

- Development of surge center
- Change in the feedback sensitivity to estradiol

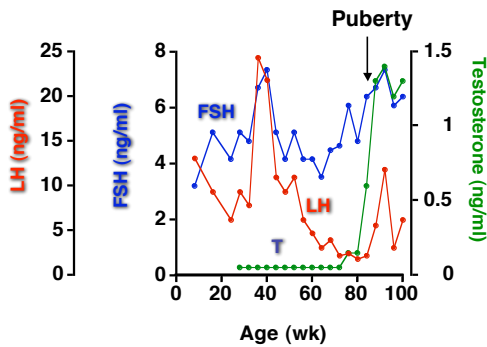


Silent Ovulation at Puberty



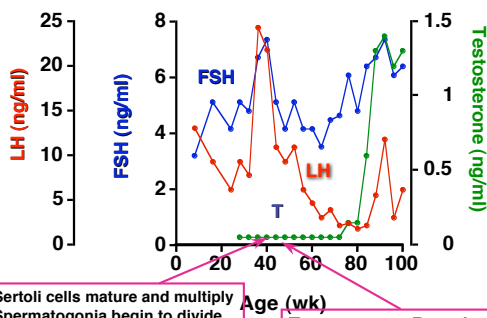
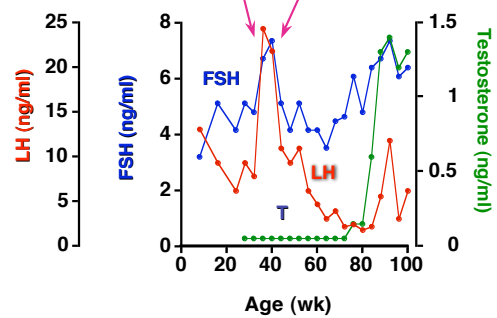
Hormonal Changes in the Male

Puberty in the Stallion



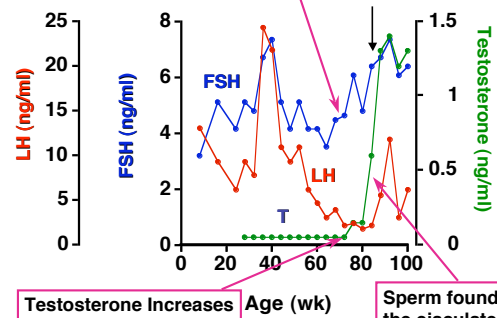
Increased Gonadotropins

Caused by ↑ GnRH



FSH Increases

Puberty



Genetics

Influence of Breed on Age of Puberty

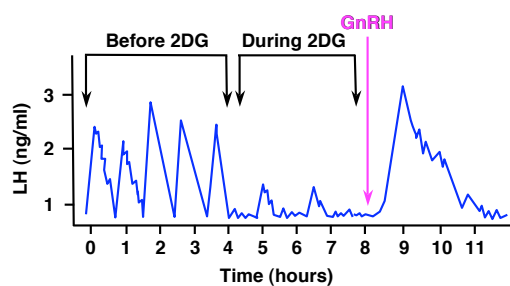
Species	Average Age at Puberty (Months)	
	Female	Male
Cattle		
Holstein	8.5	9.0
Brown Swiss	11.6	8.8
Angus	12.4	9.8
Hereford	13.0	10.8
Brahman	19.0	17.0
Swine		
Meishan	3.1	3.0
Large White	6.3	5.8
Yorkshire	7.0	6.5
Sheep		
Rambouillet	9.2	
Finish Landrace	8.6	

Nutrition

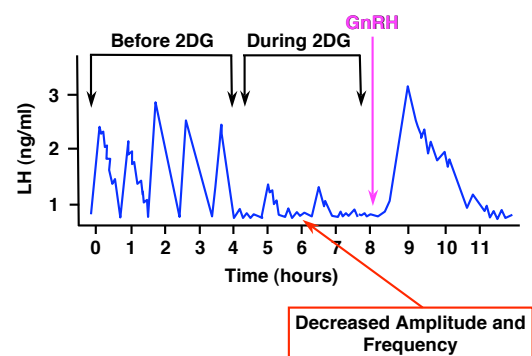
Availability of Energy Changes with Growth



