

Chapter 3

Herd Health Issues

Cows Riddled with Magic Bullets

Just after the turn of the century, German chemist Paul Erlich wrote about an imaginary, ideal drug that would act like a magic bullet, killing pathogens without affecting the patient. When the antibiotic properties of penicillin were discovered in 1929 by Dr. Alexander Fleming, many people thought that the search for the magic bullet had met with success.

Antibiotic use is now routine in veterinary practices, but it has become apparent that penicillin and other antibiotics are not magic bullets. Strains of bacteria can become resistant to antibiotics. Antibiotics can have side effects, too. Consumers are especially aware of one side effect: potential antibiotic residues in milk and meat. The movement to restrict antibiotic use in certified organic products is consumer driven. Many consumers have the impression that organic dairy farmers never use antibiotics at any time.

The current organic standards do not require total abstinence from antibiotic and hormone treatments, but with more stringent restrictions and withdrawal periods, these tools become uneconomical.

What are the proven alternatives? The only 100% effective organic herd health tool is prevention. Nutrition and the cows' environment are the two key factors dairy farmers control to prevent disease. When a health crisis does arise, it can be managed with acupuncture, homeopathy, and a variety of home remedies. What we have learned from numerous organic producers is that a holistic view of farming needs to include the livestock, not just the crops and pasture. Instead of concentrating on killing disease organisms, holistic vets emphasize strengthening the cow and letting her immune system do

its job. Supportive therapies and nutrition take the place of active intervention with antibiotics.

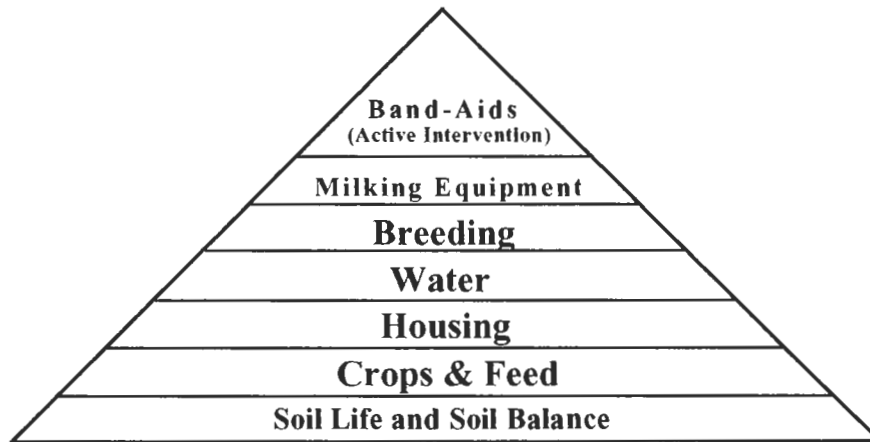
An Ounce of Prevention is Worth a Pound of Cure

Organic farmer Bill Welsh of Lancaster, Iowa, says, "Healthy soil makes healthy crops, healthy crops make healthy livestock, and healthy livestock make healthy people." While this statement seems to make a lot of sense, many people in the conventional food industry strenuously object to the claim that chemical-free agriculture produces human food that is more wholesome or forages that are better for livestock. In the book *Empty Harvest*, Dr. Bernard Jensen and Mark Anderson note that continuous cropping without rotation can deplete micronutrients from the soil. Commercial N-P-K fertilizer can assure a good-looking crop year after year, but the food may lack the trace levels of iron, zinc, copper, calcium, boron, and other elements needed for a fully functioning immune system. Jensen and Anderson coined the words 'empty harvest' to describe the foods that lack nutritional balance from growing in depleted soil.

When people ask Bob Johnson what tests are most important for a herd health program, his reply is, "Soil tests." Johnson is the resident farmer at Midwestern Bio-Ag's Learning Center near Lone Rock, Wisconsin. Johnson advocates a change in thinking in which soil fertility is the basis for herd health. Dairy farmers give a great deal of attention to their cows' health, but they may not associate improving their soils with herd health maintenance. To illustrate his point, Johnson presents a herd health pyramid for "bio"-logical farming (Figure 3-1).

