

Kentucky Dairy Notes

July 2011



Bull Breeding Soundness

George Heersche, Jr.

I am a proponent of Artificial Insemination in dairy animals. However, not everyone shares my enthusiasm for A.I. so I will concede if one is going to use natural service one should make sure the bull is capable of getting cows or heifers pregnant.

Natural service bulls should be taken to your veterinarian for a Breeding Soundness Evaluation (BSE). The results of the BSE will predict a bull to be fertile, subfertile, or sterile. Only bulls in the fertile category should be used.

A bull BSE includes the following four components:

1) Physical exam;

Evaluates the physical characteristics of a bull necessary for mobility and athleticism, structural soundness, overall internal and external reproductive tract development, etc.

2) Scrotal circumference:

Evaluates testicular size and health, as well as estimating the bull's sperm-producing capacity. Bulls must meet minimum scrotal circumference measurements based on age in order to pass a BSE.

3) Sperm motility:

Ensures that the bull is producing sufficient numbers of live sperm. Bulls must have at least 30 percent motility to pass a BSE.

4) Sperm morphology:

Ensures that the bull is producing sperm that are properly shaped and capable of fertilization. Bulls must produce at least 70 percent normal sperm to pass a BSE.

The recommended minimum requirements for scrotal circumference, sperm motility, and sperm morphology are outlined by the Society for Theriogenology.

A BSE does not evaluate a bull's libido, nor does it ensure that a bull will remain a satisfactory breeder. If a bull suffers injuries to his feet, legs, reproductive tract, etc., such an injury may render him incapable of breeding your cows. Therefore, it is still extremely important to observe your bulls regularly to ensure they are doing their job. A BSE also does not guarantee that bulls are free of infectious diseases, so consult with your veterinarian on what diagnostic tests may or may not be appropriate for your bull.

***Neospora caninum* Abortion in Cattle**

Michelle Arnold, DVM

Neospora caninum is a protozoan parasite that is emerging as an important infectious cause of weak calves and abortion in cattle. *N. caninum* infections have been reported from most parts of the world with studies in the United States, New Zealand, the Netherlands, and Germany indicating that 12-45% of aborted fetuses from dairy cattle are infected with the organism. Exposure is common in US dairy herds ranging from 16% to 36% of dairy cows testing positive on serum. A distinguishing feature of the disease is abortion at 4-6 months of gestation, a unique time frame among infectious causes of bovine abortion. It is a very efficiently transmitted parasite with infection rates reaching 90% within some herds. Cows contract this parasite in one of two ways: 1) "Horizontally" by consuming feed or water contaminated with eggs (oocysts) from infected dogs and other canids or 2) "vertical" transmission from cow to the fetus during pregnancy. An important feature of this parasite is that once it infects an adult cow or bull, a calf or a fetus, it is maintained as a life-long infection. Once infected, a cow can pass the organism through the placenta to her calf in every pregnancy throughout her lifetime. In some pregnancies, this fetal infection may result in abortion or weak calves. However the vast majority (95%) of calves born with the infection ("congenitally infected") from positive dams are absolutely normal but remain infected for life. A heifer calf born with the infection can transmit the infection on to the next generation when she becomes pregnant, thus maintaining the infection within the herd. Vertical transmission (dam to calf) is known to be the major mode of transmission in cattle but both horizontal and vertical transmission are vital for parasite survival.

The way in which *N. caninum* causes abortion is complex and not fully understood. Abortion losses can occur after a primary infection (ingestion of eggs) but it is more commonly associated with reactivation of a persistent infection during pregnancy. Once the organism reaches the bloodstream of a pregnant cow (parasitemia), it invades the placenta and the fetus. Abortion is thought to occur by direct fetal and placental damage and/or the placental damage may cause release of maternal prostaglandins that cause luteolysis and abortion. Definitive diagnosis of abortion is through detection of the *N. caninum* organism in the fetal tissues, most consistently the fetal brain. There is no known drug to clear a cow of infection. A killed vaccine is available (NeoGuard, Intervet Inc) but studies suggest it has only a modest effect in reducing abortion risk and much uncertainty remains. Control is based on culling positive animals, preventing entry of infected replacements into the herd, and preventing likely routes of horizontal infection.