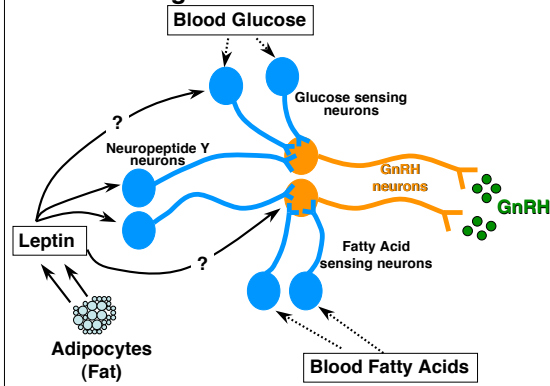
Effect of 2-deoxyglucose on LH Pulses



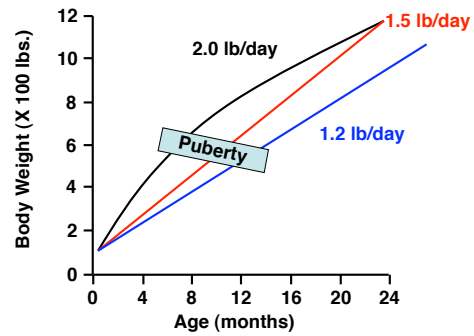
Effect of 2-deoxyglucose on LH Pulses



Metabolic Signals Influence GnRH Neurons



Effect of Nutrition on Puberty

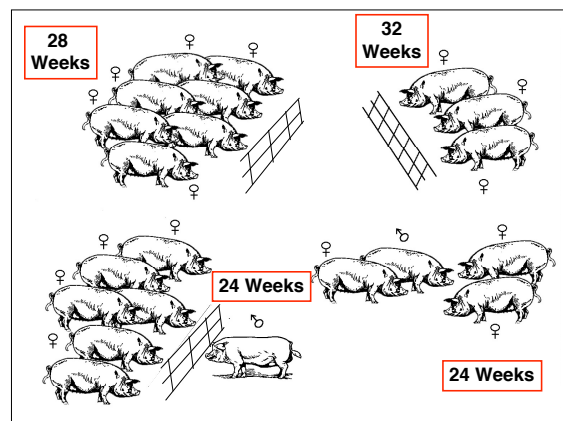


% Mature Weight at Puberty

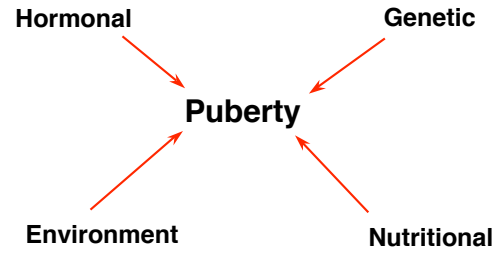
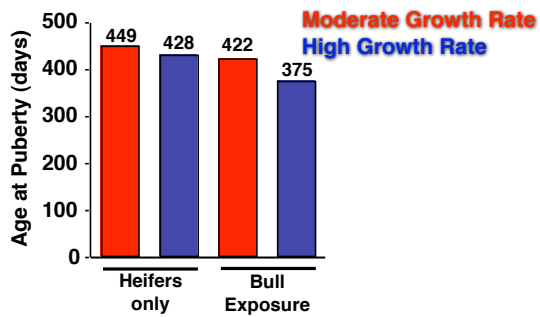
Dairy Cattle	30-40%
Beef cattle	55-65%
Sheep	40- 63%

Environmental and Social Conditions

Effect of the Number of Females Housed Together and Exposure to A Male



Influence of Growth Rate and Bull Exposure on Age of Puberty



Recommended Age to Breed

- Heifer 15 months (65% mature BW)
- Bull 15 natural mating, 12 months AI
- Filly 2-3 years
- Colt 2 years
- Boar 9 months