*Examination of Problem Mastitis Herds in Ohio

Lawrence E. Heider, *D.V.M.*
Extension Veterinarian
The Ohio State University
Columbus, Ohio 43210

Four problems can occur in a dairy herd which may cause the herd to be identified as a problem mastitis herd. These are:

1. Antibiotic residue present in bulk tank milk.
2. High bacteria count.
3. High leucocyte count.
4. Increased number of serious clinical cases with deaths.

1. **Antibiotic Residues.** Antibiotic residues in milk generally occur as an accident. There are, however, still a few who are not convinced of the potential seriousness of this infraction. Regardless of whether or not we agree with the reasoning behind the regulations, we have to realize that the integrity of the milk market could be adversely affected by sensational publicity. A few have been lulled into disregard by the infrequency of sampling. The sampling frequency is increasing, and the goal is to sample every farm tank at every pickup, but the truth is that most producers' milk has been sampled only once a month. The frequency of sampling and the sensitivity of the residue test both affect the likelihood of antibiotic infractions being identified. Just as the sampling frequency is increasing, the sensitivity of the tests applied to milk and milk products is increasing. Veterinarians and producers need to be aware of these changes, and, in view of the serious potential effect of this problem, we need to concentrate our efforts on the prevention of residues as follows:

a. Cows treated by any route must be identified by some visual marking.
b. Regard must be given to withholding instructions on labels.
c. Prescription therapy must be accompanied by the appropriate withholding advice.
d. Bulk tanks that are suspected of accidental contamination should not be picked up, or the milk should be tested before pickup.

In addition to being aware of the preventive measures, it is necessary for us to be aware of the liability involved. Milk from a farm tank is mixed with milk from other farms in a truck. The milk in the truck is mixed with milk from other trucks. This process can go on through additional steps, involving larger and larger quantities of milk. As the regulations are now enforced, milk mixed with milk containing antibiotic residue may not be used as food. In Ohio on at least one occasion, an infraction has resulted in milk being recalled from store shelves.

The following information on milk samples from Ohio dairies gives some idea of the extent of the problem.

Table 1

Month	Samples	Positive	%
1-75	3,541	16	.45
2-75	3,550	16	.45
3-75	3,609	4	.11
4-75	3,413	6	.18
5-75	3,472	9	.25

This demonstrates considerable improvement over an earlier time when 15% of milk samples were estimated to be contaminated.

2. **High Bacteria Counts.** Milk may not contain more than 100,000 bacteria per ml. High bacteria counts in milk are caused by one of three problems or a combination of these.

a. Improper cleaning
b. Improper cooling
c. *Streptococcus agalactiae* infections

Although the veterinarian may not become involved in this problem, he should be capable of advising his clients how to avoid the problem. Almost all high bacteria counts are the result of improper cleaning. Upon learning this, a dairyman with a problem usually reacts by attempting a better job of cleaning. Unfortunately, to many dairymen, doing a better job can have different meanings! Some react by adding larger and larger quantities of chlorine in the sanitizing solutions. This removes the carbon from the rubber parts, which causes pitting or checking and makes them impossible to clean. Or, he may react by washing or soaking for extra long periods of time. Wash water should go into a pipeline at 165° F and come out at not less than 110° F. In winter months in this climate, wash water may drop below 110° F, particularly if it is circulated too long. When the temperature drops below 110° F the fat goes out of suspension

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and clings to the pipeline. This is what provides the media for bacterial growth and resultant high counts. The solution to cooling problems is obvious and the method of handling *Streptococcus agalactiae* infections will be discussed later.

Table 2 illustrates the extent of the high bacteria count problem in Ohio.