Life Cycle and Transmission of *Neospora caninum*:

Horizontal transmission of the organism occurs when a cow consumes an egg (oocyst) passed in the feces of a domestic dog, coyote, or other wild canid. Once inside the cow, the oocyst opens and releases tachyzoites that multiply rapidly and enter the bloodstream (parasitemia). Either the tachyzoites are transmitted through the placenta to the fetus or the immune system of the cow slows down the multiplication of the organism and they become encased in a shell ("encysted"). These "tissue cysts" are primarily found in the brain, spinal cord and muscles of cows but are thought to exist in the placenta as well. If dogs (or other wild canids) ingest these tissue cysts by eating a placenta, aborted fetus, or carcass of an infected cow, the organism can reproduce and form eggs (oocysts) in the intestines of dogs, beginning the cycle again. Deer are also known to form tissue cysts of *N. caninum* infective to dogs. Cow-to-cow transmission does not occur. Although not definitively proven, venereal transmission or by embryo transfer is considered highly unlikely.

Tissue cysts are primarily found in the central nervous system but can be in the muscle as well.

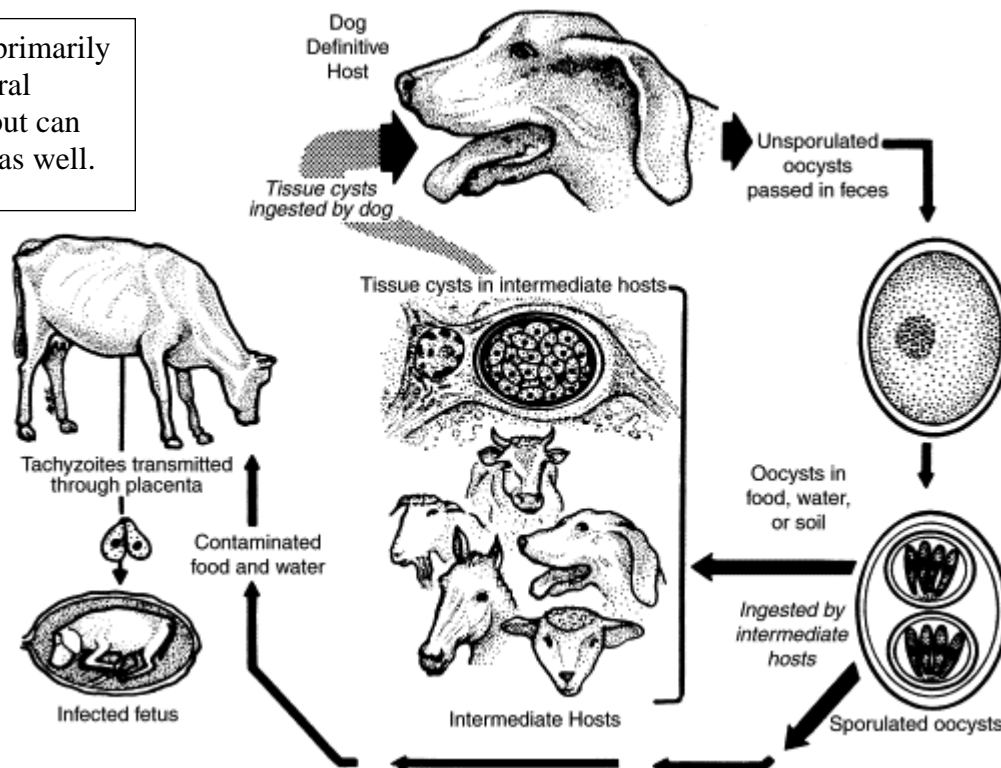


Illustration from Dubey JP: Neosporosis in cattle. Vet Clin North Am Food Anim Pract 21:473-483, 2005.

Vertical transmission occurs when the tissue cysts of persistently infected cows reactivate during pregnancy. It is believed that changes in the immune status of the dam allow tissue cysts to reactivate and release the organism to the bloodstream (parasitemia). In a majority of cases, vertical transmission leads to a healthy but congenitally infected calf. This contributes significantly to persistence within a herd by propagating the infection to successive generations.

