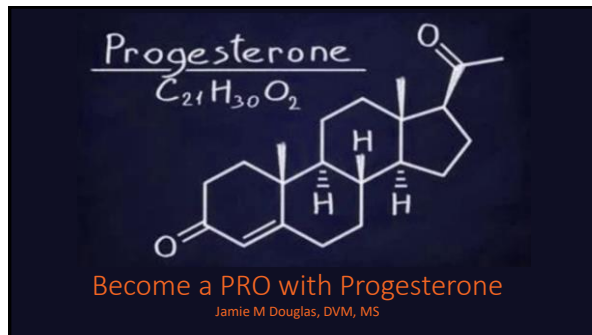
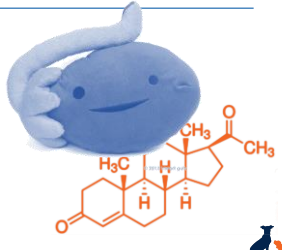




Overview

- **Introduction**
 - Characteristics
 - Canine Estrous Cycle
 - Breeding Management
- **Progesterone**
 - Profile
 - In Action
 - Practice
 - Tidbits
- **Questions**



Introduction Characteristics

- **The bitch:**
 - Monoestrous
 - Non-seasonal
 - Polytocous (litter-bearing)
 - Spontaneous ovulator
- Pubertal estrus occurs at 6-14 months
 - Positively correlated with breed size




Introduction Canine Estrous Cycle

- **Four stages:**
 - Proestrus
 - Estrus
 - Diestrus
 - Anestrus

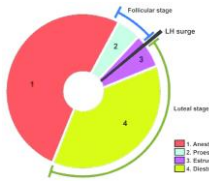


Figure: Carneiro et al. 2016



Introduction Canine Estrous Cycle

- **Four stages:**
 - **Proestrus**
 - 1st outward evidence of fertility
 - Serosanguinous discharge
 - Turgid vulvar swelling
 - "Coming into heat"
 - Length: 9 days (average)
 - Bitch will **not** permit mounting/breeding

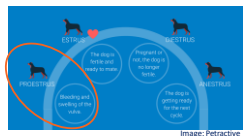


Image: Petrevious



Introduction Canine Estrous Cycle

- **Four stages:**
 - Proestrus
 - **Estrus**
 - Vulva softens
 - "Color change" of discharge
 - "In heat"
 - Length: 9 days (average)
 - Bitch **will** permit mounting/breeding

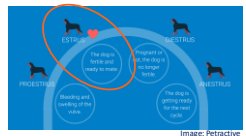


Image: Petrevious



Introduction

Canine Estrous Cycle

- Four stages:
 - Proestrus
 - Estrus
 - Diestrus
 - "Out of heat"
 - Length:
 - 63 +/- 1 day from ovulation, if pregnant
 - 49 to 79 days from ovulation, if not pregnant
 - Bitch *no longer* permits mounting/breeding

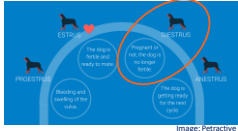


Image: Petactive

Introduction

Canine Estrous Cycle

- Four stages:
 - Proestrus
 - Estrus
 - Diestrus
 - Anestrus
 - Reproductive *quiescence*
 - Length: 1 to 8 months
 - Bitch continues to *deny* any mounting/breeding
 - Late stage rise in estrogen (E2) primes brain and cycle starts *anew*

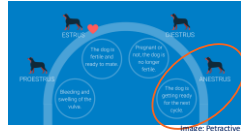
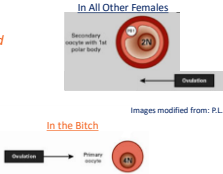


Image: Petactive

Introduction

Breeding Management

- Challenges:
 - Bitches ovulate *immature* oocytes
 - Proestrus and estrus are *prolonged*
 - Increasing *accuracy* needed
 - Limited access to ovaries



Images modified from: P.L. Senger 2013

Introduction

Breeding Management

We must *infer* what is happening via

↓

PROGESTERONE



Profile:

Progesterone

- Steroid hormone
 - Produced by *corpus lutea* (CL) on ovary
 - CLs form at sites of *ovulation*
- "Hormone of pregnancy"
 - Closing of cervix
 - uterine contractility
 - uterine secretion
 - lactation



Photo: Attatoy 2019



Profile:

Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA
 - Dark/darker than A: < 3 ng/mL
 - Light/lighter than B: >10 ng/mL
 - Lighter than A, darker than B: 3-10 ng/mL

PREMATE 5	PREMATE 10
A 1 X 10 mL	A 1 X 10 mL
B 1 X 10 mL	B 1 X 10 mL

Read to scale (Low Standard)
Read to scale (High Standard)
Read to scale (High Standard)



Diagrams: Ovucheck® Premate 5 & 10



Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA



Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA



Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA



Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA



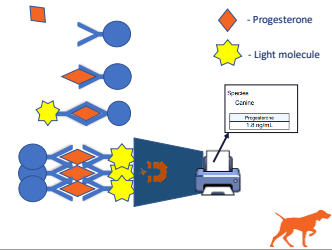
Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA
 - Quantitative
 - Definitive number
 - RIA
 - LC-MS
 - CLIA



Profile: Progesterone

- Available tests:
 - Qualitative
 - Subjective color
 - ELISA
 - Quantitative
 - Definitive number
 - RIA
 - LC-MS
 - CLIA



Profile: Progesterone

- Tips:
 - Calibration is necessary
 - What is the unit?
 - ng/mL
 - nmol/L
 - What is the highest the machine reads?
 - What is the techniques accuracy?
 - How long for test results?

ng/mL	nmol/L
1	3.18
2	6.36
4	12.72
10	31.8

Calculator: EndMemo.com



Profile: Progesterone

	P4 Concentration
Anestrus/Proestrus	< 1 ng/mL
LH Surge	~2 ng/mL
Ovulation	4-10 ng/mL
Ovulation complete	>10 ng/mL

Data: Johnston et al. 2001



Profile: Progesterone

	P4 Concentration
Anestrus/Proestrus	< 1 ng/mL
LH Surge	~2 ng/mL
Ovulation	4-10 ng/mL
Ovulation complete	>10 ng/mL

