DONKEY REPRODUCTIVE EXAMINATIONS

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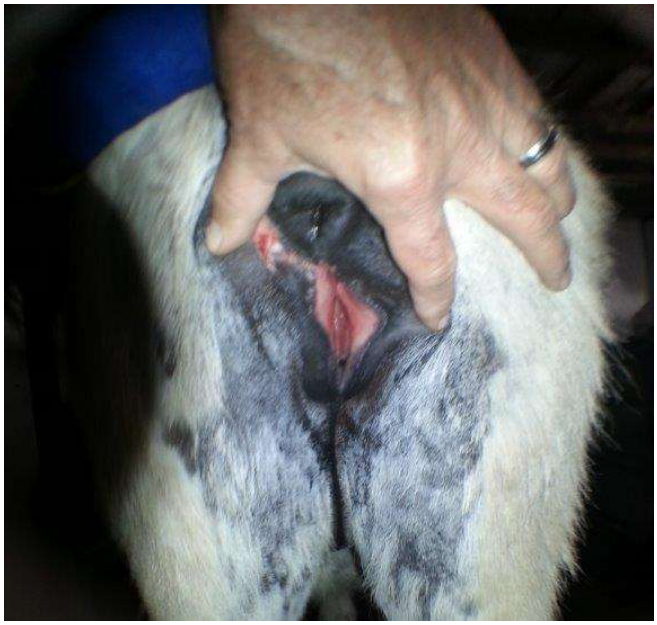
Female Reproductive Tract

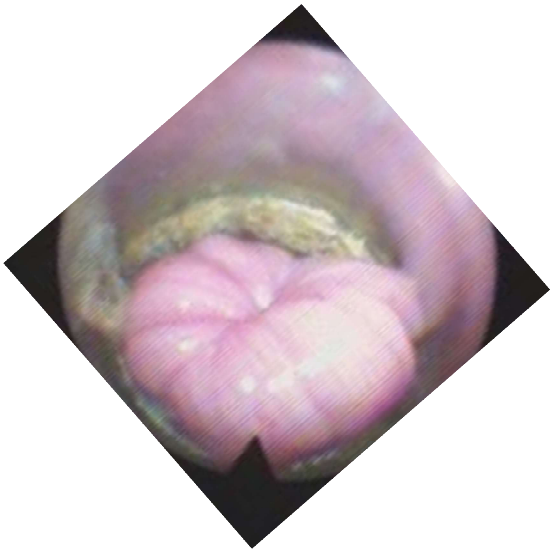
Vaginal Exam

- cardboard equine speculum or plastic heifer speculum with 6 inches removed



Closed Cervix (Diestrus)

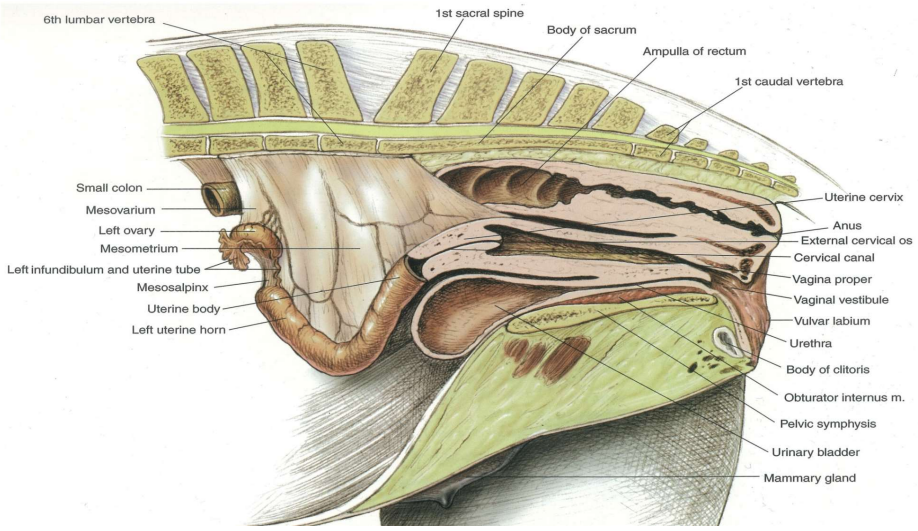
Relaxed Cervix (Estrus)



Pipette or culturette passage

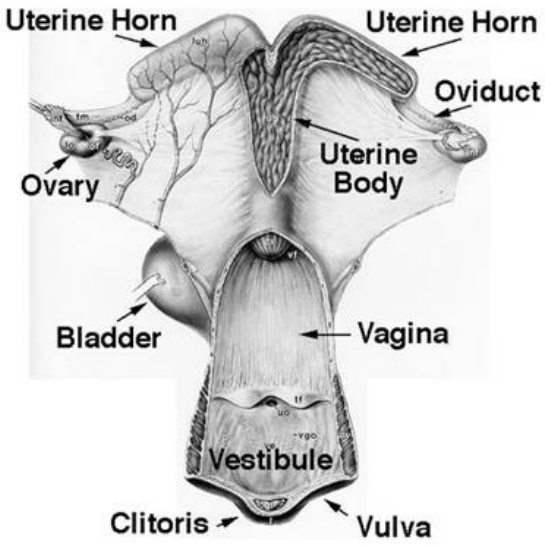
- difficult to pass through a narrow speculum and into the cervix because of its location in the vagina
- guide with a lubricated, gloved hand