Table 2

Month	Samples	> 100,000/ml.	%
1-75	3,541	190	5.3
2-75	3,550	198	5.5
3-75	3,609	241	6.6
4-75	3,413	210	6.1
5-75	3,472	261	7.5

3. **High Leucocyte Counts.** Normal milk contains less than 500,000 somatic cells per ml. Public health regulations allow up to 1,500,000 cells per ml. If a quarter sample or a cow sample contains more than 500,000 cells, it indicates that the cow is infected or has recently recovered from an infection. If a bulk tank sample contains more than 500,000 cells/ml., it indicates that infection is present in the herd. However, if the count is less than 500,000, it does not mean that infection is absent. Laboratories running tests for leucocytes in milk screen the milk samples with the Wisconsin Mastitis Test (WMT). Upon identifying a high WMT reading, the leucocyte count is confirmed using the Direct Microscopic Somatic Cell Count (DMSCC). Only those herds with counts over 1,500,000 cell/ml. as determined by DMSCC are required to take action to reduce infection. It is very common to learn that a herd with a high count has had between 1.0 million and 1.5 million cells/ml (WMT 16-21) for long periods of time. I think we need to take heed of the large number of herds that are nearly in trouble. These herds are losing significant amounts of production because of infection and can be helped by a herd investigation and the institution of a mastitis control program. Table 3 illustrates the extent of the problem in Ohio herds. Between ¼ and ⅓ of our herds are experiencing a regulatory problem or are nearly in trouble with high leucocyte counts each month.

Figure 1 gives a general idea of the relation between California Mastitis Test (CMT) scores, WMT scores, and leucocyte counts.

Table 4 shows the production losses associated with CMT scores on a quarter and a cow basis.

In most cases, when a dairyman gets two consecutive high leucocyte counts he is required to seek the services of a veterinarian. We use the following protocol when asked to assist a practitioner examine a herd.

Table 4

Production Lost

CMT Score	Cow Comparison	Quarter Comparison
t	6.0%	9.0%
1	10.0%	19.5%
2	16.0%	31.8%
3	24.5%	43.4%

Schalm, O. W., Carroll, E.J., and Jain, N.C.; Bovine Mastitis; Lea and Febiger, Phila., Pa.

a. Environment. This is undoubtedly the easiest part of the examination. We are concerned that the housing is clean, reasonably dry, and free of obstructions. We are also concerned that the free stalls or stanchions are of adequate size. The reference for this information is the booklet. *"Dairy Housing and Equipment Handbook,"* a Midwest plan service booklet available through the Cooperative Extension Service.

b. Milking Machine Function. **There is no longer any question about whether or not milking machines affect the new infection rate. Work by investigators in the United Kingdom has demonstrated that vacuum fluctuations adversely affect the new infection rate.** *(See figures 2, 3, 4, and Table 5.)*

The case for good machine function with adequate vacuum reserve is convincing. The discussion can no longer center on who is or who is not going to examine the equipment but rather, has the function of the equipment been determined and is the equipment adequate? Veterinarians need to be knowledgeable in this area. As outlined in the AVMA Mastitis Committee Report in the August 15, 1973 JAVMA, a veterinarian who offers mastitis control program advice for his clients must understand machine function.

The first step in checking a milking system is to survey the entire system. A reference for line sizes

Table 3

Month	Samples	WMT <16mm	WMT 16-21mm	WMT 22+mm	WMT %> 16mm	DMSCC > 1.5 mill./ml.
1-75	3,543	2,593	793	157	26.8%	52
2-75	3,551	2,364	965	222	33.4%	120
3-75	3,609	2,675	764	170	25.8%	106
4-75	3,406	2,368	866	172	30.4%	N.A.*
5-75	3,476	2,459	856	161	29.2%	N.A.*

*N.A. = not available.