Spending time and energy on the lower levels of the herd health pyramid is easier and more

Figure 3-1 The Herd Health Pyramid For Biological Farming



efficient than finding the right drug or active intervention to cure a sick cow.

Early Treatment

A conventional farmer described the need for antibiotics with the case history of a cow that suffered from a retained placenta, which led to an infection of the uterus. By day three or four, the cow had a high fever, was glassy-eyed, listless, and off-feed. The farmer said, "At that point you either have to treat them [with antibiotics] or shoot them."

It's true that when an infection has become systemic and the situation is critical, there may be no time left to find an alternative. An organic farmer needs to seek every opportunity to prevent disease and keep infections from becoming life-threatening.

Richard (Doc) Holliday is a holistic vet now working in marketing. Holliday presented Figure 3-2 to emphasize the importance of herd health maintenance and early intervention. Whether treatment is conventional or alternative, the cow has a better chance of healing

Figure 3-2. Richard Holliday's Levels of Animal Health

| | | |
|------|-------------------------------------|-----------------------------------|
| 100% | Healthy cow | |
| 75% | Not really sick, not really healthy | < Start treating here |
| 50% | Sick cow | |
| 25% | Call the vet | < Maybe too late for effective Rx |
| 0 | Dead cow | |

with early intervention. Emergency veterinary care is the most expensive form of treatment.

Holliday says, "If you want to send in some [high SCC milk] samples and get cultures to find out what your resident bacteria are, that service is available. You can find out not only what's affecting that individual cow, if you send in ten samples and they all come back [identified as] one type of bacteria, then that gives you a clue. You've got some problem in management. In all this—remember good nutrition, good management, and taking care of the little problems before they get to be big problems. You'd be surprised how little treatment you have to worry about. But it takes time. Frequently, it will take you a couple years to really get to a place where you can see this starts working. Start taking good care of your cows now. Take good care of those heifer calves. When they get in the milking line and you're milking heifers that are raised from a holistic standpoint, that's when you can have reasonably trouble-free dairying. But you have to work toward it."

The Organic Standards and Antibiotics

Can antibiotics ever be used on an organic dairy? Yes, but withdrawal times are extended. Different certification agencies have different standards, but the minimum milk withholding is two weeks or twice the label requirements. When the national standards are implemented, they are likely to be strict. The National Organic Standards Board has recommended that the USDA set the withdrawal period to 90 days. These requirement makes antibiotic use uneconomical.

Antibiotic use at any age will disqualify the animal for organic beef. The use of any antibiotic will prompt questions from the inspector as to how the management will change to avoid use of restricted inputs in the future.

That's enough of the "thou shalt not" stuff. The remainder of this chapter will be a series of short essays devoted to promoting herd health

by managing the cow's environment, alternative medicinal systems, and alternative treatments for specific health problems.

One Farmer's Experience

Organic dairy farmer Cathy Pulvermacher says, "My husband, Carl, and I have a certified organic dairy farm in southwestern Wisconsin. We've been dairy farming for about 17 years now, and the last 12 we've lived on our present farm. We bought it in 1982 and decided we were going to go chemical free on it, and see what we could do with our land. We found that the land just got better and better the less chemicals we used. We had tremendous results in all our crops with rotations and mechanical cultivations and that whole bit. And our vets kind of challenged us on this. We were doing everything to our cows our vets said—you know, if a cow gets sick you give them a shot or dry cow treatment and all this. They [the veterinarians] said, 'You're going against the University on your land but you are doing everything we say on your cows. Why do you feel you can't do it on your land?' We just took it the other way and said, 'Well, let's see if we can do something different with our herd then.' So in 1988 or '89 we became certified organic in our dairy, also. I'd say the health of our animals has gotten a lot better."