Reproductive Ultrasound

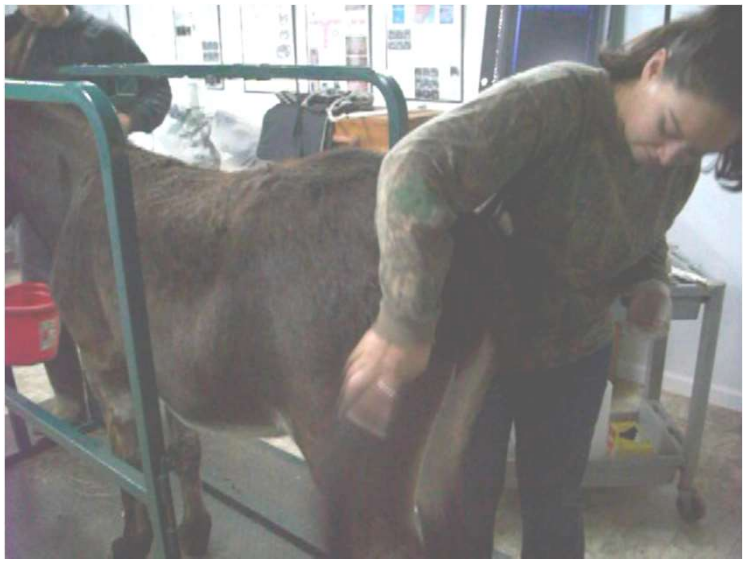


Spurgeon's Color Atlas

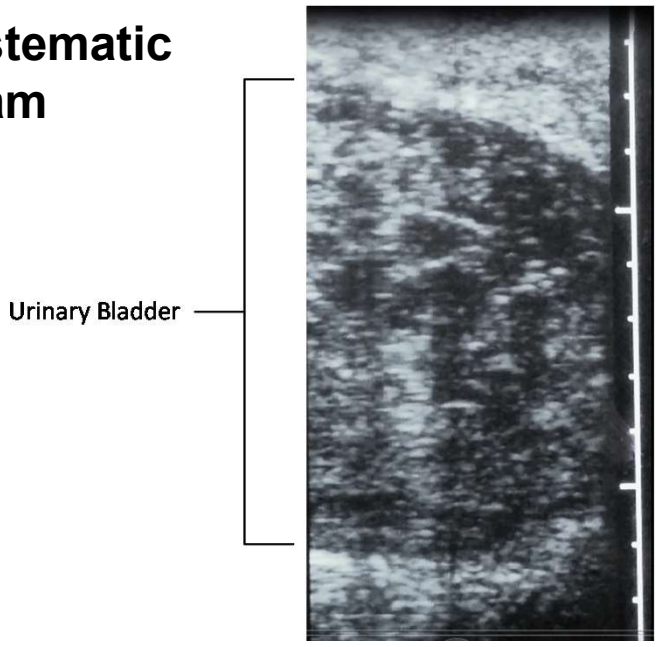
Equine Uterus



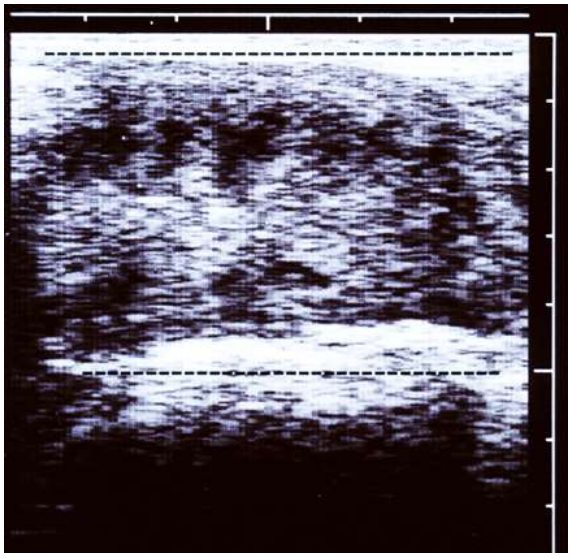
Transrectal US Technique

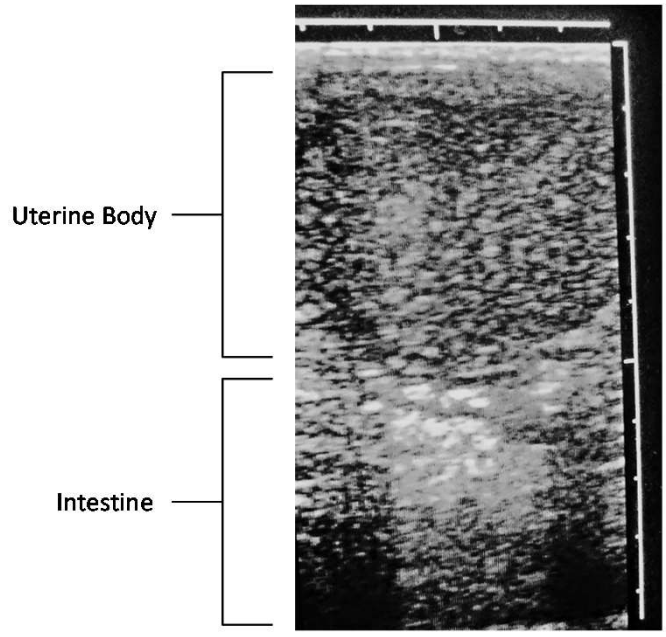


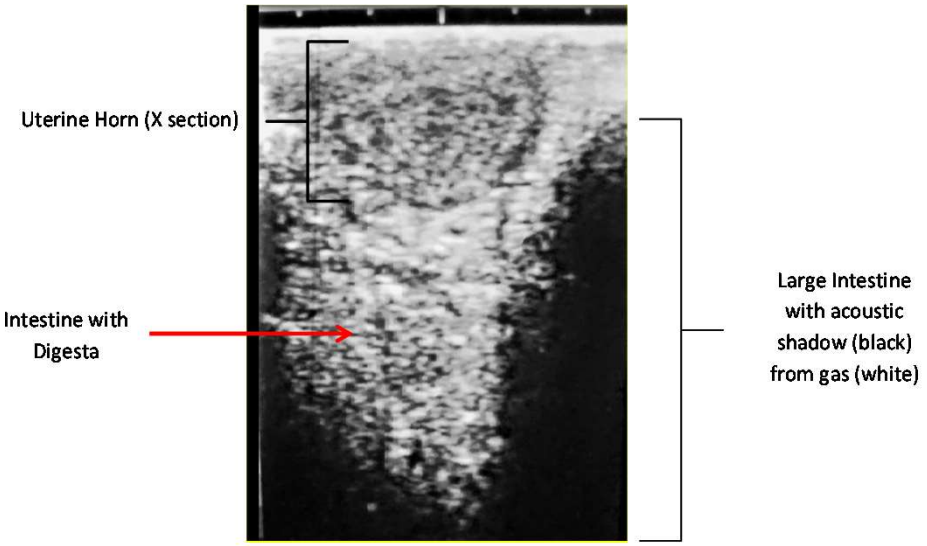
Systematic Exam



Uterine Body



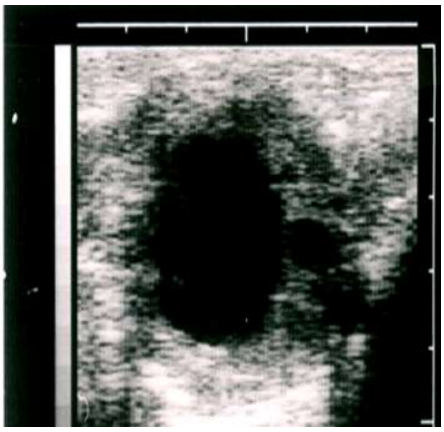




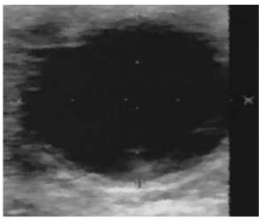
Ovarian Follicular Dynamics

- Usually one large follicle >> follicular dominance
- Multiple ovulations may >> twins
- Incidence in donkeys??
  - Natural reduction to singleton pregnancy?
- Follicles ≥ 25-30 mm capable of ovulation
- Ovulation near the end of behavioral estrus

