Hello and welcome to this lecture on the theriogenology of goats. You will see many parallels between caprine and ovine physiology and theriogenology. Sheep and goats are both inherently seasonal breeders, they have similar genitals, they are in heat for about the same period of time, they ovulate about the same time, they have similar gestation lengths, similar fetal membranes and they share many of the same abortifacients and neonatal problems.

However sheep and goats are very different in many respects. To start with, sheep have 54 chromosomes, goats have 60 and goats have longer estrous cycles than sheep; 21 days instead of 17 days. They are also much more demonstrative than sheep when they are in estrus, wagging their tails, bleating and as you may remember, showing a response to something called a "buck rag".

Of course only a few sheep breeds are farmed for their milk but most goats are farmed for milk and cheese and because of this, they are known as Milch (milk/cheese) breeds. In many
countries goats also used for their meat and some breeds are used almost exclusively for meat. A good example of this is the South African Boer goat.

Angora goats are farmed for mohair and those you see here seemed very interested in the photograph I took of them in the early morning on my father in law's farm in South Africa. Like all goats they are inquisitive and intelligent that is probably why many people also keep goats as pets. So don't be surprised if you're in companion animal practice and a goat turns up on your doorstep one day. Perhaps that alone is reason enough to pay some attention to this lecture.

Because sheep and goats are so similar in many respects, all I really want to do here is to illustrate some remarkable differences between the two and point out some unique findings in goats.
In this illustration for example, you see a uterus that’s filled with clear fluid. This is known as hydrometra and for all intents and purposes it is unique to goats. For an unknown reason a doe will suddenly stop having estrous cycles and begin to accumulate fluid in her uterus. Because these does are not having estrous cycles, they are also said to be ‘pseudopregnant’. The clear fluid remains in the uterus for a variable period of time because there is usually a corpus luteum present as well. In this case, there are two. This progestogenic environment keeps the uterus quiescent and the cervix firmly closed. At a certain point, spontaneous luteolysis occurs and the fluid is discharged. At the time of discharge, the condition is known as a "cloud burst". Now, fluid can accumulate rapidly and the uterus may contain close to ten liters of fluid in some cases but it never appears to be in danger of rupturing.

You may come across this condition while performing ultrasound for pregnancy diagnosis or an owner may complain that she is unable to detect estrous in a doe that was cycling earlier, despite her diligent estrous observation. In some herds, up to 20% of the does will experience hydrometra but it usually affects less than 10 % of the herd. It is also most prevalent in older does, so the average age of the herd may influence these figures. . In essence you can see that it can be a significant problem in dairy goats.

On ultrasound examination, the uterus is full of fluid but neither placentomes nor a pregnancy is visible. A luteolytic dose of prostaglandin should be given to induce estrus but does should not be bred at that time i.e. subsequent to the “cloudburst”, because fertility is very low then, probably because some fluid is retained in the uterus. Therefore this treatment should be repeated in 10 to 12 days. In fact, failure to re-treat these goats results in a high recurrence rate of hydrometra. When does are bred after the second prostaglandin treatment, one can probably expect normal fertility.

It is not known if there is a heritable predisposition to hydrometra but this seems likely because it is more common in some breeds than others.
The list of abortifacients that affect goats is similar to that in sheep. In fact *Chlamydophila abortus* is very important in goat herds. Some have even said that it is the most important cause of abortion in goats in North America. Therefore, if a *Chlamydophila* vaccine is not available for goats, the vaccine used for ovine EAE should be used instead.

Interestingly, *Campylobacter fetus* and its subspecies do not appear to be significant causes of abortion in does. Therefore vaccination against campylobacteriosis is not warranted in goats.

As is the case with sheep, woman of childbearing age and pregnant woman should not tend to goats. Many of these organisms can be shed from the genital tract indefinitely and goats can also shed these organisms in their milk. *Toxoplasma gondii* haunts me in that respect and is just one reason I refuse to drink unpasteurized goat’s milk.