Another Farmer's Experience

Wayne Peters is one of the owner/managers of a dairy farm that became certified organic in 1988. They have used antibiotics once in recent memory. Wayne explains, "A heifer had a damaged foot. A toe was removed and it became infected. But she was just a six month heifer [so the lengthy withdrawal period presented no problem]. For twisted stomach, we operate on them without antibiotics if they do it right. They clip it [the area of the incision] and wash it and make a small cut. It's not like having an appendix out on a human. No internal organs are cut. They make the incision, flip the intestine, put in one stitch, and then close the wound

with a few more stitches. It takes them longer to clean up than it does to do the surgery. Sure, if you do a sloppy job you need the antibiotics. Twisted stomach is one the few things that vets have a good track record on. Other ailments—they just don't do much." As for disease prevention Peters relies on good nutrition and adds, "Cleanliness is half the battle."



The Peter's Dairy Barn

Docking tails helps keep cows clean in barns using minimal bedding to facilitate liquid manure systems. The practice of docking tails is controversial in organic circles and has been banned in the Wisconsin Chapter of OCIA since this photograph was taken. The argument against docking tails is that it removes the cow's natural fly swatter.

Disease Prevention - Vaccines

Vaccines are allowed under organic herd health rules, but they are not required.

According to Dr. Harry Socket, the Wisconsin State Veterinarian, no cattle vaccines are required by law, but a Bang's negative certificate must accompany any unvaccinated cow that is sold in Wisconsin.

The major viral diseases of cattle, IBR (infectious bovine rhinotracheitis), BVD, (bovine virus diarrhea), PI-3 (parainfluenza-3), rota/corona viruses and syncytial virus can be prevented by vaccines or by keeping a healthy herd from contacting infected animals or their manure. It is not enough to close a herd to prevent infection. Contaminated manure on the boots of visitors and delivery workers can be enough to spread a catastrophic disease. State Animal Health Inspector Marti Graham says, "The most important thing is where you go in your own boots."

Vaccines are also available for numerous bacterial infections including pink eye, black leg, and leptospirosis.

Vaccines do have drawbacks. Some formulations cause granulomas at injection sites. The immune response to a vaccination can produce some symptoms of the actual disease. For example, brucellosis (Bangs) modified live vaccines are generally restricted to young animals that aren't pregnant because the vaccine itself may cause abortion in a pregnant cow. European organic farm advocate Nicolas Lampkin recommends that farmers avoid livestock vaccines unless a herd has a known risk for a specific disease. The incidence of severe adverse reactions (SAR) from vaccine challenges to the immune system are part of the reason Lampkin wants farmers to abandon vaccines as a routine prophylactic. In Great Britain there were a series of sheep deaths in 1989 traced to the use of a vaccine against clostridial diseases and pasteurella.

The development of eight-in-one vaccines and nine-in-one vaccines means added speed and convenience for the person administering the shots, but it also requires the animal to simultaneously respond to many different antigens. The immune system stress, especially if it is added with other stress factors, may be overwhelming. One producer in southern Wisconsin noted several abortions after administering an

eight-in-one vaccine. He concluded it was inappropriate for pregnant cows and changed the farm's vaccination schedule to open cows only.

Vaccine Efficacy

Another drawback to vaccines may be a false sense of security. Breaks in protection do occur in properly vaccinated animals, but the breaks are difficult to predict until they occur. Veterinarian Marta Engel says, "When a client says 'I don't know why this cow is sick, she's been vaccinated.' I always ask 'What else did you do [to prevent disease]?"

The effectiveness of a vaccine in producing an immune system response is measured by blood tests for antibodies. The timing of booster shots and the expected level of protection are two pieces of product information the farmer should get before choosing a vaccine.

Some vaccines have limited protection, such as the J5 vaccine for *E.coli* mastitis. While the vaccine is reported to reduce the incidence of coliform mastitis by 80%; it does not eliminate the disease. Keeping cows in a clean environment, manure removal, and well maintained milking systems are still necessary to prevent coliform mastitis, even in a vaccinated herd.

There is no single vaccination program that will make sense for every farm. Vaccinating for sexually transmitted diseases like vibriosis is not economical for closed herds or herds that are exclusively artificially inseminated.