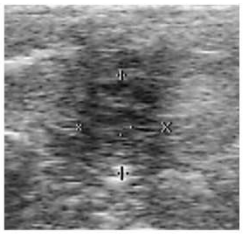
Estrus Ovaries



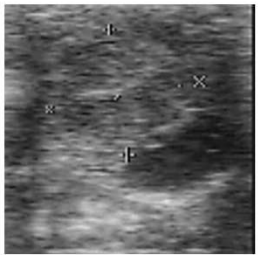
Progression of Ovulatory Structures



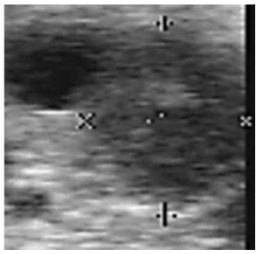
follicle



CH



CL

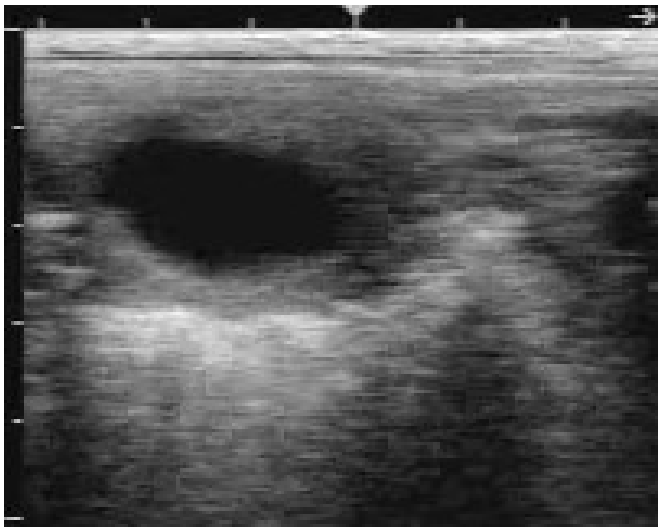


CA

Corpus Luteum (CL) Dynamics

- Characteristic US echogenicity- frequently (though not consistently) a bright echodense central line or round area in the mature CL.
- Mature CL diameter 20 to 25 mm- round
- Do not have cystic regions as is sometimes seen in the horse.
- in the case of non-pregnancy at 1-2 weeks after ovulation, the CL decreases in density and size, and a central echodense area becomes visible.
  - classified as a **corpus albicans** or “white body” which continues to decrease in size until it is no longer observable
  - generally visible for 0.5-1.5 weeks.

EV and CL



Uterine Contractility and Embryo Mobility

- Repeated contractions of the myometrium
- Contractility not uniform throughout the uterine horns and body
- May be easiest to observe in the body.
- **Ongoing study-** 6 miniature and standard donkeys
  - In the majority of the animals studied in early pregnancy (≤ 90 days) contractility was either not present or was seemingly random in its presence.
  - In a few instances, however, the appearance and subsequent disappearance of contractility occurred surrounding the day of embryo fixation (cessation of embryo mobility), with the peak occurring just as the embryo fixated (18-20 days after ovulation).

- In one instance (1 of 3 pregnancies studied in one miniature jennet) contractility spiked at the time implantation should ideally have occurred, but did not decrease afterwards.
  - This continued presence of contractility after the predicted time of fixation continued until the time of early embryonic death observed at 30 days.
  - The significance of this occurrence is under study.
  - Ginther (1988) has reported that uterine contractility continues after embryo fixation in donkeys as in horses and ponies.

18 day Embryonic Vessicle

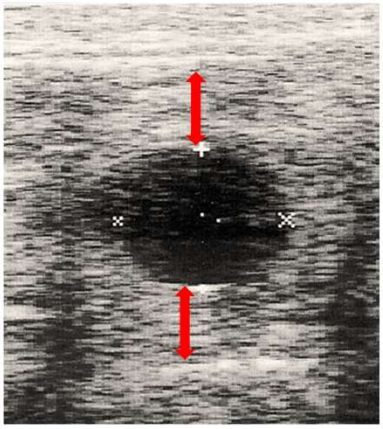


Figure 11: An 18 Day Embryonic Vesicle (approximately 18-20 mm diameter) in a Donkey. The black circle represents the area of ***embryonic fluid*** associated with the pregnancy. The ***uterine wall*** thickness is represented by the red arrows.

EV in Uterine Body 16 days after breeding

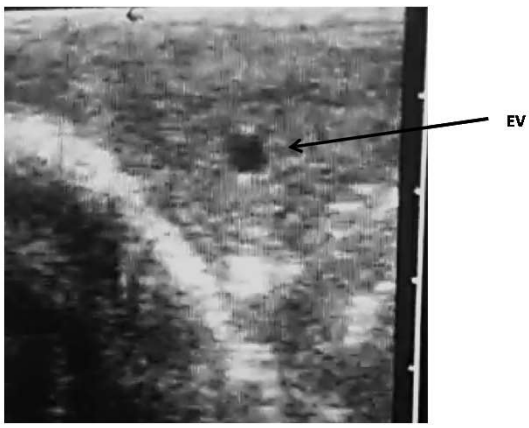


Figure 10: Embryonic vesicle (EV) in the uterine body at 16 days after breeding. The EV is the size of a 10 day pregnancy. This resulted in an early embryonic death. White spots at top and bottom of vesicle are ultrasound artifacts. Large white diagonal line at lower left of picture represents gas in the large intestine with an acoustic shadow below it.

Early Embryonic Death (EED)

Figure 12: 18 day EV in a jennet *showing estrus behavior*; receptivity continued and this embryo was not found 2 days later. This is also a case of early embryonic death (EED).