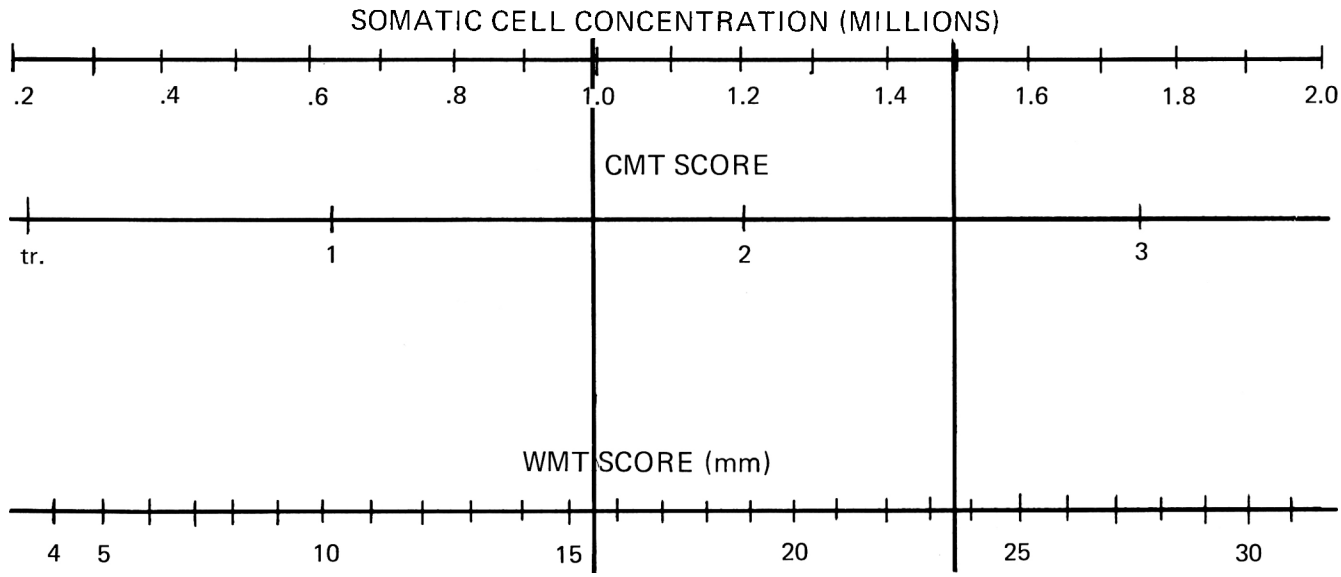

Figure 1. Mean cell concentration equivalents (approximate) for screening test scores. *Adapted from Fig. 2 (Schultze) Proc. ADSA Annual Meeting 1972.*

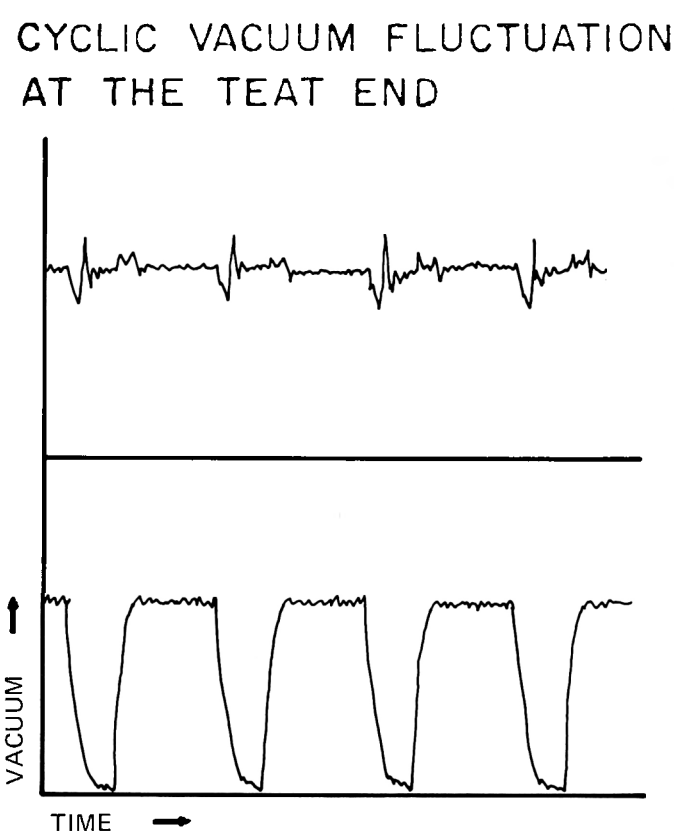

Figure 2. Cyclic vacuum fluctuation at the teat end. *From McDonald, J.S. Proceedings NMC 1974.*