Changes in management, breeding, or adding new animals to the herd should trigger a review of the farm's disease prevention program, including the vaccination schedule. Vaccines have risks and benefits, just like other medicines. The organic standards neither require nor forbid vaccines. Each farmer needs to arrive at their own decision about vaccine use.

Additional Resources

Empty Harvest. Dr. Bernard Jensen and Mark Anderson. 1990. Avery Publishing Group. Garden City Park, NY.

Organic Farming. Nicolas Lampkin. 1990. Farming Press, Ipswich, U.K. Distributed in North America by Desmond Farm Enterprise.

Herd Health. W.D. Hoard & Sons Company. 1993. 103 pages. P.O. Box 801, Fort Atkinson, WI 53538.

"Who Needs Vaccines?" Randy Kidd, DVM. *The New Farm*. Vol. 17 No. 2. Feb. 1995. pp. 6-9.

"Antibiotics helped these coughing cows" L.C.Allenstein, DVM, *Hoard's Dairyman*. Vol. 138, No. 19. Nov. 1993. p. 814. [Don't skip this because of the politically incorrect title. It's basically a discussion of what IBR vaccines can and cannot do to prevent pneumonia a closed herd.]

"Partial budget analysis of vaccinating dairy cattle against coliform mastitis with an *Escherichia coli* J5 vaccine." F. J. DeGraves, DVM, and J. Fetrow, VMD. *Journal of the American Veterinary Medical Association* (JAVMA). Vol. 199, No. 4, August 15, 1991. p. 451.

"Autogenous Vaccines." David Ellefson, DVM. *Large Animal Veterinarian*. April, 1993. pp. 16-18.

Microbiology. Gerard Tortora, et. al. 1982. Benjamin/Cummings Publishing Company. Melno Park, CA. [Section on microbe/host interactions pp. 345-661.]

Spotlight on the Immune System

The immune system is dispersed throughout a cow's body. The skin and mucus membranes are the first line of defense against microscopic invaders. Intact skin gives a cow **non-specific immunity** because it blocks many types of pathogens from entering the body. What happens if the skin is broken? Lymphoid tissue, fluid called lymph, and white blood cells work together to destroy invading bacteria and viruses.

White Blood Cells

If a cow is cut or wounded, the damaged blood platelets release a chemical that attracts white blood cells. Pus from a wound is an accumulation of many white blood cells that have died consuming invading organisms. White blood cells are the first responders to injury and disease. Some white blood cells are anchored in the spleen and lymph nodes. The anchored cells just wait and engulf bacteria or foreign bodies if they happen to pass by. The white blood cells that engulf invaders are called macrophages, but there are other types of white blood cells, too.

If an infection becomes established, B-cell lymphocytes and T-cell lymphocytes form a second line of defense. They are also white blood cells. Each B-cell is a technical specialist. Its outer cell membrane carries the code to recognize one specific foreign protein called an **antigen**. The B-cell becomes activated when it meets the antigen of the bacteria or virus it was meant to fight. Activated B-cells divide rapidly and some of the new B-cells will begin producing antibodies. Antibody production begins on a grand scale with a single B-cell capable of putting out 2,000 molecules of antibody per minute. The antibodies circulate in the blood, attaching themselves to the antigens on the invading organism and neutralizing them.

Immunoglobulin is another word for antibody because antibody proteins have globular shapes. When an antibody attaches itself to an

antigen, macrophage white blood cells come as a clean up crew to engulf the antibody/antigen complex. Some of the activated B-cells will become memory cells. These cells may live a long time. If the same antigen invades the body, the memory cells will divide rapidly and differentiate to begin antibody production again. Memory cells are able to do their work so quickly that the cow may not show any symptoms of infection. In fact, a repeat infection may be overcome with antibodies so rapidly that the cow may not even feel sick.

When a disease organism is unable to establish a second infection, we say that the cow has **acquired or specific immunity**. Vaccines work by introducing antigens into the cow's body. Memory cells will remember the antigen, and when the real disease organism is in the blood or tissues, antibodies will be produced quickly to subdue it.

