Mastitis - Update on Recent Findings

Dr. Darrell Johnson, *Presiding*

Robert B. Bushnell, D.V.M.
Veterinary Medical Extension,
University of California, Davis, CA 95616

Most opportunities for a veterinarian to initiate a mastitis control program on a dairy occur because a dairyman is having mastitis related problems. If a veterinarian develops a planned approach aimed at solving the initial problem along with a long term goal of an extended control program, he usually will find the owner receptive. Progressive dairymen today are seeking ideas for stabilizing management procedures directed toward maintaining healthy herds and high production.

With the advent of **somatic cell** counting equipment, many dairymen are becoming more aware of somatic cells as a barometer for herd health. Consistent counts of fewer than 200,000 somatic cells/cc of milk are attainable, and many people become concerned when counts exceed 500,000/cc. Excessively high somatic cell counts can be attributed to cows with CMT readings of 2-3 (over 2 million cells), which are almost entirely due to chronic *Streptococcus agalactiae* and *Staphylococcus aureus* infections. Thus, a herd's high somatic cell count is the result of *Staph. aureus* or *Strep. ag.* infections.

Excessive numbers of **bacteria in the bulk tank milk** may or may not be the result of mastitis infections. *Strep. ag.* and *Prototheca* spp. are the only organisms that are shed directly from infected udders in numbers great enough to produce bacteria in excess of 50,000 colony-forming units per cc in the shipped bulk milk. Numbers of *staph. aureus* organisms appearing in the milk as a result of infected cows are generally fewer than 20,000 organisms per cc, even in heavily *Staph.*-infected herds.

Other types of udder infections, either acute or subacute, do not shed organisms into the milk in numbers sufficient to create a detectable bacteriological problem, whether it be standard plate, coliform or after pasteurization counts. These organisms are present in the bulk tank as a result of poor cow sanitation prior to milking, incomplete equipment washup, incubation of milk within the system, such as in dead-end lines, milk filters, or inadequate milk cooling.

Peracute flareups of mastitis or chronic cases resistant to therapy often constitute a major complaint to veterinarians. Bacteriological culturing of milk samples taken by the dairyman from clinical quarters prior to treatment and of samples from selected quarters which show persistent clinical disease is an important first step in an investigation of the cause of the disease. A complete history, physical examination of affected quarters, and inspection of the details of a dairyman's treatment procedures are necessary to establish the sequence of events which lead to the various types of mastitis infections.

Probably the most complex complaint to investigate is one associated with **loss of milk production,** because so many factors other than mastitis can be involved. Improper nutrition, an inadequate milking system, transient voltage, extended lactations due to inefficient breeding, inferior genetics, corral and weather conditions, and other stressful situations frequently are contributing factors. But certainly mastitis can be either a primary or a secondary contributor to production loss.

Monthly barn-sheet summaries of DHIA tests and DHIA individual cow records may help pinpoint some of these problems. For example, wide fluctuations in AM-PM milk weights of individual cows is always a tipoff of a possible mechanical defect in the milking parlor.

A thorough investigation of the potential for mastitis infection to occur on a given dairy could include the following:

1. *Heifer calves.* Immature udder infections can occur in the heifer raising areas. Calves that are maintained on natural milk after being placed in group pens are at higher risk for udder infections initiated by sucking of teats by penmates. Ideally, calves should not be fed natural milk in group pens.

Immature udders can become infected from the feedings of natural milk contaminated with *Strep. ag., Staph. aureus,* or *Mycoplasma* spps. Many people consider milk from clinical mastitic cows to be high in these organisms; however, mastitic milk is no more likely to be contaminated with *Staph.* or *Strep.* organisms than is the fresh milk from the bulk tank. *Mycoplasma* will be found in higher numbers in the hospital milk when clinical disease is occurring.

Flies feeding on teat ends, excessively muddy or contaminated corrals, or estrogenic feeds, such as clover hays, can also increase immature udder infections that will become evident at freshening or during the first lactation.