Most **EEDs** occur in the first 30 days of pregnancy

Embryo Fixation ~ 18 days of pregnancy

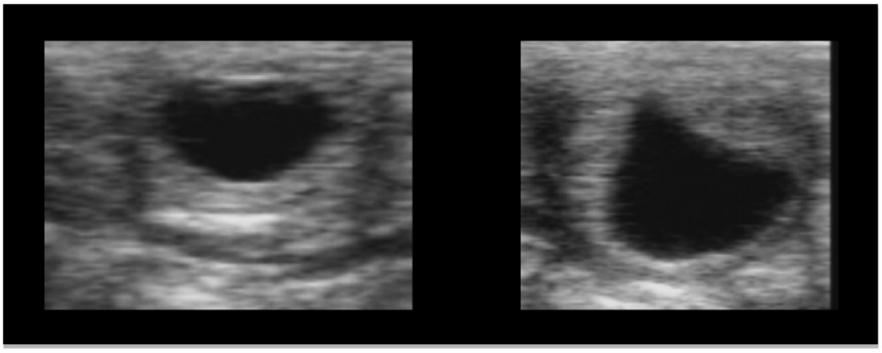


Figure 13: Non-fixated EV on left; EV on the right fixated and deformed due to uterine contractility (approximately day 18). (Shailor et al, 2013)

Embryonic Migration

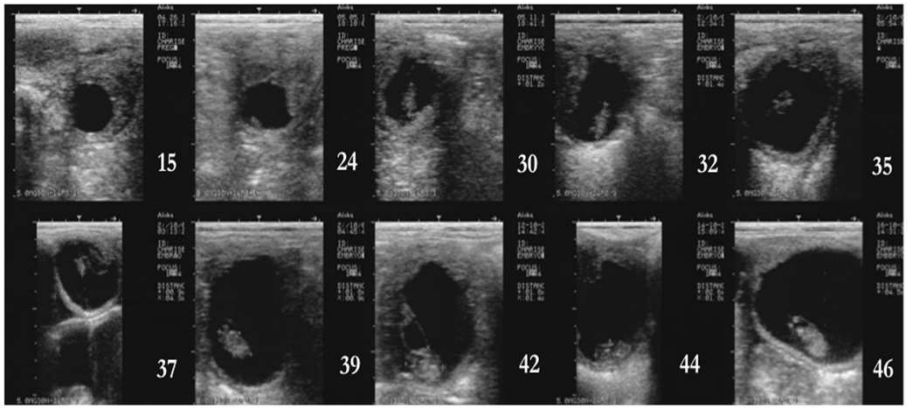


Figure 14: Apparent diagonal migration of embryo proper and back within the embryonic vesicle in a jennet (days 15-46 of pregnancy). (Brown et al, 2013)

Embryonic and Fetal Events

Day of Pregnancy	Event Detected by Ultrasonography
2	Corpus hemorrhagicum detected
4	Corpus luteum detected
10	Earliest pregnancy diagnosis
17-20	Routine pregnancy diagnosis and best time to scan for twin conceptions
18-20	Approximate time embryo mobility stops (fixation)
24	Embryo proper and embryonic heartbeat first detected
27	Start of placental formation
40	End of embryonic stage; start of fetal stage; implantation of conceptus
40	Stomach first detected
35-52	Cephalization and head nods detected
48-53	Umbilical cord first detected; whole body movements common
60	Orbit first detected

Fetal Ultrasound Pictures

- Transrectal ultrasound- 5 MHz linear probe. (Brown et al, 2013)
- Many of these structures could also have been identified from transabdominal examinations
- 100s of examinations performed by many people on several miniature and standard donkeys.
- Do not expect to find all or even most of these structures on every examination depending on:
  - aspect of the fetus during the examination
  - cooperation of the jennet
- much easier to identify structures during a live examination

Early Fetus

Figure 16: 61 Day Fetus

Fetus is shown in a lateral view with the spine downwards and head to the right. Note the eye socket.

Note uterine wall/placenta (above arrow) below the fetus.

Figure 17: 69 Day Fetus

Spinal column (tail to the right) along ventral surface of uterus with ***genital tubercle*** near tail (female fetus). Hind limb is above and to the left of it.