Change in 3 ng/mL

Data: Johnston et al. 2001



In Action: Progesterone

- Mapping
 - LH surge
 - 2 days later: Ovulation
 - 2 days later: Peak fertile window




In Action: Progesterone

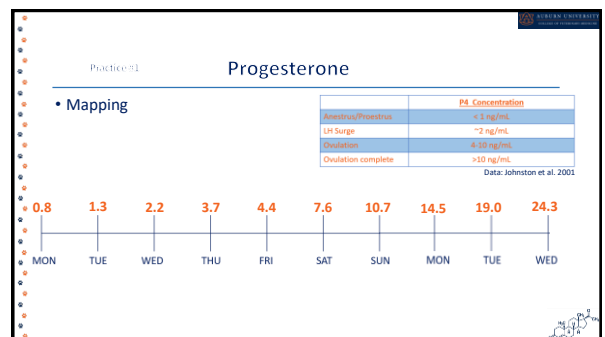
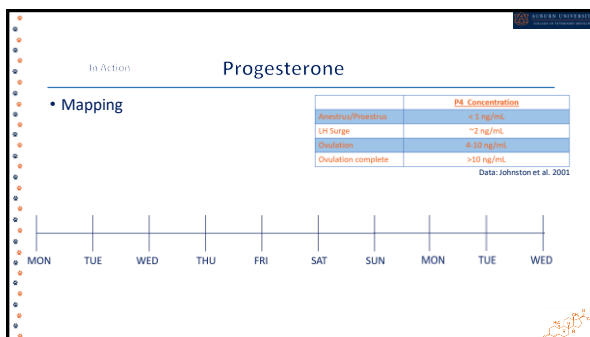
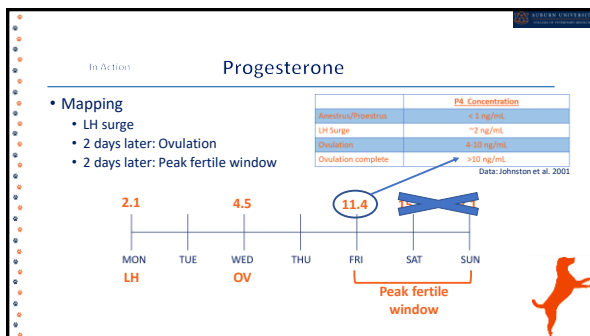
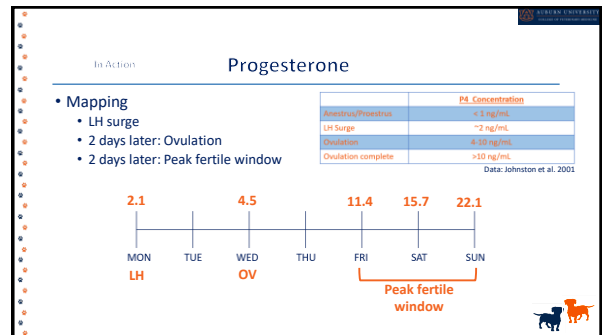
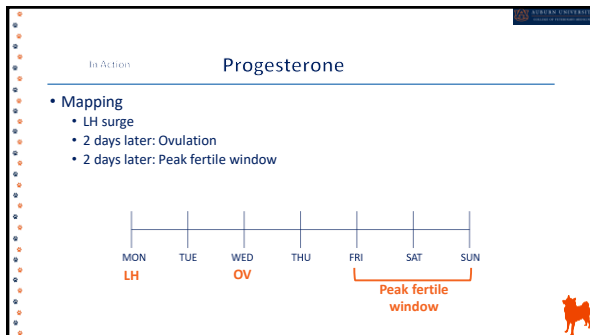
- Mapping
 - LH surge

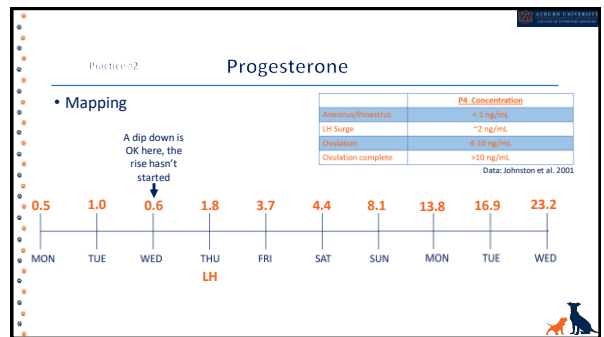
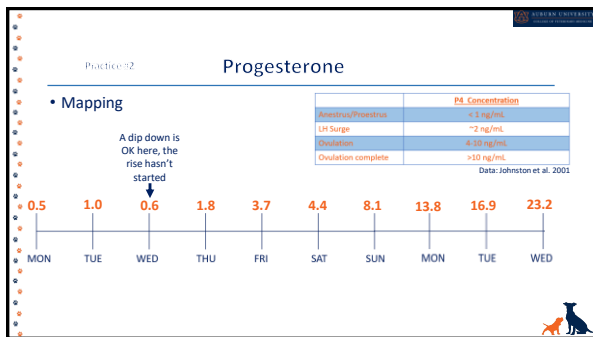
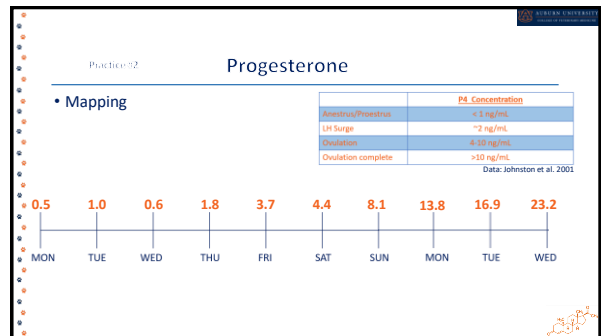
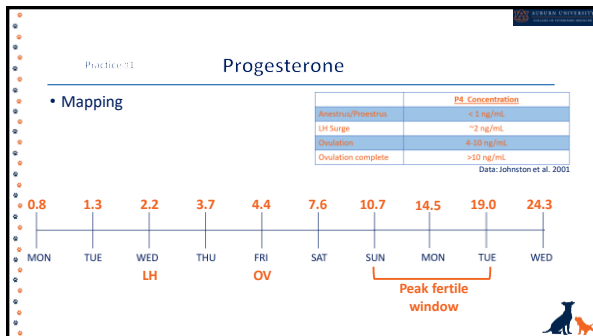
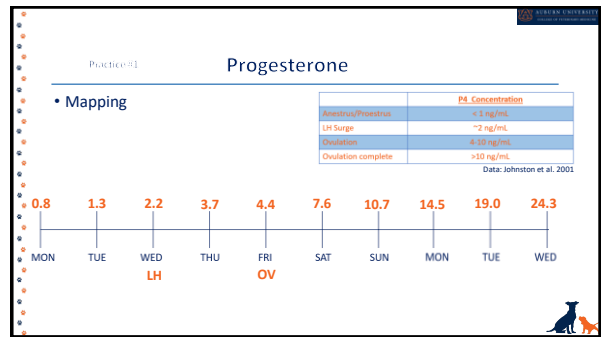
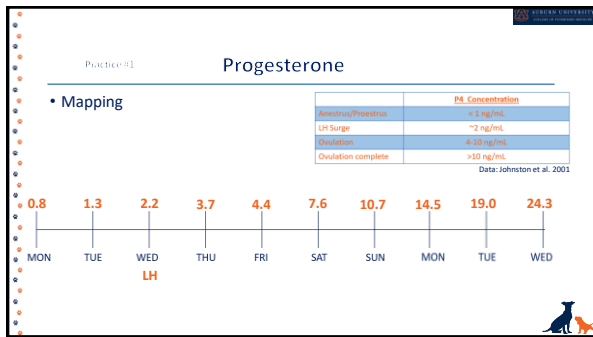