Passive immunity is the type of protection given by feeding colostrum to a calf. Colostrum contains the dam's immunoglobulins so the calf's body does not need to produce them.

Killer T-Cells and Helper T-Cells

T-cells have a special role in acquired immunity because viruses work differently than bacteria. A virus actually gets inside a host cell and then takes over the cell's protein production. Antibodies can immobilize viruses in the blood, but once the virus has gone inside a cell, it is out of reach. When a cell is infected with a virus, it will begin carrying some viral antigens on its outer cell membrane. Effector T-cells (often called killer T-cells) will recognize the viral antigens and destroy the diseased cell.

Helper T-cells function as a control to make sure the cow doesn't start producing antibodies to her own tissues. If the cow's immune system overreacts and hurts the cow's own body the disease is called an **autoimmune response**.

Organic Feed Supplements and Direct Fed Microbials

Vitamins and Minerals

Farmers are quick to recognize the link between feed quality and herd health. Livestock can suffer from any number of vitamin and mineral deficiencies. For example, some Wisconsin soils are marginal or deficient in selenium. Selenium and vitamin E work together in the body as antioxidants in cell membranes. Deficiencies in cattle can result in stiff gaits, white muscle disease, and increased rates of retained placentas. In selenium deficient areas, mineral supplements or direct injections of selenium/vitamin E are allowed in organic production to maintain herd health.

If possible, the preferred source of vitamin and mineral supplements are feedstuffs. Culled squash is a source of carotenes that animals convert to vitamin A. Green grass is a source of many vitamins readily accepted by dairy cattle. Seaweed is rich in mineral salts, especially iron and iodine. Using seaweed as cattle fodder may seem far fetched in America's Midwest, but it was a traditional practice for dairy farmers on the Isle of Jersey. The organic standards allow vitamins and mineral supplements because the seasonal availability of forages or other local conditions might make the micronutrient content of organic feeds insufficient. Malnutrition is not acceptable in an organic herd for any reason.

The Balancing Act

Minerals and fat soluble vitamins are called micronutrients for a good reason. Too much of a micronutrient in the ration can cause as many health problems as deficiencies. The *Feedstuffs Reference Issue* includes detailed charts on the dietary requirements of cattle by breed and growth stage, with notes on micronutrient requirements. Ration balancing is an art as well as a science. Many veterinarians also act as feed

consultants because a balanced ration is so critical to herd health.

Direct Fed Microbials - Probiotics

A healthy cow's digestive tract always has bacteria present. Direct fed microbials promote digestive health by augmenting the numbers of good bacteria. From experiments with animals in sterile environments, we know that mammals can survive without microflora in their intestinal tract, but they are much weaker. In 1974, R. B. Parker published the article "Probiotics, the other side of the antibiotic story" to describe animal feed supplements that enhance animal growth by changing the flora in the gut. The name stuck, and the word "probiotics" has been used to describe direct fed microbials ever since.

The FDA does not yet allow the manufacturers of direct fed microbial products to make medicinal claims, but the agency has published a list of microorganisms allowed as feed additives that are generally recognized as safe (GRAS), see Table 3-1.

Microbiologists are less shy about claiming the virtues of good bacteria. Direct fed microbials may inhibit the growth of pathogenic organisms by:

- ◆ Competition for nutrients.
- ◆ Competition for adhesion sites.
- ◆ pH changes associated with lactic acid producing bacteria.
- ◆ Alteration of microbial metabolism by increased or decreased enzyme activity.
- ◆ Stimulation of host immunity.

Direct fed microbials have three main applications in dairy cattle: disease prevention, supportive therapy, and enhancing feed efficiency.