Outbreakes of coliform mastitis in springer heifers is commonly found. Those infections which become clinical are initiated near freshening. Clinical flareups from *Staph.* observed at this time are considered to be the result of infections which occurred in the young calf fed

contaminated milk.

Regardless of the organism involved, the clinical disease is exacerbated by the feeding program. Heifers raised on high energy feeds in the prepartum period, particularly the last 30 days prior to calving, are extremely prone to this mastitis syndrome. Feeding a ration balanced in protein, energy, fiber, and Ca-P will yield the best results in reducing this problem.

A similar syndrome occurs in freshening cows and, again, is related to a diet high in energy. Heavy challenge feeding programs that begin in the prepartum springer pen potentiate masitis due to the early letdown of milk in these prepartum cows. Acute coliform mastitis or flareups of chronic *Staph.* quarters can occur as in heifers. The nutrition of dry cows can have a dramatic impact on cow health in general.

Feeding regimens are an important factor in drying cows during the end of lactation. Milk which remains in the udder for several days or weeks into the dry period is an open invitation for infection. High-energy rations and contaminated corrals create an unhealthy situation. Although dry cow therapy plays an important role in this process, its benefit can be offset by poor management of the cows at this time.

Sound nutrition and management dictate that the dry cow period should be divided into three separate periods:

The *post milking period.* Ideally, in preparation for udder infustion after the last complete milking, teats should be dipped in an iodine based product, which is allowed to dry momentarily, and then teat ends should be cleansed with a cotton dipped in alcohol. If *Staph.* and *Strep.ag.* are evident in the herd, all four quarters should be infused with a labeled dry-cow product. Antibiotic sensitivities run at 6-months intervals against *Staph.* will help guide the decision in selecting products for treatment. After infusion, each teat should be dipped again in an iodine product. If unsanitary corral conditions are uncontrollable, one to two coats of a barrier dip can follow the iodine. However, the barrier dip should be used freshly from the bottle for each set of cows because the dip becomes contaminated easily.

Most importantly, during this phase the cows should be placed under observation in a separate area and fed a limited diet of longstem oat hay or poor quality grass hay for 7-10 days. At 3, 5, 7 and 10 days, the cows' udders need to be observed during feeding time. Swollen quarters or udders which fill excessively with milk should be selectively milked out and retreated. Normal cows need not be handled again.

Selective dry-cow therapy may be carried out successfully in herds in which *Strep.ag.* is eliminated and the *Staph.*-infected cows, if few in number, are identified ahead of time. In that case, all four quarters of *Staph.* cows are infused. Other cows with selected problem quarters or chronic CMT 2 and 3 histories should also be treated. Known repeat problem quarters may be brought in, stripped and retreated 2-3 times during the 7-10 day drying-off process.

At the end of this period the **dry cows are transferred to a midlactation pen,** where they receive a balanced forage ration dependent upon the commodities available. An example of a balanced ration on a dry-matter basis is 1/3 corn silage, 1/3 alfalfa hay, and 1/3 oat hay, with a trace mineral salt and Ca-P supplement mix offered free-choice.

The third segment of the dry period includes the springer cows and heifers 7-14 days prefreshening. In this pen, cows should be maintained in as clean an environment as possible when udders begin to swell with milk. The ration should contain the balanced forage as given for the mid-lactation cows, plus 3-5 lbs. of grain. Another workable thumb rule is to feed this pen the same ration provided for the string of cows producing 40-45 lbs. of milk daily. Ideally, the cows will freshen on this ration and be kept on it for 5-7 days post-calving.

Udders that show evidence of mastitis in the springer pen should be stripped and infused 1-3 times with a mastitis formula for lactating cows. (Dry-cow products may produce prolonged residues if used too close to freshening.) The same double teat-dip procedure before and after infusion should be followed.

The majority of mastitis infections and resulting treatment will occur in cows during the lactation period. However, the factors previously discussed cannot be overlooked as to their importance and subsequent influence on mastitis observed during the lactation period. A veterinarian's thorough investigation of a herd with mastitis may not always be carried out because of the commitment of time involved and because often easy solutions may not be found. However, the veterinarian will feel his approach is more complete if he appreciates all the options open to him in investigating a disease problem. There is no doubt that a thorough analysis will yield long-term benefits and lead to the development of a continuing mastitis control program if he so desires.

