

## Staph Aureus and Bulk Tank Culturing

Staph Aureus is a serious problem that affects many dairy cows, resulting in a significant loss of milk production due to mastitis. Once these bacteria invade the mammary gland, they will advance deep into the secretory cells and ductal tissue. Staph infections produce scar tissue and can cause small abscesses to form in the udder. Both may permanently limit a quarter's ability to produce milk.

Milk loss varies with the severity of the infection. It is generally agreed that about 0.65 kilograms of milk per day is lost with each doubling of the somatic cell count above 50,000 cells/mL. Table 1 shows the relationship between annual milk loss and somatic cell counts. Each increment in the somatic cell score (Linear Score) represents a doubling of the actual SCC and a 200-kg loss in milk.

LINEAR SCORE	CELL COUNT (cells/mL)	MILK LOSS (kg/year)
0	12,500	0
1	25,000	0
2	50,000	0
3	100,000	200
4	200,000	400
5	400,000	600
6	800,000	800
7	1,600,000	1000
8	3,200,000	1200
9	6,400,000	1400

Table 1. The relationship between somatic cell count, linear score and annual milk loss.

### Culturing

Culturing is essential in the identification of organisms responsible for mastitis. It is impossible to develop an effective control program without first correctly identifying the organisms. Samples collected for these bacterial cultures must be 'clean' - results from contaminated samples are worthless. Contamination from milkers' hands, the side of the cow or a teat that was not cleaned properly can all result in an incorrect identification of the organism responsible for the mastitis problem.

The results of only one negative (no growth) sample can also be misleading. Bacteria can be engulfed by white blood cells in milk and fail to grow in the laboratory media. Antibiotics will also inhibit the growth of bacteria, and it is for this reason that milk from cows treated with antibiotics should not be cultured.

The problem with Staph Aureus is that the excretion of this bacteria into the milk is inconsistent. This is shown in Table 2 which also demonstrates why somatic cell counts are not always a good indicator of the level of infection.

DATE	Staph Aureus (bacteria/mL)	SOMATIC CELLS (x 1000 cells/mL)	LINEAR SCORE	DIAGNOSIS BASED ON :		
				BACTERIA	SCC	BACT+SCC
Jan 20	0	8	0	-	-	-
Jan 21	450	144	3.5	+	-	-
Jan 22	920	1560	7.0	+	+	+
Jan 23	>10000	2500	7.6	+	+	+
Jan 30	0	980	6.3	-	+	-
Jan 31	50	490	5.3	+	+	+
Feb 2	75	270	4.4	+	+	+
Feb 5	235	870	6.1	+	+	+

Table 2. Bacteria and somatic cells in sequential milk samples from a case of Staph mastitis and results of diagnosis using bacterial counts, somatic cell counts or both. A diagnosis based on bacterial growth is negative (-) only if Staph aureus bacteria/mL = 0. SCC diagnosis is positive (+) when somatic cells/mL exceed 250,000. At this level, there is an 85% probability of infection.

## Bulk tank culturing

The problem with culturing bulk tank samples has been that the technique used in the past had a very low sensitivity : very few herds with staph (about 10-15%) were detected by culturing bulk tank samples. Recent research by Dr. Matt Schoonderwoerd and Dr. Gerald Ollis of Alberta Agriculture, Food and Rural Development, has resulted in the development of a quick, inexpensive and effective means of identifying herds with Staph Aureus; a new technique which greatly enhances the recovery of Staph Aureus bacteria from raw bulk milk. These researchers have developed a new growth medium that inhibits the growth of environmental bacteria, normally found in raw bulk milk. This medium has an accuracy rate of 87% in identifying infected and non-infected herds.

The result of a one-time sampling of bulk tank raw milk showed that 67% of the herds in Alberta had at least one cow in the herd infected with Staph Aureus. These positive herds had bulk tank somatic cell counts from less than 50,000 to well over 1,000,000 cells/mL.

## How to use the new method

To determine if your herd is negative for staph aureus, 3 bulk tank samples should be collected. The samples should be taken at 48 hour intervals, and should be aseptic (it is important that the milk dipper be disinfected). The samples should be frozen, and delivered to the veterinary laboratory still frozen. If all 3 samples are negative, a herd can be considered staph-free. These herds should start a regular (i.e. quarterly) sampling and monitoring program. In this way, new staph infections can be identified accurately and quickly.

## Staph infected herds

Herds positive for Staph Aureus need their mastitis control program reevaluated. Staph Aureus is extremely contagious. The main sources of infection are teat skin, teat sores and milk from infected cows. Transfer from infected to non-infected cows usually occurs during milking via contaminated inflations, milkers' hands and common-use wash cloths or sponges. For this reason, staph infected cows should be segregated and milked separately after the clean, non-infected cows.

It is very important that the clean group remain clean. This should be checked on a regular basis by use of the selective culturing media. To carry out the 'clean group' check: Start with an empty tank; milk the clean cows and

take a milk sample from the tank (ie. before the infected cows are milked); freeze the samples immediately; repeat this procedure 3 times, at 48 hour intervals, starting each time with an empty bulk tank. If one of these samples is positive, it means that at least one Staph Aureus infected cow is included in the clean group. If the infected cow(s) within the clean group cannot be identified, composite cow milk samples may have to be taken and cultured. Cows should leave the infected group only through death or culling, or by producing a negative culture result following dry treatment.

## Prevention and control programs

To keep Staph Aureus under control, a good prevention program is a must. This program would include:

- Proper nutrition and sound general vaccination programs for heifers and cows.
- Good sanitation in housing areas.
- Properly designed and maintained milking equipment, and correct usage of equipment.
- The use of good milking management procedures; teats should be clean and dry before machine attachment.
- Teat dipping.
- Dry treatment of all cows.
- Enrolment in the DHI somatic cell count option.
- Culling of chronically infected cows.
- Limited, managed use of veterinarian recommended antibiotics for treatment of mastitis during lactation. Treatment of staph infections during lactation will cure only 10-20 % of infections; therefore, lactation therapy should be limited to severe clinical cases.
- Maintenance of a closed herd to prevent introduction of infected cows.
- Good calf management to ensure that adequate numbers of replacement heifers are available.
- Periodic bulk tank culturing with specific media to monitor staph incidence once staph has been eradicated from the herd.
- Cooperating with the veterinarian and the local veterinary laboratory to establish Staph Aureus control and prevention programs.

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