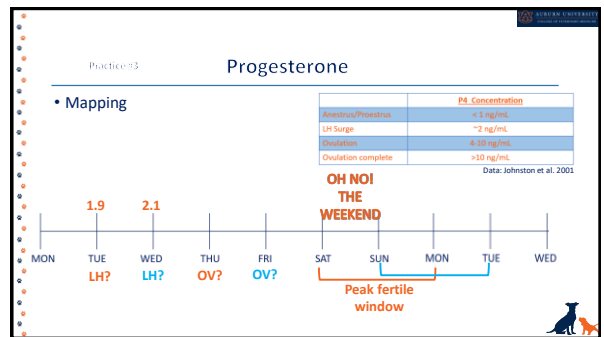
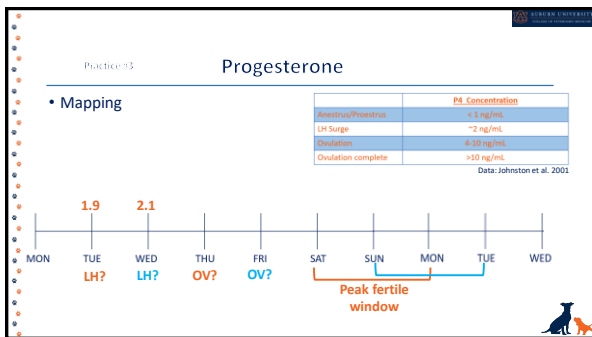
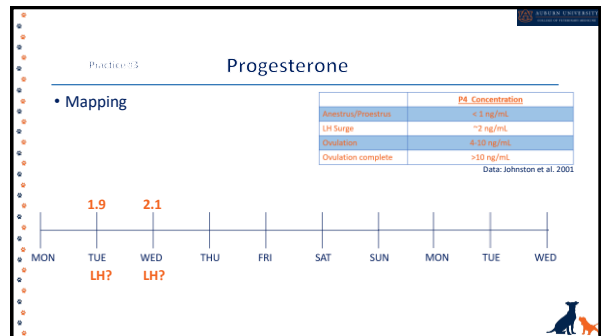
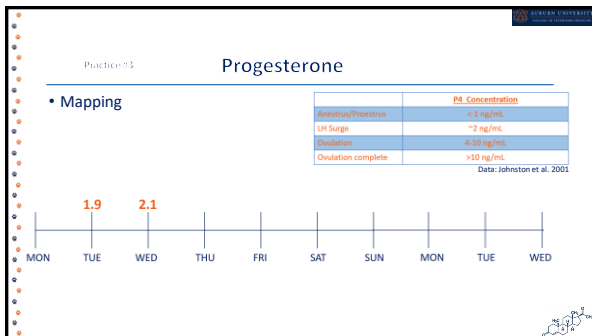
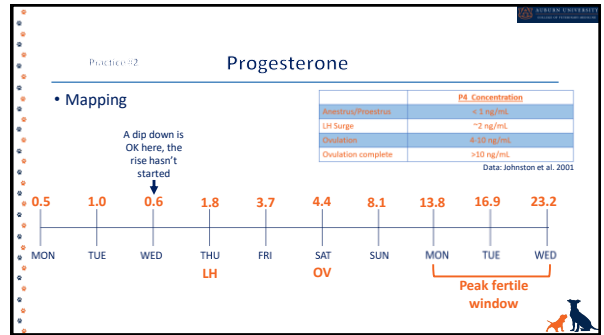
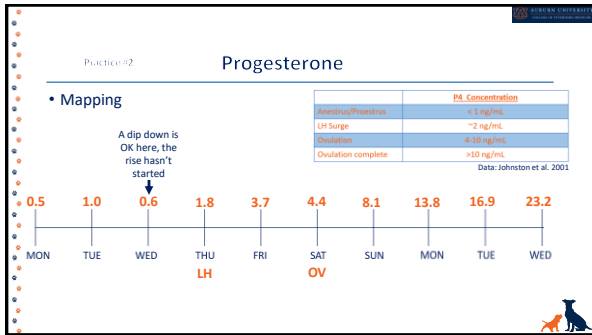

In Action: Progesterone

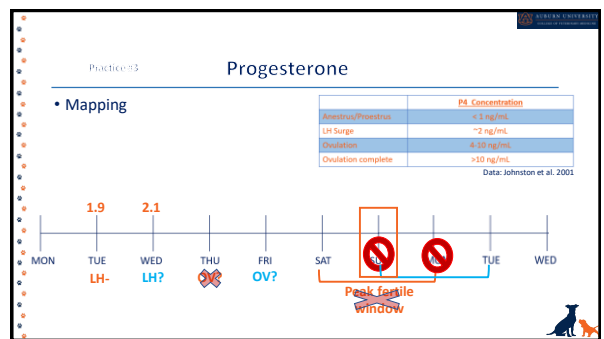
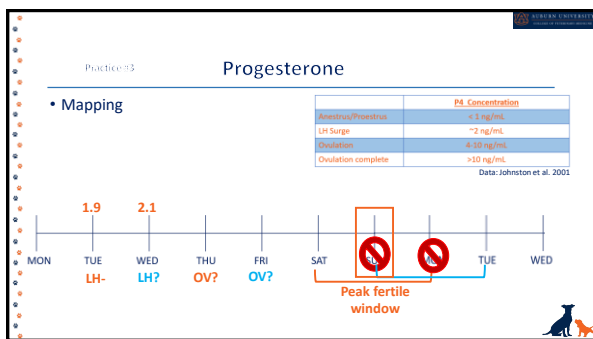
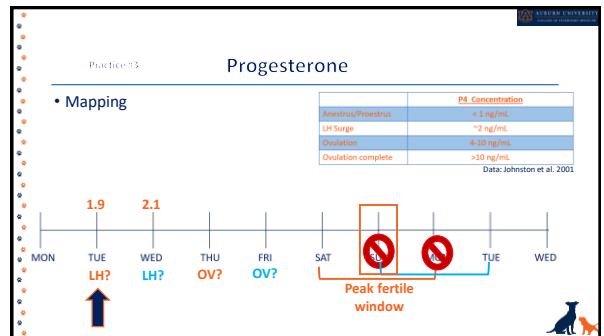
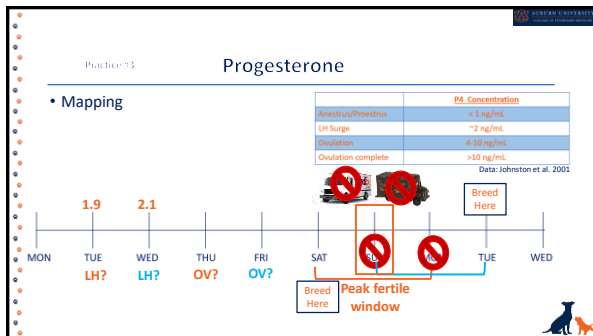
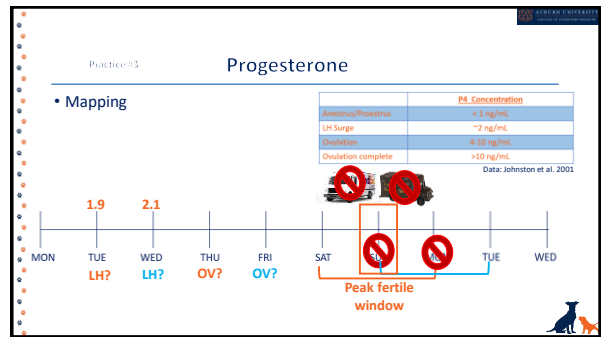
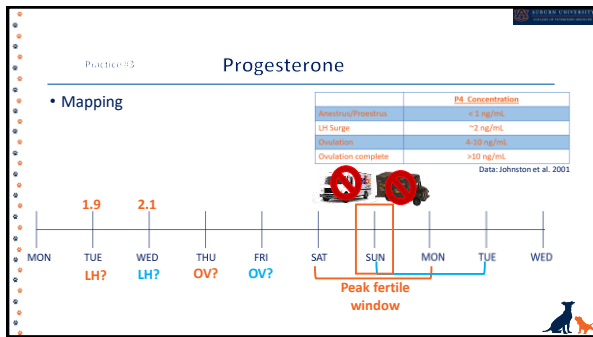
- Mapping
 - LH surge
 - 2 days later: Ovulation
 - Can be 3 in some dogs

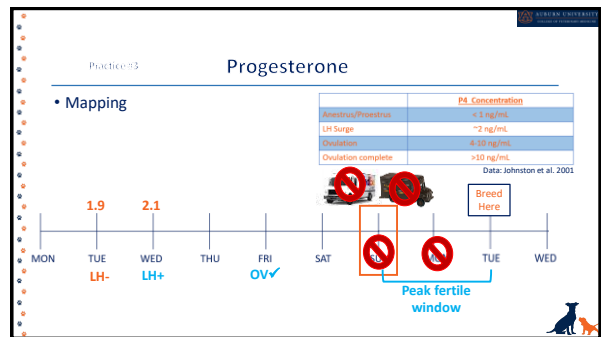
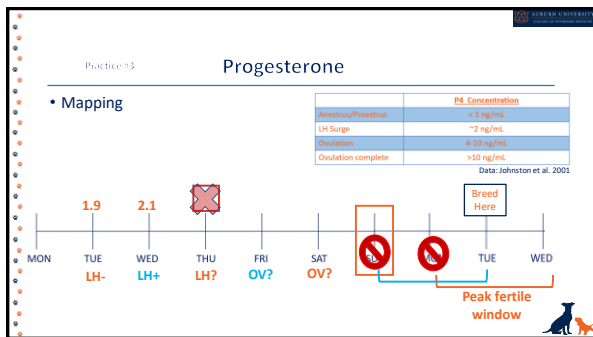
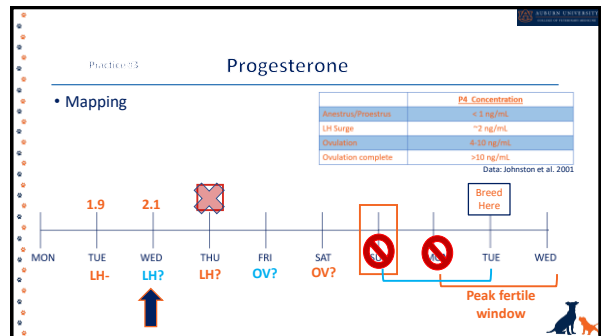
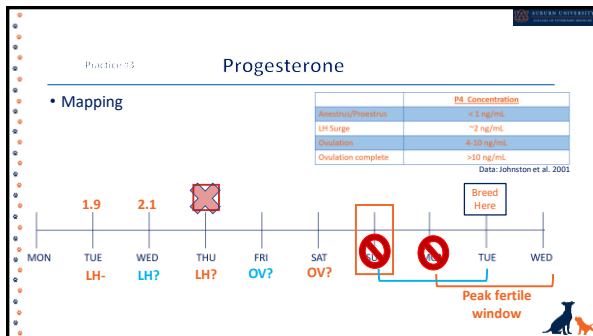
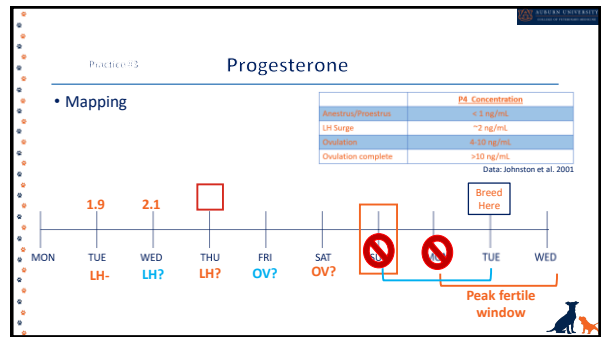
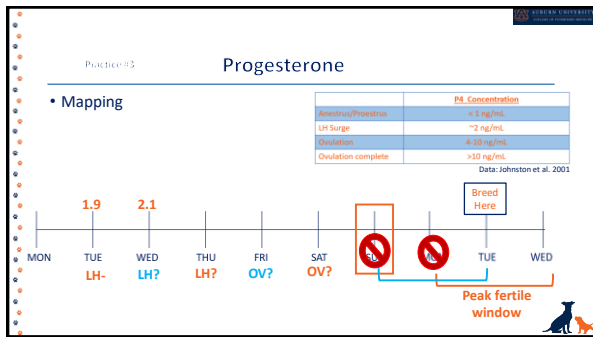


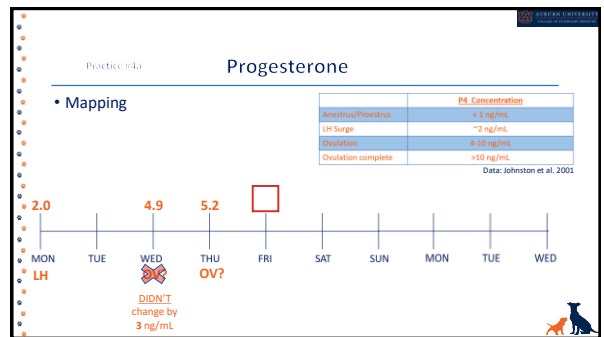
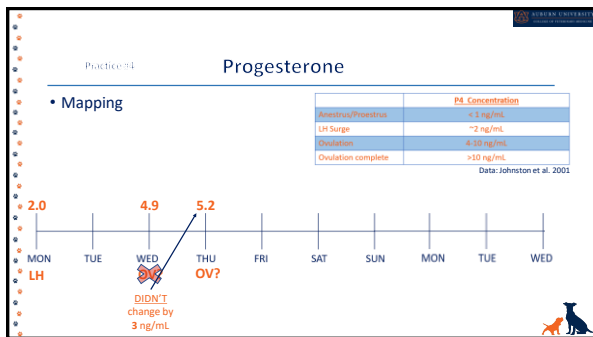
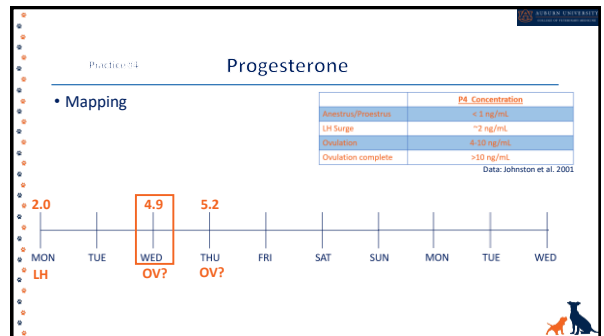
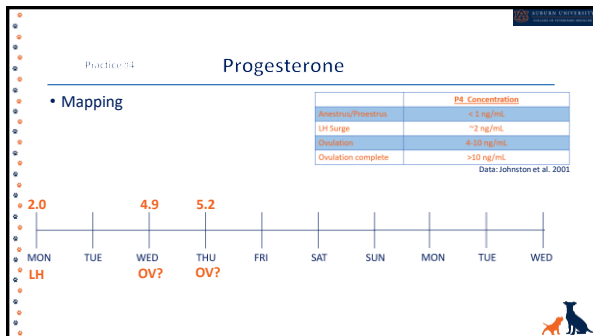
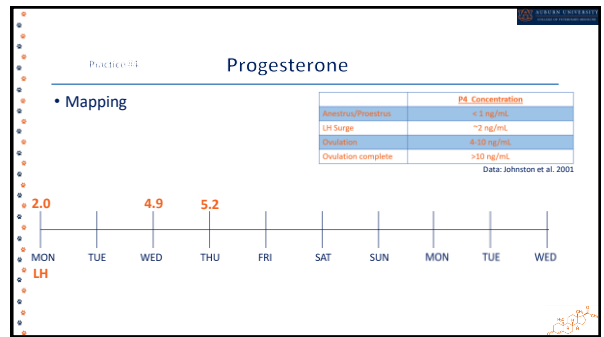
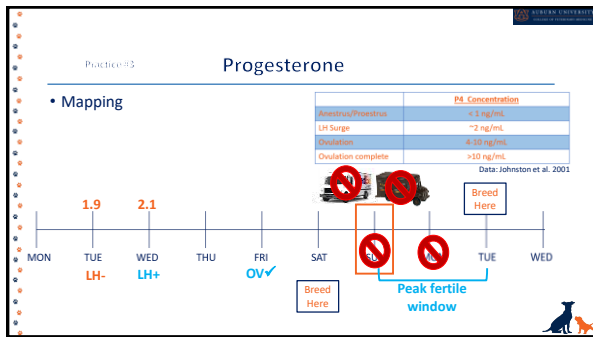