There are several areas to be considered in preparing for mastitis control work: The first is bacteriology.

1. **Screening bacteriology** needs to be accomplished to help provide a basis for the types of infection to be dealt with. Each type of infection may have a separate origin and thus require a separate set of standards for solution.

Tank milk is readily accessible; however, 3 or more separate samples taken over a week or longer period should be examined before conclusions are drawn. A single sample often can be inconclusive or misleading.

Samples of clinical cases taken before treatment should be collected by the herdsmen or by the veterinarian in a sanitary manner. Samples of chronic or nonresponsive cases should be taken even though they have been treated previously. These various samples can be collected over a week's period and frozen for the veterinarian to pick up later for laboratory analysis.

Fresh cows. During the same time period, the dairyman should collect composite samples from all four quarters of each cow and heifer 2-3 days post freshening. Fresh heifer samples should be marked with (H), fresh cows with (F), and

clinical quarters with (C) so that upon examination of the culture results the isolates can be interpreted based on the type of sample they represent.

2. **Culturing the entire herd.** The results of the screening procedures plus conclusions drawn from an investigation of the dairyman's problem will indicate whether composite milk samples should be collected from the entire milking herd, or perhaps a portion of the herd, or whether it would even be of any benefit to sample the milking herd.

Culturing of the herd is indicated if *Strep. agalactiae, Staph. aureus* or *Mycoplasma* ssp. are the primary disease-producing organisms, because they are considered highly contagious. If clinical coliform or non-*agalactiae* streptococci (such as *uberis*) are identified, then herd culture is not necessary because these organisms are not considered to be spread principally by cow-to-cow contact.

Situations where combinations of infections occur may frequently be encountered. For example, the major clinical disease identified through clinical samples could be due to coliform organisms, yet high CMT scores or bacterial numbers in the tank milk are related to a substantial level of *Strep. ag.* or *Staph. aureus,* which are not always readily identified in clinical samples. Concurrently, very resistant forms of mastitis may be found which are due to *Norcardia,* yeast, mycobacteria or *Prototheca* infections. These result from the contamination of udders through faulty treatment of the initial *Strep. ag., Staph. aureus* or coliform infection. Thus, three types of situations can exist concurrently in a given dairy herd. In investigating a herd problem, it is necessary to identify the various types of infection and the separate management factors leading to their introduction into the udder.

Laboratory procedures. Somatic cell estimations combined with microbiological identification in all milk samples will always yield more useful information than if either procedure is used alone.

Foremilk samples taken carefully and cleanly after removing 2-3 squirts of milk from each teat offer the best chance for identifying causative organisms. Somatic cell numbers will always be higher in foremilk, and therefore these samples will always be more sensitive indicators of udder inflammation than are composite samples collected by the DHIA tester. *Strep. ag., Staph.* and *Mycoplasma* isolations are considered significant, even in the presence of low somatic sell numbers. But non-*agalactiae Strep.* and micrococci are not considered significant unless somatic cell counts exceed 2 million/cc.

Simple blood agar media containing 5% washed bovine blood cells[1] is the single media that allows the broadest growth of organisms. It supports the growth of bacteria, yeasts, fungi and algae. Plates are generally read after 24-30 hours incubation at 37° C. If read earlier than 24 hours, frequently hemolysis, used as an identification criterion for *Staph. aureus,* will not be fully developed, and those organisms in doubt should be incubated for an additional 10-12 hours. When plates are not read until after more than 36 hours incubation, it is more difficult to define colony types morphologically.

Media plates which yield negative growth after 24 hours incubation with milk taken out of **clinical quarters** should be reincubated and read at 24-hour intervals for up to 5 days. Often, *Nocardia* and other slower growing organisms will not appear until after 72 hours incubation.

Special *Mycoplasma* media[2] must be used for identification of *Mycoplasma* species. After incubation at 37° C. in a CO^2 atmosphere, plates may be read as early as 72 hours but should not be declared negative until after 7 days of incubation.

If possible, the *Mycoplasma* species isolated from a herd for the first time should be differentiated by F.A. tehniques. *M. bovis,* the most common *Mycoplasma* udder isolate, tends to be more pathogenic and more contagious under field conditions than are the other *Mycoplasma* species which are encountered.

Equipment Examination

The purpose of this paper is not to discuss milking equipment examination or function in detail, as other excellent references are available.[3] However, we should be aware that standard equipment checks for adequate vacuum, line size, milking stability and pulsation ratio may not always uncover milking deficiencies. In addition to the above procedures, we should spend time in the parlor during milking to observe the following:

1. *Cow disposition.* Nervous cows can affect milk letdown and thus limit complete milk-out. Some cows should be examined by handstripping the quarters after the unit is removed in order to estimate complete milk-out. Excessive residual milk is a sign of improper equipment function, stray voltage or cow temperament.

2. *Inflation function.* Poor inflation function due to design, composition, or excessive wear produces three observable results:

   a. Audible squeaking or sucking of air around the mouthpiece.

   b. Hard teat ends, sometimes blue from congestion, or with pinpoint hemorrhage from improper massage.

   c. Grooves cut into the base of the teat from an excessive hard inflation or tight mouthpiece.

3. *Unit placement and adjustment.* Faulty placement or setting of a unit may result in poor milk-out, liner slippage, liner crawl, or falling units.

4. *Milkers' removing individual inflations prematurely* because of low production in individual quarters is an indication of excessive numbers of light quarters or blind quarters resulting from mastitis.

5. *Rough handling of equipment* and frequent overrides of automatic features by the milkers lead to poor milking practices.

6. *Proper action of automatic unit removal and backflush systems* can be tested only by observation.

7. *General sanitation procedures,* including use of preparing the cow, sanitizing milking units between cows,

teat-dipping procedures, should be noted.

8. *Evaluate types of sanitizing products,* including use of proper concentrations and compatibility with water on the dairy.[4]

9. *Examine teat ends for various forms of skin lesions* (pseudo cow pox, mammalitis virus, warts) or excessive eversions or scabbing of the teat orifices.

Handling of various types of infections

With the expense and effort involved in culturally evaluating the secretions of each milking cow in a herd, there must be some level of agreement between the veterinarian and the dairyman ahead of time that the information will be used effectively. The owner of a larger dairy needs to be ready to segregate cows, which means that facilities and feeding options need to be discussed beforehand.

Strep. ag.-infected cows. Cows close to the end of lactation can be dried off and their udders infused with dry-cow medication. Chronic non-profitable cows can be culled. The remaining lactating cows should be infused in all quarters with 1 million untils of procaine penicillan G and their milk discarded for 84 hours. A 90-95% cure rate can be expected. If there has been no dry cow therapy program to this point, or if a program has been poorly conducted, all cows in the dry pen should be infused with the same lactating penicillin product.

Staph. aureus. Unlike *Strep. ag.* infection, a *Staph. aureus* infection should be viewed as incurable, even though consistent dry-cow therapy has been practiced and will continue. Little, if any, benefit can be derived from mass treating lactating cows infected with *Staph. aureus.* Both short-term and long-term benefit will be derived from segregating these cows into a separate string and milking them last. On each successive lactation they should always return to the *Staph.* string, even though a subsequent culture may be negative.

Once cows are segregated, the percentage of cows culled from the *Staph.* string can be expected to increase 50%. Not only is milk production and chronic mastitis a problem in many of the *Staph.*-infected cows, but their reproductive performance as a group is inferior to the rest of the herd and comprises a major reason for culling.

Mycoplasma species. *M. bovis* is the most pathogenic and most common(60%) of the bovine udder *Mycoplasma* isolates. Other mycoplasmas can also cause severe clinical disease, but spread within the herd appears to be controlled much more easily. Although the original source and epidemiological factors causing introduction of *Mycoplasma* within a herd are poorly documented, field investigations and some research support the following theories:

1. *Mycoplasma* can be introduced into a herd through the purchase of older cows or heifers.
2. It may be introduced indirectly through contaminated equipment used in the milking parlor, such as testing equipment.
3. It may arise spontaneously through mechanical transfer from nasal or vaginal secretions containing the organisms coming in contact with the udder. Handling sick calves, contacting their nasal secretions, and then infusing udders of cows may be one means of transferring organisms.

Once introduced as a mastitis infection on a dairy, the **first common mode of spread is through udder infusion.** This includes the infusion of clinical quarters or udders with dry-cow medication. Most cases are first found in the hospital string, where they automatically are placed because of the nonresponsive nature of the infection. Here they continue to spread infection to fresh cows and others placed in the string for treatment of various conditions.

As cows start to break clinically in the milking string, the milking machine, milkers' hands, and other contact surfaces become the primary fomites of disease. If called at the inception of a mycoplasma epidemic, the veterinarian will find the majority of cases (99%) are already isolated in the hospital string or have been culled due to nonresponsive therapy. Very few *Mycoplasma*-infected animals, if any, will be found in the milking strings at this time. However, after infection has existed for several months in a herd without adequate control, normal-appearing shedders and latent shedders will be found in the milking strings as well as in the dry cow group. Culturing of all cows will reveal the extent to which these unrecognized infections exist. At this point, the prevalence of infection and the economics of the individual herd will dictate whether complete culling of all known carriers is preferable to living with the disease through segregation, improved sanitation in the milking parlor, and careful treatment regimens.

Coliform infections arise from the environment. Even though contamination and increased populations of bacteria in the bedding areas have a direct bearing on increased clinical disease, procedures which occur in the milking parlor are the real precipitators of disease outbreaks. Coliform-type infections often result in peracute mastitis, but 80% of infections cause milder clinical signs. In some herds, 40-50% of infections can persist after treatment and cause subsequent flareups. Chronic disease can be a sequel in 25% of the more severe cases.

Antibiotic treatment may have little actual bearing on the outcome of the disease in the udder. Because of the fact that 80% of the organisms causing disease in a given herd are of different types, antibiotic sensitivity patterns and the reaction occurring between the bacteria and the cow are always variable. Most systemic treatment in the peracute case is aimed at combatting the endotoxic reactions, sustaining fluid balances, and preventing secondary infections.

Prevention of coliform mastitis must be approached along four lines:

1. *Reducing bedding populations of coliforms* by using bedding materials that are as inert and as dry as possible. Bedding choices are not always available.

Manure is acceptable if dry and maintained dry. Sand is excellent if available, although it is detrimental to manure pumps in flush-down systems.

Screened manure solids are usable if composted for 60 days and managed properly. Sawdust and shavings are more dangerous because when moisture is present, their nutrient components tend to promote selective growth of *Klebsiella* organisms. Rice hulls and straw are very useful bedding but in some situations may be difficult to handle and maintain in free-stall areas.

2. *Being certain cows' udders are dry when milked* and that udders are not re-sprayed with water during the milking process is extremely important to prevent migration of large numbers of bacteria down the inflation during milking.

3. *Equipment must be working properly;* particularly, all pulsators must be functioning. Liner slipping and leakage is a major factor in precipitating infections, so these should be monitored closely. Air inlets in the short milk tubes should not be present in conjunction with an air inlet in the claw, a very common finding. If maintenance of air inlets in the short milk tube is questionable, they should be eliminated and only an inlet in the claw used.

4. *Premilking sanitation* must be optimal. Flushing or washing the teats in 100 ppm of iodine will reduce coliform numbers by 98% if properly done and can be a major factor in preventing infection. The udder must not become wet in this procedure because excessive runoff will nullify the germicidal effect. Although teatdipping post milking with germicidal products has not been proven to prevent coliform infections, dipping premilking has been shown to be beneficial. The risk of causing milk residues with premilking teat-dipping is high with products currently available, but teatdipping premilking of the most susceptible high-producing cows may be recommended for short periods in an epidemic. Experimental products may be marketed in the future that will reduce the hazard of residues from premilking dips.