Clinical Disease: Whether horizontally or vertically transmitted, bovine neosporosis is mainly a disease of the placenta and fetus. Adult cattle show no other clinical signs of disease. The fetus is most vulnerable to *N. caninum* before the 95th day of pregnancy and is unlikely to survive. In the middle third of pregnancy, the fetus may be able to mount an immune response that may or may not be sufficient to save it. In the third trimester, the fetus is usually clinically normal but infected for life. Abortion may occur as an epidemic or sporadic and occur at any time of the year. Unique characteristics of the disease include:

1. A majority of abortions occur from 4-6 months gestation (range from 3 months to 8 months) with moderate rotting (autolysis) of the fetus. The fetus that dies *in utero* may also be resorbed, mummified or stillborn.
- 2. The vast majority (95%) of calves born to positive dams will be born infected but normal.**
3. An infected calf may be born alive with neurologic signs, birth defects, and /or born weak and unable to stand.
4. Cows can transmit the infection to their offspring in several consecutive pregnancies or intermittently.

Diagnosis: Examination of the fetus is necessary for a definitive diagnosis of abortion due to neosporosis. The best tissues to sample include brain, heart, liver, placenta, and also body fluids. Fetal brain is the most consistently affected organ and has the most characteristic lesion. Tests are available that can distinguish *N. caninum* from the two other protozoans that cause abortion in cattle, *Toxoplasma gondii* and *Sarcocystis cruzi*. A positive blood test from an aborting

cow is only indicative of exposure to *N. caninum* and not diagnostic for abortion. There are several commercial cELISA blood tests that detect antibody to *N. caninum* that are rapid, inexpensive and consistent.

Control: *N. caninum* is efficiently transmitted vertically in cattle for several generations so culling of positive animals is one way to prevent this perpetuation of infection. In herds with a high prevalence of infection, blood testing the herd and selling the offspring of positive cows may be more economically feasible to reduce vertical transmission. Embryo transfer from positive cows to negative recipients can preserve valuable genetics safely. Testing of all purchased animals should be considered to prevent entry of positive animals in to the herd.

To prevent horizontal transmission, it is important to prevent exposure of the cows to feed and water contaminated with feces from dogs that may contain oocysts. Dogs and coyotes should not be allowed to eat aborted fetuses, fetal membranes, or dead calves. There is a killed parasite commercial vaccine (NeoGuard, Intervet) but there is no convincing data about the efficacy of this vaccine in preventing *N. caninum* abortion in cattle.

Neospora caninum is a protozoan that is becoming more widely recognized as an infectious cause of reproductive problems in cattle. Testing for this organism should be considered especially in herds that vaccinate routinely for infectious causes of abortion yet are still experiencing losses, particularly in the second trimester of pregnancy.

Measuring Somatic Cell Counts in DHIA

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¹ University of Kentucky, ² Mid-South Dairy Records

Somatic cells, or leucocytes, moving into the dairy cow's mammary gland from the bloodstream are the key defense against mastitis. The presence of 200,000 somatic cells per ml or more in a composite sample of milk produced by all four quarters of a dairy cow generally indicates that the udder is under stress from the invasion of microorganisms. Somatic cell count (SCC) refers to this concentration of somatic cells and is one measure of milk quality.

There is regulation of somatic cell count and the current legal limit is 750,000, although a recent vote to lower this limit to 400,000 in the US failed by only one vote of the National Conference of Interstate Milk Shipments. Already there are milk processors who are requiring milk they receive from dairy farms have fewer than 400,000 cells or even lower. The somatic cell counts from individual shipments from dairy farms are a composite from the milk of all the cows whose milk is included in the shipment. Milk handlers are required to obtain a sample from the bulk tank for each pick-up of milk at the farm before it is transferred to the tanker truck. Dairy farmers usually receive a report of the somatic cell count and other measures of milk quality from their dairy.

DHI Testing of SCC by Mid-South Dairy Records

Dairy producers who are enrolled in the Dairy Herd Improvement Association (DHIA) program have the opportunity to receive somatic cell count information for the individual cows in their dairy herd. To have this information, a sample of milk is drawn at the same milking where the milk yield of the cow is recorded. These samples for Kentucky DHI herds are then shipped to the Mid-South Dairy Records laboratory in Springfield, Missouri.

The samples, once they arrive at the lab, are processed under specific guidelines established by the Quality Certification Services (QCS) which is a branch of National DHIA that establishes minimum standards for DHIA operations across the United States. Annual inspections of DHIA operations ensure that standards are met and that programs meet uniform minimum performance. Mid-South Dairy Records consistently exceeds QCS's standards for accurately determining the concentration of somatic cells, butterfat and protein in "unknown" samples which are part of the QCS program.

Protocols of Mid-South Dairy Records (MSDR) for calibration of lab instruments, analysis of control and water samples with each set of herd samples and inspection of lab analysis and control samples for each herd are designed to ensure that accurate results are obtained for SCC and butterfat and protein of the individual cow samples. Details are given below for these protocols.

MSDR Protocols

Eastern Lab Services in Fairlawn, Ohio prepares calibration samples that are used weekly to verify and adjust for proper calibration of each lab instrument. Their calibration and monthly “unknown” samples are used in all DHIA labs across the US. Eastern Lab Services is affiliated with Dairy Farmers of America.

Control samples are prepared each week for use in the lab. They are used during morning startup and for validation, after each herd, that machines are working properly. After preparation, control samples are analyzed on both lines of instruments and a target value is established for each component analyzed. During morning startup, a random group of 10 control samples with SCC values ranging from 100,000 to 1,250,000 are analyzed and must fall within a range for all samples of 7% for SCC. Water values (with an expected value of 0 for SCC) and sample volume must also meet an acceptable standard before any DHIA samples are analyzed. Normally instruments operate within 4% for SCC.

Two control samples and two water samples are analyzed after each DHIA herd is tested. Control samples with an SCC level of 300,000 must be within 7% for SCC of the target value before the test results for the herd are accepted and the samples are discarded. If control samples do not fall within the acceptable range, lab employees troubleshoot the instrument, resolve any instrument problems and rerun herd samples.

Prior to final acceptance of herd results a lab supervisor also inspects the lab analysis and control samples values for each herd. Only after this last step are samples finally discarded. This lab supervisor also creates and prints the lab hotsheet. This hotsheet is either mailed, e-mailed or is available via the Internet to the DHIA herdowner.

Once each month, Eastern Lab Services distributes two duplicate sets of 12 “unknown” samples for analysis on each instrument. These samples are analyzed just like a regular DHIA herd and results are reported to QCS. Sample results are compared to results determined by chemical analysis. For SCC the mean difference must not exceed 10% and the standard deviation must not exceed 10% in three of the four previous monthly trials. The rolling mean difference over the previous six trials must not exceed 5%. Mid-South consistently exceeds the minimum standards and normally operates within a 4% standard deviation of percent differences for the SCC samples. By being inside these minimum standards the results from Mid-South are more reliable.

Mid-South Dairy Records has exceeded the requirements for lab certification since the inception of the QCS program 21 years ago.

Sample Collection Is Important

How milk samples for SCC analysis are obtained is very important. This is true whether they are the bulk tank sample at the farm for milk handler evaluation or the milk samples from the bulk tank or individual cows for analysis by MSDR of DHIA samples. Accurate results can only be obtained from samples that are properly drawn. For bulk tank samples, the tank contents must be sufficiently agitated and the sample drawn from the body of the tank. These results represent the milk from the milkings and cows added to the tank at the time of sampling. Likewise, individual cow samples must be a representative sample of the milk produced at the milking at which the sample was drawn. Because somatic cells tend to attach to butterfat particles, if the sample does not represent properly dispersed butterfat particles the SCC results are not likely to be accurate. Thus, samples should be properly drawn from a sampling device attached to a milk measuring device such as a weigh jar or in-line meter. If no sampling device is used samples should be drawn from individual quarters during the milking process and after the milkers have been attached for at least 2-3 minutes. The samples drawn from all 4 quarters should be pooled and mixed thoroughly and then a single sample drawn.

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Kentuckiana Dairy Exchange

Cost is \$50/person

Registration Deadline: July 22nd

Lodging: Don Hall's Guesthouse (260-489-2524)

The link below is the registration brochure

<http://www2.ca.uky.edu/afsdairy-files/extension/events/2011KYINExchange.pdf>

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