



Repro Tracks

► by **Bill Beal**, beef cattle reproductive physiologist, Virginia Tech

neighboring fetuses do not share circulation and complete masculinization of the females does not occur.

Student question No. 3:

The simple question posed by a student after watching a cow eat the placenta of her calf 10 minutes after delivery was, "Why?"

Response: There have been many theories advanced for why a cow, and, in fact, most mammals, instinctively eat the placenta of their offspring shortly after giving birth. There are some very bizarre theories. I found a carefully investigated answer to this question published by three students in the University of Alberta's "There's a Heifer in Your Tank" educational program. Stacy Hammer, Elina Kim and Jake Simms wrote an article entitled "A Little Afterbirth Snack" (www.hiyt.afhe.ualberta.ca/fall05/projects/placenta.pdf).

The students narrowed their answers down to three possible causes: hunger, predator avoidance and instinct. That cows instinctively eat the placenta after delivery was accepted as a "given." The idea that a cow experiences a specific craving to eat the placenta was defended based on the fact that in some human cultures mothers are encouraged to ingest the placenta based on the belief it may prevent postpartum depression and be beneficial to the psychological health of the new mother.

Perhaps the most believable of the theories is that mammals instinctively eat the placenta as a mechanism to deter the attraction of potential predators to the birthing site. This tracks best with the idea that the behavior was maintained during evolution because it was beneficial to survival of the species. It also matches the "common sense" of 17% of the beef producers and 43% of horse, sheep and swine producers polled by the University of Alberta students who indicated they remove the placenta to prevent attraction of predators and to prevent the dam from choking on it.

Regardless of what theory you accept, the article by the University of Alberta students will stimulate your thinking. I encourage you to check it out, and if you have never heard of the "There's a Heifer in Your Tank" project, you may be interested in it as well (www.hiyt.afhe.ualberta.ca).

Editor's Note: Bill Beal is a beef cattle reproductive physiologist at Virginia Tech. E-mail your questions to him at wbeal@vt.edu or mail them to him at the Dept. of Animal & Poultry Sciences, Virginia Tech, Blacksburg, VA 24061-0306.

Interesting questions about the placenta

The placenta is a remarkable organ that provides the fetus with nutrients and gas exchange during pregnancy. During a recent laboratory dissection of the reproductive tract from a pregnant cow, college students posed some interesting questions about the placenta. The answers demonstrate how vital and complex placental function can be.

Student question No. 1:

If the cow is pregnant in the right uterine horn, why does the placenta expand and extend up into the left uterine horn?

Response: The obvious answer is "surface area." The placenta attaches to the uterus at points on the placenta called cotyledons. At each cotyledon, the fetus exchanges nutrients (glucose, fatty acids) and gasses (oxygen, carbon dioxide) with the blood circulation of the dam. The larger the placenta, the more cotyledons there are to attach to the uterus and the greater the exchange of nutrients and gasses.

Actually, the placenta expands into both uterine horns early in pregnancy (Day 12-14) before there are any attachments present. During this time, the expanded placenta makes contact with all of the uterine horn on one side and part of the uterine horn on the other. The contact between the placenta and uterus may be important in the process referred to as maternal recognition of pregnancy. This process allows the cow to "know" she is pregnant and blocks the return to heat, an event that would occur 21 days after the cow was bred if pregnancy did not occur.

Later in pregnancy the number and size of the cotyledons increases dramatically, and nutrient and gas exchange become critical to the survival of the fetus. Twin fetuses in the same uterine horn compete for space as their placentas expand. This can lead to the death of one or both twins if the number of attachment sites is inadequate to sustain viability of the twin(s). In fact, embryonic loss has been reported to be higher for twin fetuses in the same uterine horn (53%), compared to bilateral twin pregnancies (10%) where one twin is in each horn.

Student question No. 2:

I read that a "freemartin" is the sterile female born twin to a bull. Is the freemartin sterile because she shares the same placenta with the male fetus during pregnancy?

Response: Male and female twins are derived from the fertilization of two different ova, and each twin develops its own placenta. However, as the placentas expand (see question No. 1) the placental membranes of the male and female twins usually make contact and fuse. If this fusion occurs prior to the time of sexual differentiation (days 45-55 of pregnancy), the sexual development of the female calf is partially masculinized by compounds in the placental circulation of the male twin.

A related question that is almost always asked is, "could a female twin calf born with a male ever be fertile?" The answer is "yes" if the placentas do not make contact or do not fuse during pregnancy. Unfortunately, this occurrence is very rare. When cattle were selected for increased twinning in a research study at the U.S. Meat Animal Research Center (USMARC) at Clay Center, Neb., only 20 of 463 (4.3%) female calves born twin to a male were fertile.

It is interesting that freemartinism occurs in cattle, but not in hogs or sheep. In those species, a female born in the same litter with male lambs or male baby pigs is not infertile. The difference between species rests with the differences in placental development. Although some research indicates female pigs that develop "next door" to a male in the pregnant uterus may have some postnatal behavioral characteristics that are influenced by the proximity to the male placental unit during pregnancy, the placentas of

Focus on Females