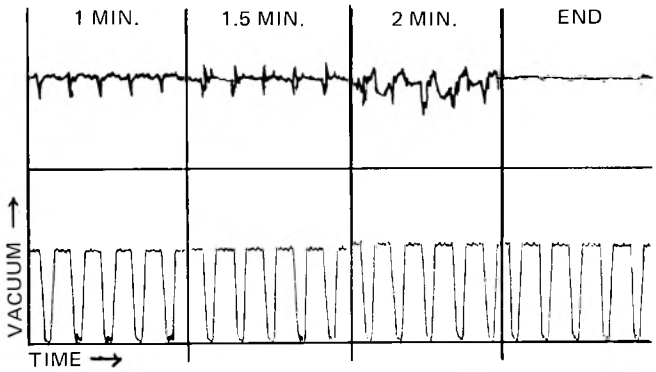

Figure 3. Recordings during dynamic testing at four stages of milking. *From McDonald, J.S. NMC Proceedings 1974.*

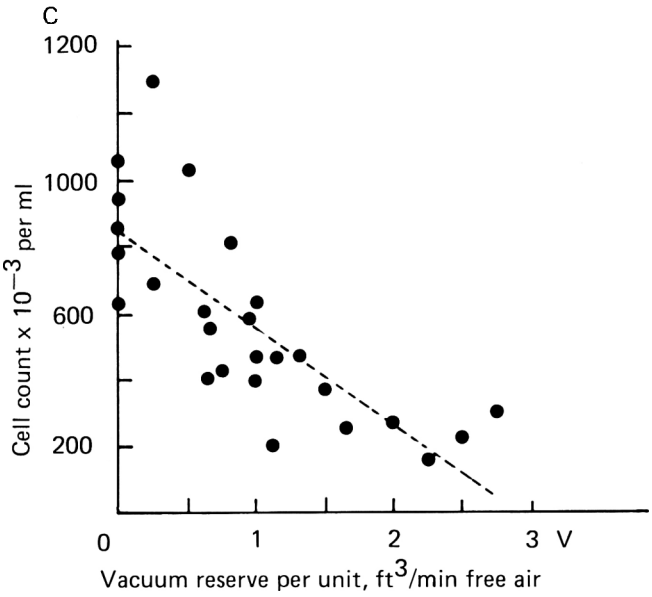

Figure 4. Relationship between mean cell count of herd bulk milk (C) and vacuum reserve per unit (V). C = -142V + 844. (r = -0.58). *Hyhan and Cowhig: Vet. Rec. 1967, pg. 122-124.*

Table 5

Influence of Diminished and Accentuated Cyclic and Irregular Fluctuations in Vacuum, Separately and Together, on Mastitis Infectivity. Results from 11 Experiments.

State of Vacuum Stability in the Half-Clusters	No. of Quarters Becoming Infected in 20 half-udders in 2 Weeks in the Different Trials
All vac. flucs. diminished as far as practicable	5, 1, 2, 3 4
Large cyclic flucs. alone	4, 8*, 6*
Irregular flucs. alone (1 exp. with each type)	2, 1
Large cyclic + irreg. flucs. of liner and pulsation vacuum	12, 13
Large cyclic + irreg. flucs. of liner vacuum only	19, 25, 21, 17, 25

*These are likely to be overestimates. In both trials the machine conditions were large cyclic + irreg. flucs. during peak flowrate, followed by large cyclic flucs. alone until the end of milking. In the last trial (6 infected quarters) the exposure period was 3 weeks. *Thiel, C. C., Proc. NMC 1974, pg. 42.*

and other parameters should be consulted during these surveys until one becomes familiar with the recommendations. *(See "Guidelines for Installation of Milk Handling Equipment," Wisconsin Department of Agriculture, Food and Standards Division, Madison, Wisconsin.)*

The second step is to determine the pump capacity in cubic feet per minute (CFM). The recommendation of 10 CFM (American Standard) per unit on a pipeline milker is supported by observation and research. The recommendation for buckets is 2-3 CFM/unit. Most systems are outdated and do not meet this standard.