Other environmental infections, such as non-*agalactia* streptococci, have epidemiological features and require control measures comparable to those of the coliforms. The one exception to this observation is that control of non-*agalactiae Streptococcus* infections may benefit from post miling teat dips.

Nocardia, yeasts, Mycobacterium, Pseudomonas and Prototheca infections generally result from contamination from unsanitary practices in udder infusion (*Nocardia*), increased numbers present in the environment through water contamination (*Pseudomonas*), or unknown sources (*Prototheca*). Improving udder infusion practices is always a major consideration when these types of organisms are found in the udder.

A systematic approach to a mastitis control program can be rewarding for both the dairyman and the veterinarian if both are willing to consider the many facets of the disease which lend themselves to improvement. Frequent contact with management and the use of a regular periodic program to moniter the herd bacteriologically, examine routine equipment function, and evaluate milking, treatement, sanitizing procedures, housing, and nutrition form the backbone of success.

References

1. National Mastitis Council. Microbiological Procedures for the Diagnosis of Bovine Mastitis. 1969: 27 pages.—2. Jasper, D.E. Bovine mycoplasmal mastitis. Jour. of the Amer. Vet. Med. Assoc. 1979: Vol. 175:1072-1074. — 3. Smith, F.F., Leonard, R.O., Eide, R.N., and Fairbank, W.C. Milking System Design and Performance. WREP No. 8. Univ. of California. 1980: 29 pages. — 4. Bushnell, R.B., Brazil L., and Douglas, L.R. Evaluation of hygiene in controlling mastitis on large dairies. Proc. 3rd Int'l. Cong. on Hygiene (Vienna). 1980: 130-133.

Panel Discussion

Question: Barrier dips—What about these?

Answer: The barrier dips are like teat shield, teat coat. Some are non-germicidal, but they're meant to coat and seal the teat. I know that most of you are familiar with these. The theory is that you prevent infection occurring when the animal goes back and lies down in the bedding area. The material has to be removed almost by hand. It doesn't come off easily so that takes extra labor which the milker in large areas do not want. The dips do become contaminated and we've cultured some of these dips and you can recover Strept, Staph and Coliform out of them in very large numbers, so they don't kill the organisms and you can actually spread these organisms. If you are in hurry and you are trying to prevent Coliform, you will spread staph and strep ag. with the barrier dips. We've encountered places where we have had flare-ups in drying cows, cultured those barrier dips and they are just loaded with organisms. They are actually contaminating those cows because they have had poor management of the dip. It all goes back that a product is a pretty good product sometimes if you use it the right way, but you find that dairymen are just not conscious of contamination of products. And contamination of a teat dip with other organisms is a major factor in the spread of disease. So our experience with barrier dips has not been good.

Question: Do you check iodine and pH levels?

Answer: There are iodine test kits available through most of the commercial companies. You can also make a test using a starch indicator which is accurate enough to determine the iodine level in the end product. The pH can be checked

with pH papers in a field situation, but if you are doing a trial and want to really be accurate then you had better do it with a pH meter. As you know, pH changes so if you take a sample in the field and bring it back to the laboratory it is not accurate, so you want to test it in the field. So I would say a simple iodine test kit and a pH paper, trying to get on the acid side of the pH cycle, hopefully below four and the levels of iodine we talked about for each procedure, are your goal. Iodines are more functional on organic matter at an acid pH.

Question: What are the advantages of an iodine teat dip?

Answer: One of the beauties of iodines is they have good residual activity and it's fairly hard to contaminate an iodine solution. This is not true of some of the other teat dip products on the market and it's one of the disadvantages. I would say that any time a teat dip becomes grossly contaminated, manure and stuff in it, (never use sponges in it for example), you want to have them clean it out. But certainly if the solution at all looks clean, let them keep using it because it is expensive, they are not going to throw it away.

Quesion: What is the strength of the product?

Answer: It depends on the stability and preparation of the product. There are a lot of products, 5000 parts products, that we tested in the laboratory looked just as good as the 10,000 parts and I think are acceptable in the field. We are going to see products come out that will even be lower than that eventually. A lot of the problem has been stability. Stability the iodines have put in there. And I think we've got a lot of these things licked now so I would say that in most situations the 5000 parts are good enough to be used. The thing I probably didn't go back and re-emphasize enough was that there are three things in the milking timetable. Number 1 is the cow is dry and clean. Number 2 is the action of the inflation, if you have sucking of air inflation or old inflations, you're going to have problems. The third thing is the air inlet that I mentioned earlier. If you have a double air inlet and a short milk tube in the claw you're in for some trouble. So those in a coliform situation are the three things you look to in a dairy farm.

Question: What are some other factors?

Answer: I quess you start assuming that if you have a pulsator deficiency you are going to cause infection of coliform and other organisms too. That's an important point. You want to be sure that your basic systems function properly. But in addition to that, these other things then become important.

Question: Why are coliforms important?

Answer: Because if you've ever tried to sample a cow that's wet, it's almost impossible to get a sample without getting coliforms in it. Meanwhile you dried it and take that sample quickly. So what happens is that the water causes migration of the organisms down the teat and most of that migration occurs at the end of milking and certainly it occurs greater if you have poor sealing of the liners and so forth. You can take a sample of milk out of the shortmilk tube when the cow is milked dry in a coliform situation and you can find hardly any coliform as she ends milking, but in the wet cow they are in there by the millions. So it's a matter of increasing the migration of organisms to the end of the teat at the end of milking. If the whole udder is wet you've got to let it drip dry, but if you are going to have to sanitize, you concentrate only on the teats and the area you can dry.

Question: Do not get the whole udder wet?

Answer: In a stall barn if you go to a five-gallon bucket and you put 200 parts of iodine in it and you dip the whole claw in it, you'll do a pretty good job. It's not as effective as back flushing but you don't have the worry. If you were going to flush it in the gutter then you should have a hose. But in a cold weather situation I can see that a bucket would be the best way to go and we've been very successful with buckets where you maintain a high enough level of iodine and dip the whole unit in it, it's not too bad. Just dip it in and pull it out, shake it dry and if you can hang it for a little while, that's great, otherwise just go on to the next cow.

Question: How many times can you use it?

Answer: You can dip about 40 cows in it.

Question: What about the take off system?

Answer: In a hand take off system, by the time you get that unit out of there, a lot of milk has been shaken or drained out of the claw. It's not like in the automatic take off, you see it sitting there with an inch or half an inch of milk in it. So when you physically remove the unit and it's being swung around and usually you are taking it in and out you don't have residual milk in it when you take it off by hand and dipping it in the bucket. For practical experience, the bucket dipping is not the best but if you did not have another option, that is the way I would go, but if you could rinse with water and rinse with iodine and rinse with water and do it all by hand, sure that would be ideal, but you can't get these guys to do it. One of the measurements we make in the automatic back flushes system is the amount of visible moisture and that's why they have the air dry and the blow dry at the end; mainly it's to get the water that's out of that loop that's in the milk hose or anything that's in the claw, but there's no measurable impact of water in the milk in a properly designed system. If the udder is basically dry, the amount of moisture that is there is going to be sucked in, that usually will be gone at the first part of milking. It is the moisture at the end of milking that gets you into trouble. The first approach would be to see if you could get those udders clean when they came in, either in a wash system or something else. Maybe you don't have that option. If you don't have that option, then your best chance is to concentrate probably on the teats. If you do the teat and the base of the teat, the only thing that I could suggest would be put the units on properly. They are not going to contaminate that much, but certainly if they have to wash that whole udder she's going to have to drip dry for 10 or 15 minues before you can get eough moisture off. If this is occurring and they do not have coliform or strept ag. problems, you know you probably wouldn't change the procedure, but if they're having a problem, then you have to look at their procedure as a deficiency.

If you concentrate on the teats, hopefully the manure and mud that is on the udder is a little bit dry, semi-dry, so it's not going to run off. You may knock chunks of it off. But I think in a situation like that you are better off concentrating on those teats and leave the udder alone, especially if it is sticky muddy than trying to wash that whole udder. I don't know what else to tell you, but you have to improvise and design a way out.