Now, as you can see, there are many other infectious causes of abortion in does and this was also true of sheep but just didn’t mentioned it there. It is true that any of these can emerge as
very important diseases from time to time but I have limited these discussions to what is arguably an essential list of abortifacients. Of course, the most important cause of abortion is the one that is causing the problem you have right now so my lists may be totally useless in the first case of abortion you see. The best you can do however is to bear the important abortifacients in mind and protect your clients and their animals and as best you can. Then have the diagnostic lab look for every possible disease to find out what you may be dealing with. You can then research that abortifacient and take it from there yourself.

Slide 4

The neonatal care of goats is similar to that of sheep but goats are more likely to be kept under intensive conditions so neonatal death is less common in goats than it is in sheep. Also with regard to “Clip, Strip and Dip” only “Dip” is really important because there is no hair around the udder in goats and the teats are often examined anyway in preparation for collection of colostrum and the commercial milk production.
Now this is a digression from theriogenology but one thing I should remind you of with regard to all small ruminants, is to examine all the newborns for entropion. This is extremely common and should be treated as early as possible before signs of keratitis and epiphora start to show themselves. My approach to this is simply to put a small Michel clip into the upper eyelid to evert it. I just leave them in until they fall out by themselves after several days. Incidentally, susceptibility to entropion has been shown to be heritable in sheep so this is probably true for goats as well. In other words, you should probably not keep these animals for breeding.

Slide 5

This is essential knowledge for every veterinary student planning to write the NEB examinations. This is the intersex condition in goats. So listen carefully:
These are the things you have to remember

1. Although these are all XX goats, they are practically all male pseudohermaphrodites. In other words, they all have testicles and the rest of the tract is ambiguous. The testicles may be located within the scrotum or these goats may be cryptorchid. The structure of the rest of the tract is highly variable.

2. The genes for the intersex and polled conditions are carried on the X chromosome.

3. Because the intersex gene is linked to the gene for the polled condition it is known as the Polled Inter-Sex (PIS) gene.

4. The intersex condition only expresses itself if a goat is homozygous for the PIS gene.

5. To do it avoid the homozygous condition, one of the parents should always be a horned animal because a horned animal cannot possibly be carrying the polled gene. Why? It is because the gene for polling is dominant.

6. So the intersex condition can be avoided by using a horned male for breeding. That’s the really important thing to remember.

Now: I don’t expect you to know the following details but for those of you who may be interested, it is fascinating to know that these animals are not positive for the SR-y gene. Instead it is a homozygous allele deletion on the PIS gene on the X chromosomes that makes it impossible for the female to suppress the formation of testicles. You see, the formation of testicles is not only because of a positive “switch on testicles” effect by the SR-y gene but due to an active homozygous “switch off testicles” signal from both X chromosomes. If the “switch off testicles” transcription is somehow screwed up as it is here, testicles will form. I had a stallion like this a little while ago. He was pure XX but he had testicles and I couldn’t understand why because he was also negative for the SR-y gene. Now I think there must be some gene deletions on his XX chromosomes.
An occasional and amazing finding in male goats is **transient lactation**.

I once had a castrated male goat that lactated for a couple of years because he had an adrenal cortical tumor. It produced predominantly estrogen, and that in turn caused a multitude of other endocrine events that eventually induced lactation. However, I have seen several other cases as well and in none of them was the cause that obvious. In fact, we never found out why lactation was occurring in any of the others. Apparently lactation in males has been associated with a defective autosomal gene but little else is known of the condition.

In some cases, lactation can last for weeks and even years; in other cases it is transient. Usually you don’t treat these cases of course because the root cause of the condition is usually unknown but you should discourage the owner from milking these animals because milking obviously stimulates further lactation.
Interestingly we analyzed this milk from one lactating male and his milk was no different to normal goat’s milk. Equally interesting, was the fact that this chap was also completely fertile and had a normal breeding season that year; he was a true dual purpose animal! Not surprisingly, his name “Lickety-split” reflected his amazing abilities.

Thank you.