Disease Prevention

Veterinarian William Zimmer explains, "Immunity imparted from beneficial organisms to an animal is a type of non-specific immunity. For example, *E. coli* causes scours in calves by binding to the intestinal wall, releasing toxins, and destroying tissue. Non-specific immunity from beneficial organisms results from feeding something like *Lactobacillus* that is normally in that gut, to keep it in place so the *E. coli* can never bind to the gut. It didn't kill the *E. coli*. It just occupied the binding site on the intestinal wall so the *E. coli* passed harmlessly through the animal. Beneficial bacteria are a broad

spectrum, non-specific first line of defense against disease organisms."

"A cow's rumen is like a 55 gallon drum full of bacteria. Remember, a little calf on milk doesn't have that. If I had only one place to use direct fed microbials, it would be on a calf. It would be on a daily basis. . . The more you repeat feeding direct fed microbials, the better chance you have of colonizing the gut. That's why I would go with a daily feeding program." Zimmer recommends that if you are purchasing a *Lactobacillus* product for daily feeding to calves it should have at least 1/2 billion to 1 billion colony forming units per dose. Of course,

**Table 3-1. Direct Fed Microorganisms, Silage Inoculants
GENERALLY RECOGNIZED AS SAFE (GRAS)
by the Food and Drug Administration and the
American Association of Feed Control Officials — 1989**

| | |
|---|-----------------------------------|
| Aspergillus niger | Lactobacillus cellobiosus |
| Aspergillus oryzae | Lactobacillus curvatus |
| Bacillus coagulans | Lactobacillus delbruekii |
| Bacillus lentus | Lactobacillus fermentum |
| Bacillus licheniformis | Lactobacillus lactis |
| Bacillus pumilus | Lactobacillus plantarum |
| Bacillus subtilis (non-antibiotic producing strains only) | Lactobacillus reuterii |
| Bacteroides amylophilus | Leuconostoc mesenteroides |
| Bacteroides capillosus | Pediococcus acidilacticii |
| Bacteroides ruminicola | Pediococcus cerevisiae (damnosus) |
| Bacteroides suis | Pediococcus pentosaceus |
| Bifidobacterium adolescentis | Propionibacterium freudenreichii |
| Bifidobacterium animalis | Propionibacterium shermanii |
| Bifidobacterium bifidum | Saccharomyces cerevisiae |
| Bifidobacterium infantis | Streptococcus cremoris |
| Bifidobacterium longum | Streptococcus diacetylactis |
| Bifidobacterium thermophilum | Streptococcus faecium |
| Lactobacillus acidophilus | Streptococcus intermedius |
| Lactobacillus brevis | Streptococcus lactis |
| Lactobacillus bulgaricus | Streptococcus thermophilus |
| Lactobacillus casei | |

Organic Feed Supplements

direct fed microbials are only part of the management needed to prevent scours. Adequate and timely colostrum feeding, a clean environment, and sanitary feeding equipment should not be ignored.

Fresh cows changing over to a lactating ration and high-producing cows may also benefit from probiotics. Ration changes are accompanied by changes in the intestinal microflora and direct fed microbials may ease the transition.

Supportive Therapy

The inflammation response in a sick cow may inhibit bacterial growth in several ways. Fever and the release of cortisol serve to lower bacterial populations. They can also make a less favorable environment for good bacteria. In supportive therapy, high doses of bacteria are fed over a relatively short period of time. There is no uniform protocol to determine the dosage rate for supportive therapy. Dr. Zimmer's general recommendation is feeding a mix of organisms such as *Lactobacillus*, Bifido bacteria, and yeast once or twice a day for three days, using five to ten billion colony forming units per dose depending on the organism.

If rumen function has been impaired from conditions like D.A.'s or milk fever, direct fed microbials may be combined with an injection of 10 to 15cc vitamin B complex. Cattle normally have no requirement for supplemental B vitamins. Vitamin B complex is naturally produced by the bacteria in the gut, but if the bacteria have been inhibited, its level may be insufficient for a recovering cow.

Feed Efficiency

Fungi like *Aspergillus* and yeasts are used for feed efficiency. Microorganisms in the rumen, including *Aspergillus* convert carbohydrates in partially digested feeds to volatile fatty acids. These volatile fatty acids are absorbed by the gut and used as the main source of energy for the cow. There are several commercial

mixtures of direct fed microbials targeted towards feed efficiency.

Yogurt For Calves

If farmers have excess colostrum, *Lactobacillus sp.* can double as both a food preservative and as a probiotic. Colostrum and the transitional milk at freshening can be cultured with any yogurt sold at a grocery store that is labeled "live culture."

Lorn Goede of Viroqua, Wisconsin, saves the first milking when a cow freshens and all discard milk for calf yogurt. Goede first stores the milk in covered buckets in the barn. One 15 gallon container holds the culture and it is refilled five gallons at a time. Goede stirs the culture with a tobacco lathe twice a day before feeding the calves. The yogurt mixture is heated to 150° F in a ten quart pail in the milk room prior to feeding. To make feeding easier with the semi-solid yogurt, Goede put 1½ inch slits into the rubber nipples on the feeding bottles. Goede feels that calf health has improved since switching from milk replacer to mainly feeding yogurt. Goede says, "I had a lot of troubles with the calves down here. I kept them alive, but they had lung problems, this, that and the other. . . I think I'm going to see better, healthier heifers when I go to milk them. They've been raised without lung problems and digestive problems."

Drawbacks

- ◆ When the weather turns warm, the yogurt spoils without refrigeration. Goede stops using the yogurt in mid-June. Goede's barn stays at about 55° F in the winter.
- ◆ Yogurt is sour. Milk is sweet. If a manager fills in with milk or milk replacer, they will have a hard time getting the calves back on yogurt.

This practice may be especially useful to operators moving towards seasonal dairying who have a large quantity of colostrum and transitional milk when the herd freshens.

Additional Resources

"We need to supplement A, D and E." Rich Erdman. *Hoard's Dairyman*. Vol. 139. No. 1. January, 1994. p. 9.

Food Power From The Sea. Lee Fryer and Richard Simmons. 1977. Mason and Charter. New York. [Comparative analysis of seaweeds *Ascophyllum nodosum*, *Laminaria digitalis* and *Ascophyllum nodosum* pp. 195-197.]

"Probiotics in man and animals." R. Fuller. *Journal of Applied Bacteriology*. 1989. Vol. 66. pp. 365-378.

"Gut Ecology and Health Implications." Dairy Council Digest. Vol. 50 No. 3. May-June 1979.

"Neonatal calf diarrhea excluding salmonellosis." pp. 53-107. The Calf. 1990. J.H.B. Roy. 5th Ed. Vol. 1. Butterworths.

"Probiotics, the other half of the antibiotics story." R.B. Parker. *Animal Nutrition and Health*. 1974. Vol. 29. pp 4-8.

Feedstuffs Reference Issue. 1994. Vol. 66. No. 30. July 20, 1994.

Probiotic Suppliers

William Zimmer, DVM
Midwestern Bio-Ag
Hwy ID, Box 126
Blue Mounds, WI 53517
(608) 437-4994 or (800) 327-6012

Richard Holliday
Impro Products
3 Allamakee St.
Waukon, IA 52172
(319) 568-3401 or (800) 626-5536



Hand feeding yogurt is quick and easy with 1½ inch slits in the rubber nipples of the feeding bottles. Rotational graziers feed yogurt to groups of calves in a barrel fit with multiple nipples. Cathy Pulvermacher who has used the barrel system says it's fine for the calves to work hard for their meal.