The third step is to determine the vacuum reserve. This measurement is made with the milkers pulsating and the vacuum regulators closed. The air flow meter must be open when beginning this measurement. The vacuum reserve should be at least 50% of pump capacity or five CFM/unit or more. Again, many outdated systems have leaks or poor pump capacity and do not meet this standard. Of all procedures, this function test is essential.

Next, the recovery time should be checked. This is done simply by allowing air to enter the system until the vacuum level is lowered by 5" Hg. When the air entry is closed, the system should recover to milking vacuum in three seconds. This is also a good time to check regulator function. A regulator should slowly begin to admit air as the vacuum level reaches milking vacuum. Many regulators need cleaning and will stick. When this happens, the vacuum level goes above, then below milking vacuum level. You can hear the typical sounds of normal and abnormal regulator function and can differentiate them with experience.

Pulsator function should be determined with a vacuum recorder. Three companies, Detco, Surge, and DeLaval, have recorders available. Some experience is necessary to determine ratios and function on a vacuum recording but it is not difficult. A vacuum recording is the only test that completely evaluates pulsating action and it should be done on every pulsator when checking a system. The vacuum recorder may also be used during milking to record vacuum level and changes in vacuum level at the teat end. This may be done visually with a vacuum gauge or an inflation tester but this method will not provide a record of the test. Vacuum fluctuations at the teat end should be minimal. Some workers have established a maximum of 2" Hg. for vacuum fluctuation. This appears to be realistic but competition between manufacturers should result in more equipment that functions without any fluctuation.

The above is essentially what we do in evaluating equipment. There are other more detailed discussions of equipment function *(see McDonald, JAVMA 1-15-71 and Proc. NMC 1974).* We realize that many factors have an effect on fluctuations and teat end massage. Once the determination is made that equipment function is inadequate, we advise the owner why, in our opinion, the function is inadequate and how corrections can be made.

The purpose of this discussion was not meant to be all inclusive. Rather, I hope that it will encourage more veterinarians to become more knowledgeable in machine function and evaluation, and although many will not want to evaluate equipment, at least they will know what questions to ask!

c. Milking Technique. The National Mastitis Council has a prepared poster listing the procedure for good milking technique. When examining a problem herd it is necessary to observe the milkers at work. Although they will be trying to do their best, the important aspects of milking technique can be emphasized during this time.

A watch should be used to determine the time between the start of udder washing and machine attachment. This time should not be longer than 30 to 60 seconds. Sibaja and Schmidt in *JDS*, 4-75, pg. 569, have shown that the plasma oxytocin level reaches its peak at about 90 seconds after the start of washing udders. The oxytocin level reduces to prewashing levels in four to five minutes. Consideration of these times is important if complete milkout is desired. And, if cows are not milked out completely, infection rates will increase. Cows' udders should be dried after washing. Disposable paper towels, one per cow, should be used for washing and drying. Cows should be milked out but should not be overmilked. After milking, teats should be dipped in an *effective* teat dip. For a complete discussion and efficacy data on teat dips you are referred to *Philpot, Proc. NMC, 1975, or Pankey and Philpot JDS 2-75.* We use 5.25% sodium hypochlorite (chlorox) in The Ohio State University herd. It has been effective and has not caused any problems.

d. *Cow Examination.* Following the observation of milking technique we do CMT's on 10-20% of the cows and collect cow samples for culture. The CMT is useful to demonstrate to the owner the extent of the problem. The cultures are necessary to plan the course of therapy. We use Mastassay D for convenience in culturing. For a further discussion of the subject see *Kowalski, Proc. AABP, 1974.* If the organism is predominantly *Streptococcus agalactiae* we recommend therapy on a prescription basis by the veterinarian. If the prevalence is above 50%, as it frequently is, we generally recommend treating all cows in all quarters with one million units of crystalline penicillin. After witholding milk for 72 hours, it is wise to have the first milk saved and checked for antibiotic residue.

e. *Dry Cow Therapy.* As a general recommendation, we recommend that problem herds begin using a product which contains either 0.5 gram Cloxacillin or one million units penicillin plus one gram dihydrostreptomycin. These products are available only through veterinarians. They have both been used in control trials where their efficacy has been established.

4. **Increased Number of Serious Clinical Cases with Deaths.** This problem has been best described by *Newman and Kowalski, AJVR, Vol. 34 No. 7, pg. 979-980, July, 1973, and Newman, Proc. AABP, 1974.* We have many dairymen using sawdust bedding but have not seen the *Klebsiella* herd problem. The most serious problem investigated during the past year was associated with *Prototheca sp.* This case was linked to excessive and poor technique in using antibiotic infusion tubes. The underlying cause was Staph. mastitis, predisposed by poor milking technique. We feel that most of the problem herds in this category will respond to the procedures listed under high leucocyte problems.

References

Managed Milking Guidelines, Publication No. 633, Extension Division, Virginia Polytechnic Institute and State University, December, 1974, $1.25

National Mastitis Council, 910 Seventeenth Street, N.W., Washington, D.C. 20006, Proceedings available for $4.00 per copy, 1975 Proceedings - Teat Dip Efficacy. 1974 Proceedings - Machine Function, Evaluation, etc.

Inflation Tester, Zero Manufacturing Company, Washington, Missouri 63090.

AABP Proceedings, American Association of Bovine Practitioners, Executive Secretary-Treasurer, H. E. Amstutz, D.V.M., Box 2319, West Lafayette, Indiana 47906.

Vacuum Recorder, Detco, Inc., P.O. Box 881, Whittier, California 90608.

Practice Tips

I had the opportunity to follow to the local locker plant a cow in which I had diagnosed right side or twisted abomasum displacement. When the butcher pulled the cow up by the hind feet, I opened her just right of the midline posterior to the umbilical for examination. The abomasum rotated to its correct position very easily. Since then I have performed successful surgery on such cows by placing the cow on her back and raising the rear legs so the tail head is about one foot off the ground. The abomasum can be rotated and stitched with vetafil as with routine surgery.

An interesting complication is the udder which completely covers the surgical area unless held out by an assistant.

I am currently seeking information relative to surgery on adult cows which still suck either themselves or other cows. I believe there is a way of removing a "V" from the ventral surface of the tongue and resuturing it to prevent its cupping. Any information relative to procedure, anesthesia, hemorrhage, etc., would be appreciated.

Which product, and which dosages are being used to inject the eyelids of cattle in the treatment of infectious keratitis? I feel that the black eye-patch is a complete fizzle.

L. J. Magnall, *D.V.M.*, Tripoli, Iowa

Mastitis Treatment–Bovine Intramammary - s.i.d. Infusion: 500 mg. Poly Flex (Bristol); 400 mg. Neomycin; Q.S. to 12 cc sterile H_2O.

Parenteral: 200 mg/lb. Polyflex I.M. s.i.d.; 400 mg Neomycin/lb I.M. s.i.d.

Colibacillosis–Baby Calves: 1. "Oral Tevcocin" - 500 mg I.M.; 2. Chloramphenicol Caps Oral - 750 mg/b.i.d.; and 3. Fluids–oral and parenteral.

R. M. Love, *D.V.M.*, Monticello, Fla. 32344