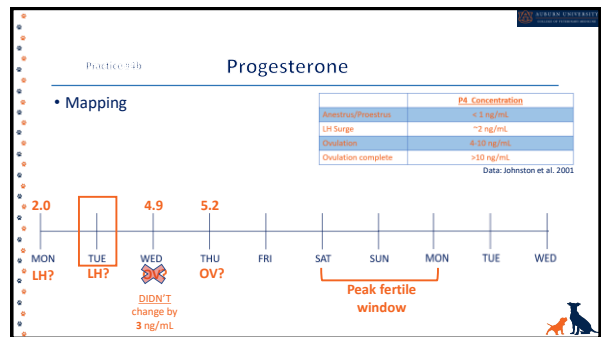
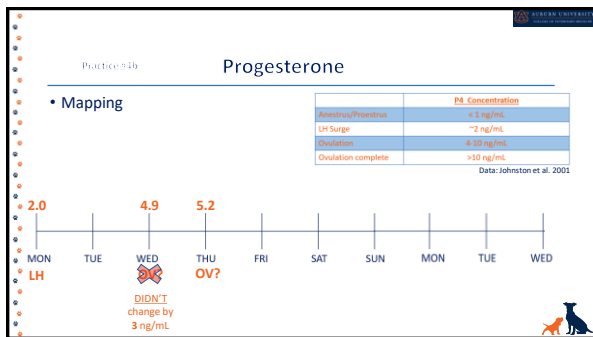
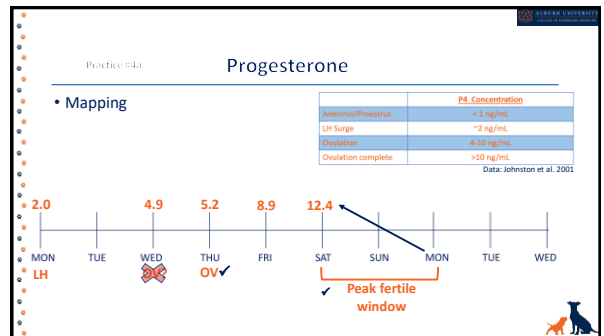
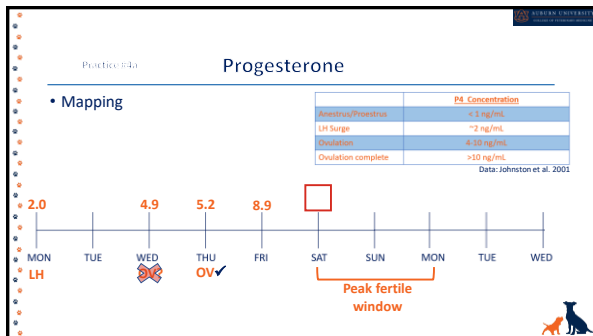
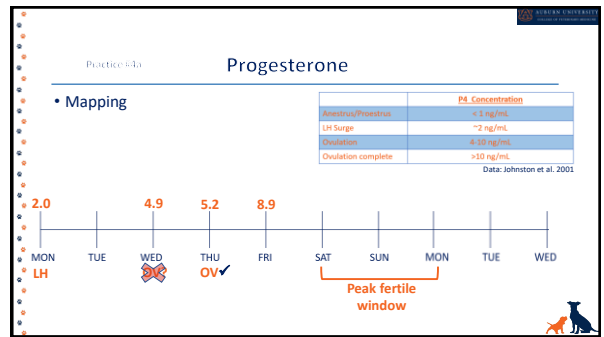
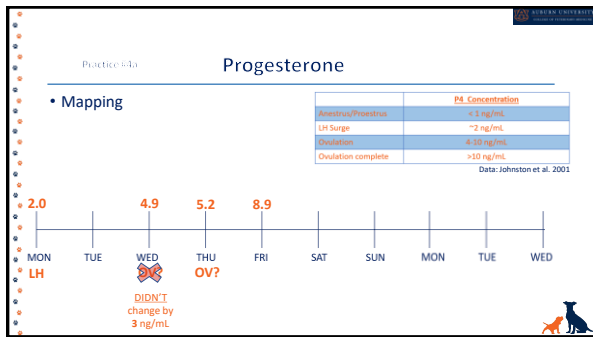


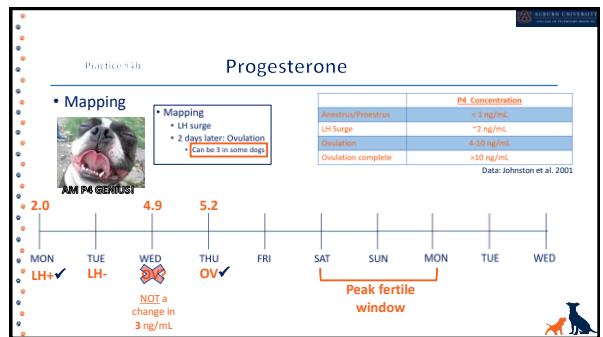
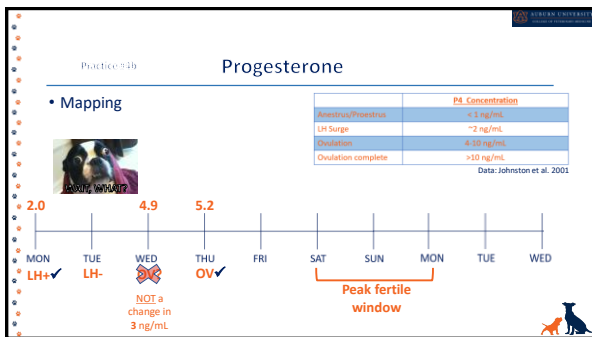
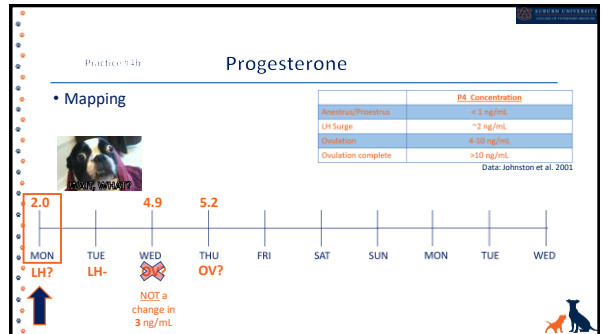
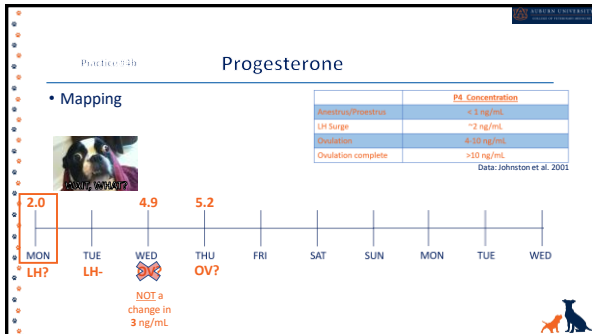
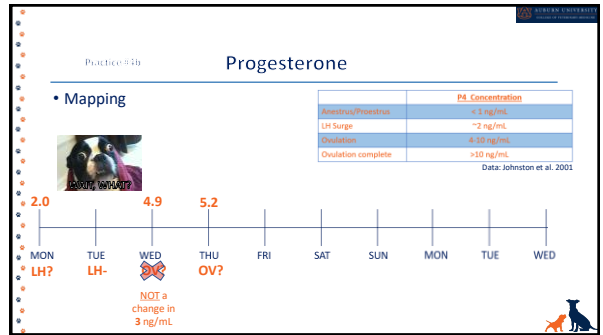
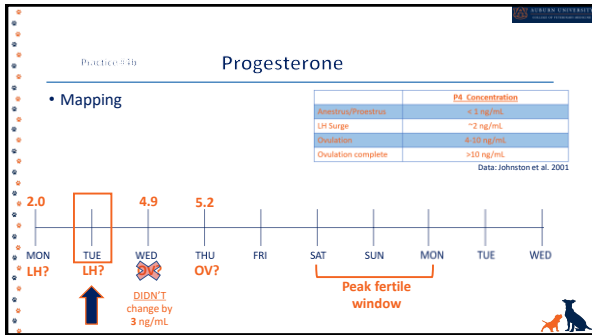


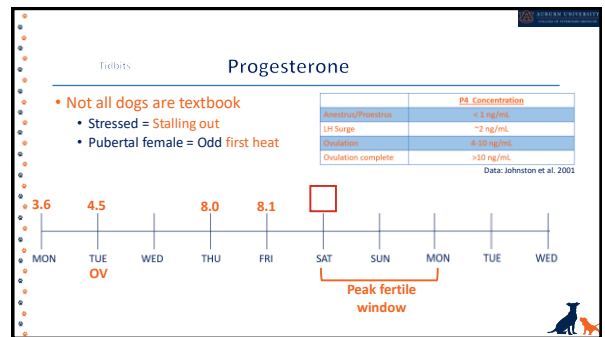
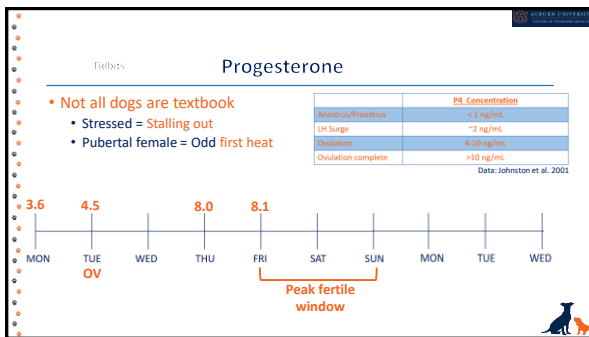
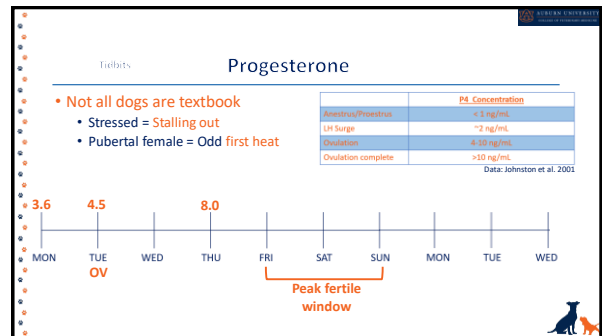
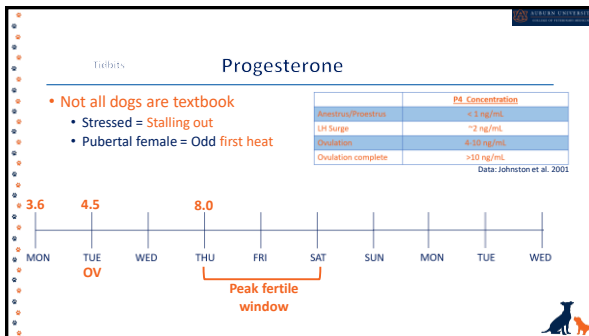
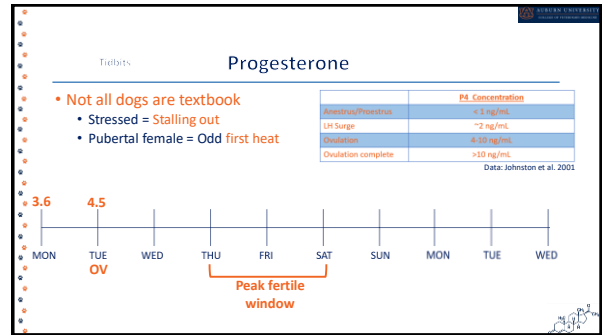
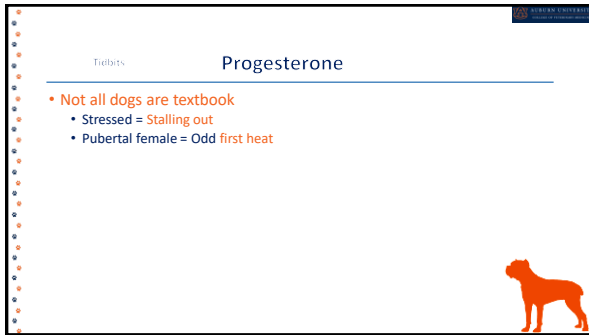


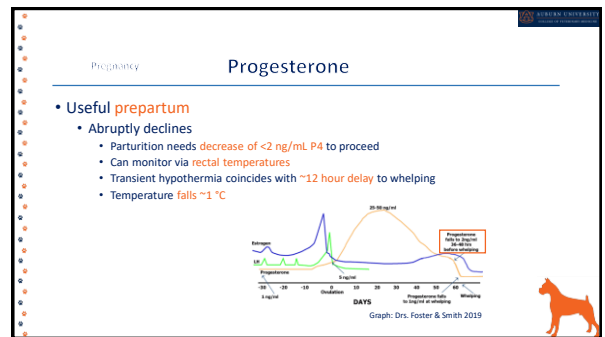
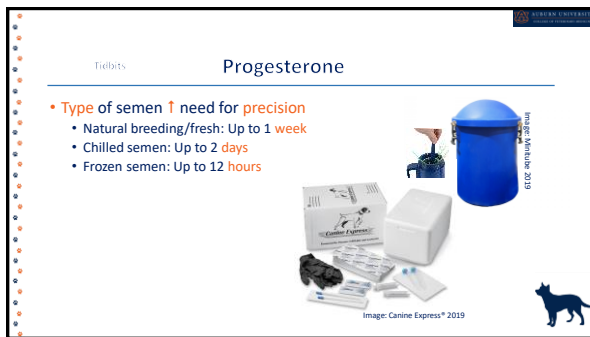
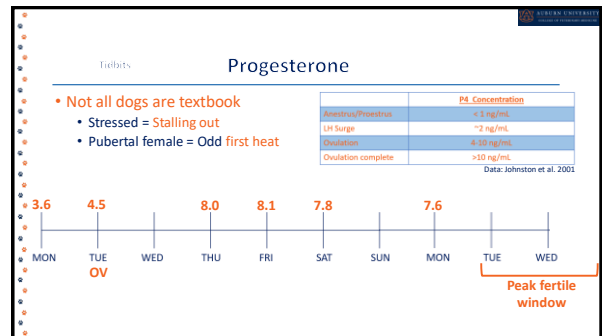
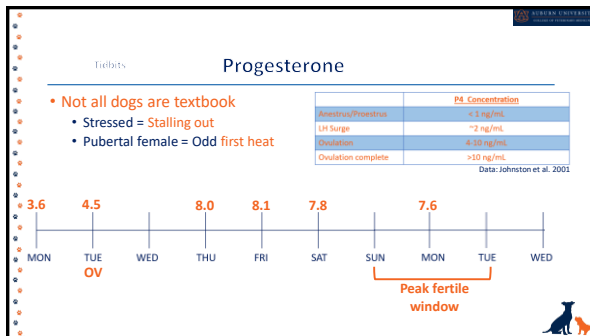
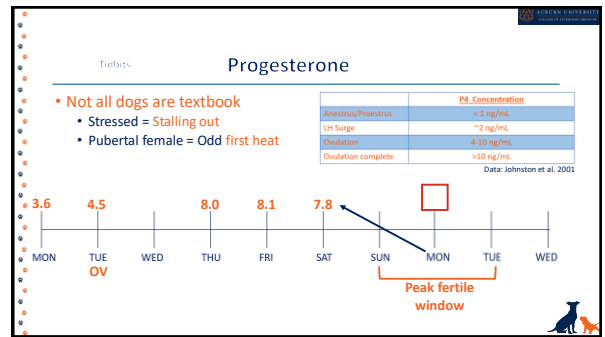
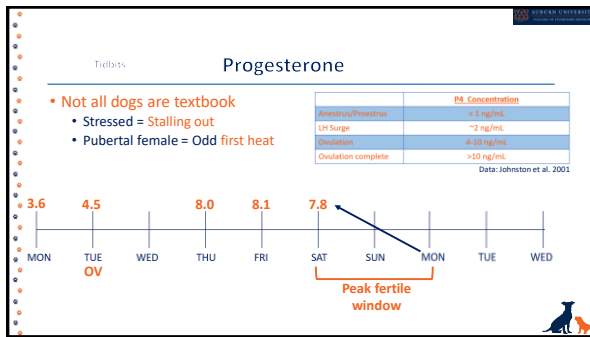












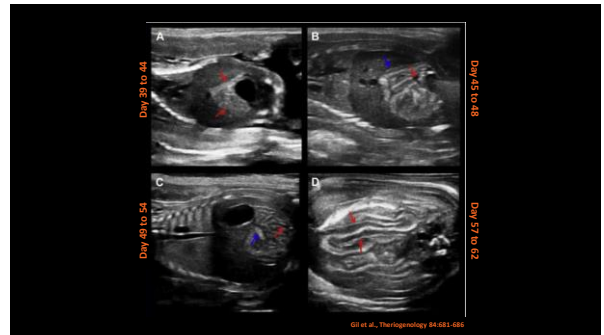
Pregnancy

Progesterone

- Predicting whelping by breeding event
 - With OV timing: 63 +/- 1 day
 - OR: 65 +/- 1 day from LH
 - Without OV timing: 57 to 72 days
 - When did she ovulate?
 - Just 2 days to early = poor puppy survival
 - Will require:
 - Multiple P4 measurements
 - Serial U/S assessment of fetal intestines

Event	Days to Parturition
LH Surge	65
Ovulation	63
Mating (Dogs)	57 to 72

Concannon et al., AVIM 44:1819-182
Jennmett & Evans, J Small Anim Pract 18:31-37

Conclusions

- Progesterone is useful for breeding management in the bitch
 - Takes practice
 - Requires blood collection (serum)
 - Dogs don't always follow the rules
- In general:
 - 2 + 2 + 2 (LH + 2 = OV + 2 = Day 1 - Fertile Window)
- P4 useful in the prepartum bitch
 - <2 ng/mL: whelping is soon!
 - Without OV: multiple P4 measure & serial ultrasound



Questions?