Quick Reference For Calf Diarrhea

Sources: 1) The Calf. 1990. 5th Ed. Vol. 1., JHB Roy, Butterworths. 2) Healthy Calves - Healthy Cattle. 1982. Ludwig Schrag. 3) Dr. William Zimmer

| Organism | Symptoms, Signs and the Course of the Disease | Infection Route | Factors Promoting the Disease | Factors Inhibiting the Disease |
|---|---|--|--|---|
| Rota Viruses Corona Viruses | Watery or runny feces. Loss of appetite. Dehydration in later stages. Feces contain undigested milk. <i>E. coli</i> proliferate to consume milk and release endotoxins. Most prevalent in first to fourth week of life. | Rota/Corona viruses are almost always present. Calves ingest the viruses in contaminated feed or water. Colostrum milked in unsanitary conditions may infect calves on first day. Incubation period 12-14 hours. | Late or insufficient colostrum feeding. Housing calves by cold, moist walls. Placing calves too close together permits cross infection. Calves in areas soiled by the manure of mature cows. | Frequently cleaned single calf hutches in an area separate from the cows. Washing calf bottles or buckets thoroughly before use. Preventative feeding with probiotics. Vaccination for Rota/Corona viruses in calves or dry cows. |
| Coccidiosis (single cell protist) | Watery feces may turn bloody quickly as the intestinal lining is damaged. | Oocytes are ingested. | Cross infection from calves housed too close together. | Feed probiotics. Enforce sanitation procedures. |
| Cryptosporidium (single cell protist) | Runny feces. Calves in later stages show signs of dehydration: sunken eyes, loose hide, straining to pass feces. | Oocytes are ingested by the calf. Manure samples from numerous Wisc. farms suggest <i>Cryptosporidium</i> is nearly always present. | Soiled feeding buckets or bottles. Cross infection from calves housed too close together. | Probiotics that block colonization by pathogens effective in preventing new cases but ineffective as treatment. Enforce sanitation. No drugs are yet approved by the FDA for treatment. |
| <i>E. coli</i> and other Coliform Bacteria | Frequently worsens the condition of a calf passing undigested milk. Calves may die of septicemia, dehydration or shock. | Usually one of the first colonizers of the calf's gut. Should decrease to low levels by day 10. Some strains are pathogenic. | Stressed or sick calves. Bottles fed too cold, delaying digestion. Improperly stored or formulated milk replacer. | Vaccinate dry cows or calves for <i>E. coli</i> . Care in feeding adequate colostrum. Feeding milk or a high grade non-medicated milk replacer. Feed probiotics. Enforce sanitation. |
| <i>Salmonella</i> sp. Bacteria | Runny, loose feces with a slimy or mucus texture. Noted for causing epidemics with high mortality rates. <i>Salmonella</i> has many strains. | <i>Salmonella</i> becomes a problem when brought to the farm by purchased animals or manure on boots. Bacteria is then ingested. | Farms that purchase large numbers of calves. Not washing rubber boots between farm visits. | Close the herd or minimize calf purchases. Use separate pairs of boots for barn and calf areas. |

Udder Health

Organic dairy farmers use a broad range of milking procedures and mastitis controls. There is no set of “organic mastitis control protocols,” but the following topics keep coming up at dairy herd health meetings.

1. Don't milk wet cows. If a ring of wash water contaminated with surface bacteria gathers at the top of the inflation, it will probably be sucked into the milking claw. From the milking claw, the bacteria may enter the udder from a liner slip and back jetting. It doesn't matter how strong the sanitizer is, some of the surface bacteria will survive in the wash water.
2. Teat dips, if they are used, need to be cleaned out periodically. Mycoplasmas that cause mastitis are able to live in teat dip.
3. Post-milking teat dipping is often recommended to lower somatic cell count (SCC), but some teat dips just don't work. FDA registration and a prominent advertising campaign do not mean the teat dip has been found effective against major mastitis causing bacteria. Managers who want to purchase a teat dip that acts as an antiseptic should ask their dealer for the manufacturer's data and ignore the glossy advertisements in dairy magazines.
4. If a farm is not culturing mastitic cows, it is best to assume the potential for cross infection and milk problem cows last in the string. If *Staph. aureus* or *Strep. ag.* are known to be a problem in the herd, infected cows should definitely be grouped.
5. Bacteria are most likely to get a foot hold in the streak canal. Massaging the udder to get milk let down without pre-stripping may move the bacteria deeper into the udder.
6. Feeding the cows after milking is one way to keep them standing. The longer the cows stand, the longer teat sphincters have to close after milking. