

Embryonic Loss: What causes it, what amount is normal, and how do I manage it?

Kevin McSweeney, DVM, ILM, Dairy Specialist

How frustrating is it to have a cow diagnosed pregnant at the 45-day vet check and then discover at dry check (day 220) that she has lost the fetus somewhere along the way? The precise dollar loss, of course, will vary with milk prices, location, and management approaches, but as an example some research has estimated the cost of every day open in four time intervals:

Open between day 100 and 130: \$0.50 per day

Open between day 130 to 160: \$1.42 per day

Open between day 160 to 175: \$2.99 per day

Open after day 175: \$4.52 per day

Fertilization rates do not appear to have changed significantly in the last 20 years, and increased embryonic loss is assumed to be a significant cause of poorer calving rates and the overall decline in dairy cow fertility. In addition to the apparent increase in rate of embryonic loss, cows that have lost their fetus are not showing estrous as clearly or estrous is not being recognized as readily resulting in “open” cows at the dry check; an often overlooked cause of economic loss.

Pregnancy diagnosis by ultrasound (~day 26-30) can be performed two weeks earlier than diagnosis by rectal palpation. Early embryonic death (EED) can be diagnosed accurately and open cows rebred immediately resulting in cost savings.

What is the normal rate of embryonic loss? Some level of embryonic loss is normal because it represents the loss of unhealthy embryos. To estimate the normal rate of embryonic death, studies of timed breeding protocols can be reviewed. These studies using flushed embryos estimate fertilization rates among lactating dairy cattle to be between 66-87%. This wide span is due to the timing of insemination used in different study protocols: breeding closer to the last GnRH dose will result in a lower fertilization rate but increase the percentage of high quality embryos. When reviewing these types of studies as a whole, the majority of early embryonic death occurs prior to day 27. Affected cows will most often be seen as rebreeds. Current information obtained by using reproductive ultrasound on large expanding dairies have found 10-20% embryonic loss from day 27 to day 45.

What are some normal EED rates in Colorado dairies? I have been working closely with two dairies here in eastern Colorado. Table one illustrates early pregnancy loss data collected with the use of reproductive ultrasound and rectal palpation.

Table One: Embryonic loss on two Colorado dairies

Dairy A milks 500 cows and had a total embryonic loss from day 28 to day 100 of 14%:

8% embryonic loss occurred from day 28 to 35,

5% from day 35 to day 55,

1% loss from day 55 to 100.

Dairy B milks 1200 cows and had a total embryonic loss from day 28 to 95 of 14.3%:

10.1% embryonic loss occurred from day 28 to day 60.

4.2% loss from day 60 to 95.

There are many reasons for embryonic loss. The following factors should be considered if the embryonic loss rate at a dairy is not acceptable.

The oocyte: The oocyte or unfertilized egg develops within the follicle. Studies suggest that once this follicle and oocyte attain dominance (usually when follicles reach ~10mm in diameter) after a few days the quality of this oocyte starts to decline. It is quite common for lactating dairy cows to ovulate poor quality oocytes, and one reason may be follicles that persist contain poor quality oocytes. These inferior oocytes lead to inferior quality embryos which are more apt to be lost.

Uterine environment also contributes to embryonic loss. To evaluate the effect of the maternal uterine environment on EED, in one study day 7 embryos were flushed from non-lactating Holstein heifers and lactating Holstein cows with poor fertility. Only high quality embryos were used. The lactating cows received the embryos from the heifers, and the heifers received the embryos from the cows. The heifers attained pregnancy rates very similar to rates attained using embryos from other heifers, but the cows had pregnancy rates similar to rates attained using their own embryos. By neutralizing the difference in origin of embryos, this study suggests that the poor pregnancy rate in the cows was due to uterine environment rather than poor quality embryos.

Blood progesterone levels must be maintained to support pregnancy. Lactating dairy cattle have been shown to have lower blood progesterone levels than they did 30 years ago. Although the cause of low blood progesterone is not completely understood one well accepted hypothesis is that it results from the industry's efforts to maximize feed intake and boost milk production. When feed intake increases, more blood passes through the liver which breaks down the progesterone and estrogen. This decrease in progesterone levels is thought to lead to more embryonic loss.

If lower blood progesterone levels are detrimental to embryonic health, what can be done to increase progesterone levels? The corpus luteum (CL) located on the ovary is the main source of progesterone. If the numbers of CL's are increased, blood progesterone levels should also increase. One way to accomplish increasing the number of CL's is to give Human Chorionic Gonadotropin (HCG) around day 5 post breeding. This causes the next follicular wave to ovulate and creates additional CL's, thus increasing blood progesterone levels. One study on a large commercial dairy in California during cool weather months showed nearly a 40% increase in conception rates (34.2% CR in the non-treated group versus 47.8% CR in the HCG treated group) by giving HCG day 5 post A.I. 86.2% of HCG treated cows had accessory CL's and their blood progesterone levels were increased by 5.0 ng/mL (a big increase) when compared to controls.

General maternal health: There are also many disease processes that can cause EED. Such common ones are BVD, coliform mastitis, trichomoniasis, neospora, vibrio, and Leptospira hardjo. Leptospirosis as a cause of reproductive failure has been gaining considerable attention lately and there is a new vaccine for its prevention.

How do I manage EED?

EED is a very complex problem, and requires diligence to deal with it. Although it may be minimized, it will never be eliminated. Certain amounts of EED are normal, but we need to manage it to minimize the negative impact on the bottom line. Another period of pregnancy loss also occurs after day 45-50 post breeding. In a recent study Vasconcelos estimated this fetal loss after day 56 to be 9.2%. Most dairies diagnose pregnancy around 40-50 days post-breeding and then reconfirm the pregnancy at dry-off (day 220), but there can be considerable loss occurring between these two checks. If a specific disease (BVD, leptospirosis, etc.) is responsible it needs to be identified and managed.

I recommend determining what level of embryonic loss you are experiencing and also when it is occurring. If you find that you have a considerable proportion of cows open at dry check, you might consider adding

an additional pregnancy check somewhere near day 100 post-breeding. For those suspicious of the use of either ultrasound for early pregnancy diagnosis or timed breeding protocols, neither have been shown to increase the amount of EED when compared to non-synched heat bred cattle or those diagnosed pregnant by rectal palpation.

If you are fortunate enough to have ultrasound on your farm, you probably have already been managing EED, with rechecks of all your pregnant cows done around day 40-60 post breeding. There has been some work out of the University of Wisconsin that showed the greatest amount of embryonic loss after day 28 occurred within that next week (day 28-35 post breeding). The data from my study also showed that 55% of the total embryonic loss occurring after day 28 occurred between day 28 and day 35 post breeding. If the vast majority of these embryos are lost during this week, why wait longer to reconfirm. On Dairy A (500 cows) we recheck all pregnant cows one week after the day 28 scan. We reconfirm the remaining pregnancies by rectal palpation near day 55, then again day 100 and finally at dry-off. We start resynchronization on all open cows whenever they are diagnosed and when their ovaries contain a CL (the best time to start resynch programs is when a cow has a CL). Some cows will still have a dead embryo and intrauterine debris and need to be "cleaned-up" by giving a shot of lutalyse prior to starting the resynchronization protocol.

This approach may be too aggressive for the average dairy, but some variation of this protocol may be beneficial. Open cows cost money. If too many cows are coming up open at dry-off, you are losing considerable money. Not only are you losing the potential increase in milk from a peak lactation cow, but also with prolonged lactation you may lose the cow. These cows are usually far into their lactation and their milk is often too low to keep them around to try and get them pregnant again. They go to the sale barn where a cow you thought had a value of \$1200-\$1800 prior to the pregnancy check now gets you \$300-\$600 as a cull cow. Identifying embryonic loss in cows as soon as possible and getting affected cows rebred promptly can mean the difference in whether you freshen these cows on your dairy in 9+ months or cull them in a few months.