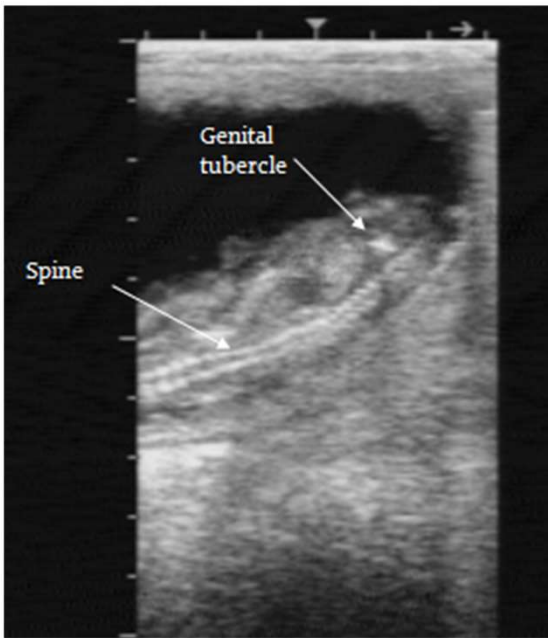
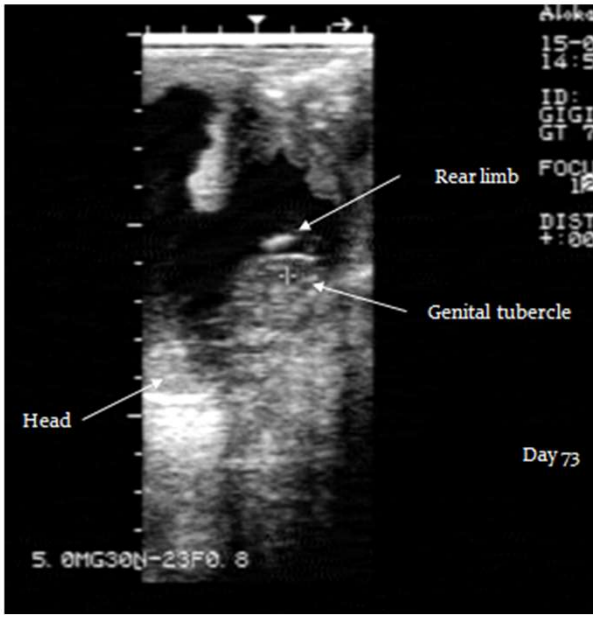


Figure 18: 73 Day Fetus

Fetus with spinal column ventral again.

Structures are difficult to identify from this still picture.

The rear limb appears as an echodense linear structure on cross section.



90 days bladder and fetus

Figure 19: 103 Day Fetus

Fetus is oriented laterally within the uterus so that both hind legs are seen.

Genital tubercle is seen between the hind legs at the back end of the fetus (female).

Limb bones appear dense white within the surrounding musculature on cross section.

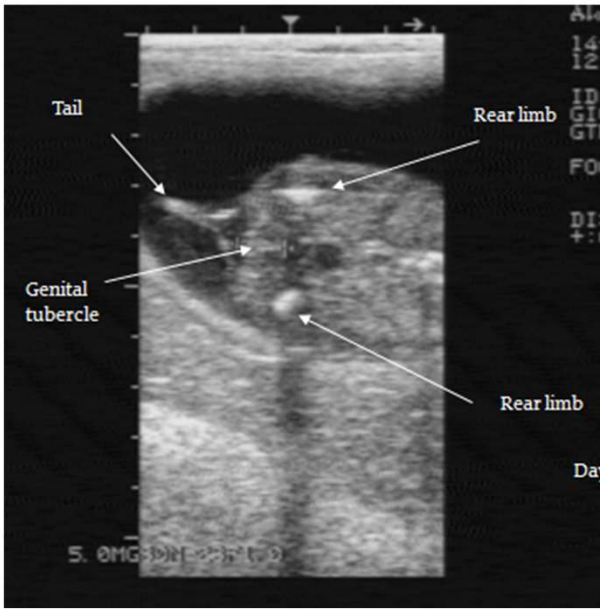


Figure 20: 121 Day Fetus

Fetal abdominal contents are seen in this view with the fluid filled (hypoechoic) ***stomach*** within the abdomen.

Fetal fluid is above and to the right of the abdomen.

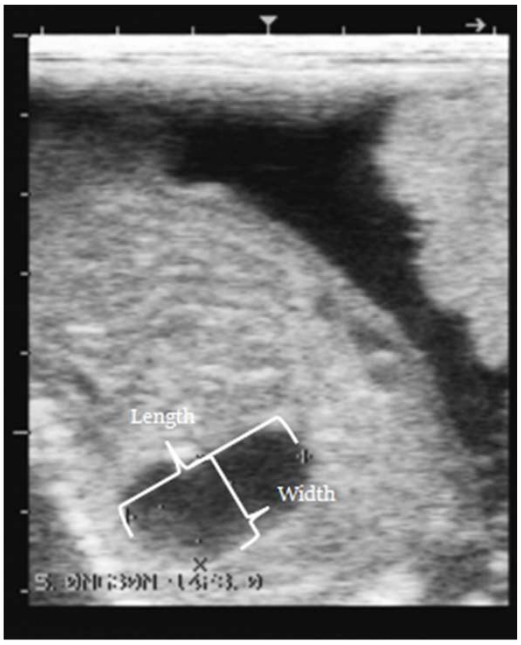


Figure 21: 133 Day Fetus

Lateral view of fetus with hind leg at top and abdomen to the right. The legs are extended away from the body allowing visualization of the ventral abdomen in the area of the umbilicus, thus revealing the **penis.**

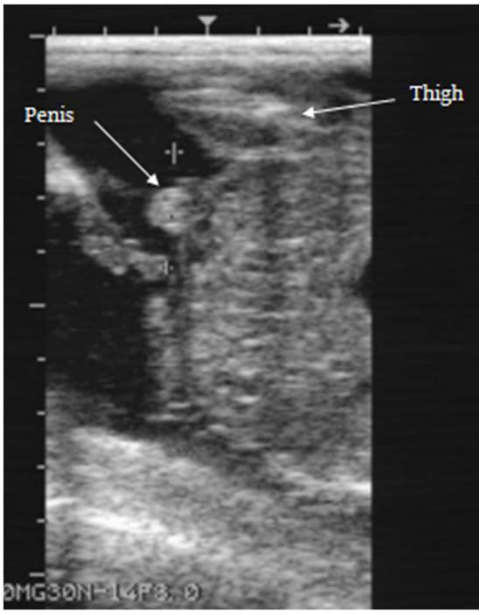


Figure 22: 147 Day Fetus

During real time examinations the ***heart*** is seen contracting in the fetal thorax at a rate of approximately 120-140 BPM.

Note the inverted V shaped pattern of the ribs to the left and right of the heart on cross section.

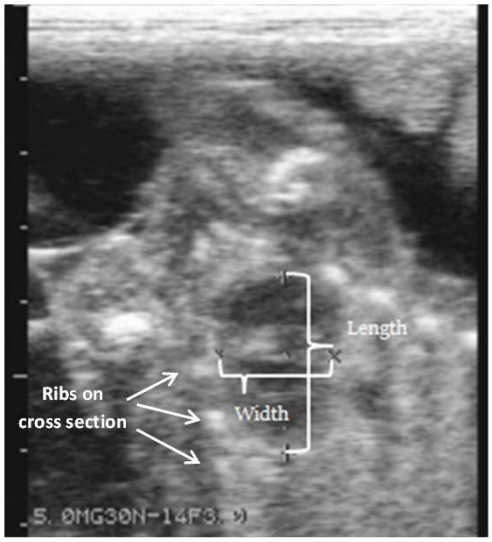


Figure 23: 196 Day Fetus

Close up view of the posterior end of the fetus reveals both thighs and the ***testes*** between.

The fetus has to be in this exact position to find this structure and this is certainly not the case for most examinations.

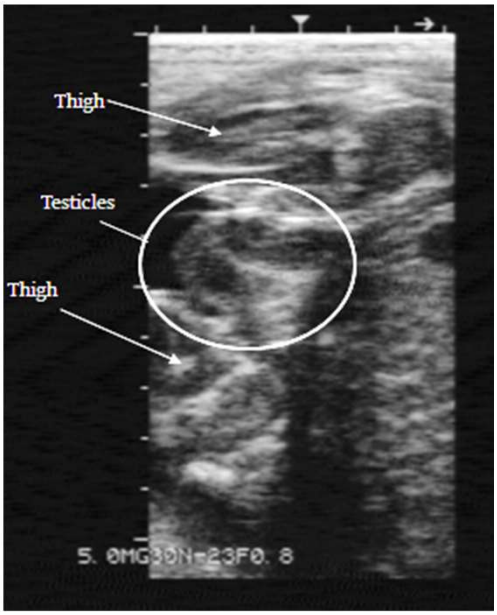


Figure 24: 214 Day Fetus

Another lateral view of the posterior end of the fetus illustrates one thigh and the the ***penis***. The testes appear stacked one over the other just to the left of the penis.

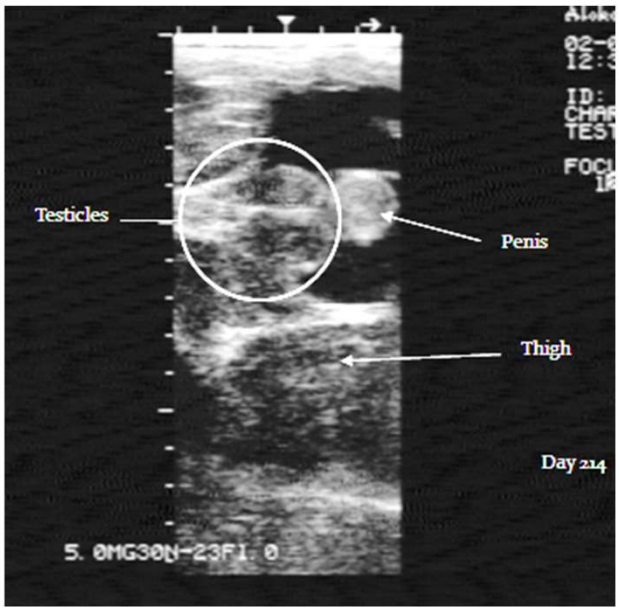
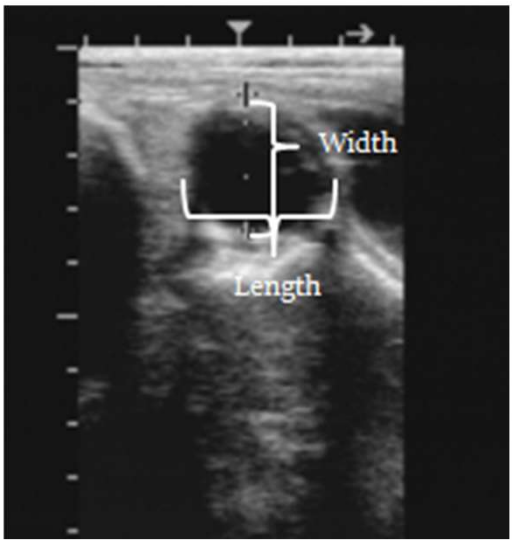


Figure 25: Day 268 Fetus

The orientation of this fetus is difficult to visualize in this still image but this demonstrates the hypoechoic area of the *eye socket* within the skull for this advanced pregnancy.



Transabdominal Pregnancy Examinations

- ≥ 70 to 90 days of gestation near the lower caudal abdomen
- **Coupling medium**
  - Water-soluble methylcellulose lubricant.
  - I routinely use alcohol
  - Hair does not have to be clipped in either case, and alcohol tends to give a clearer picture.
  - It is often necessary to apply additional alcohol during the exam to maintain the best picture quality, especially when moving the probe.
-

- **As the pregnancy progresses**, there is relatively less fluid and more soft tissue density seen when examining the fetus
- **Fetal movement-** consistently seen during approximately 90% of the initial examination period in a pregnant jennet.
  - characterized by jerking or twitching.
  - very different from contraction and peristalsis of digestive organs
  - If in doubt >> fetal heartbeat
- **Fetal heartbeat**
  - usually found on the ventral abdomen adjacent to the umbilicus in last trimester
  - normal range120-140 BPM.

Figure 26: 5 MHz linear probe applied to the caudoventral abdomen of a miniature donkey for performance of transabdominal ultrasound uterine examination at 70 to 80 days of pregnancy and beyond.

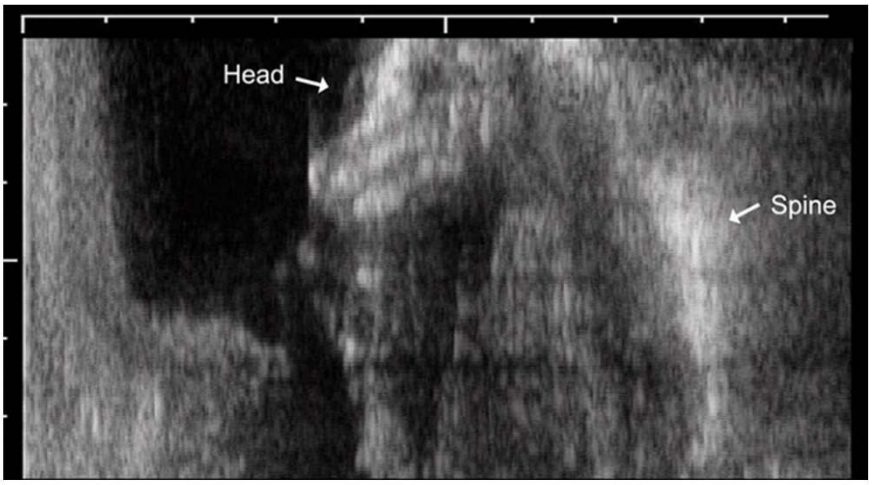
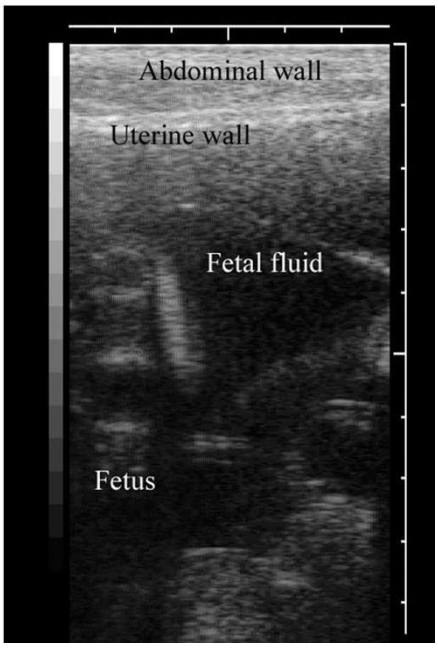


Figure 27: Lateral view of a 72 Day Miniature Donkey Fetus.

Figure 28: 255 Day Miniature Donkey Fetus using transabdominal ultrasound examination.



Thank you! Questions?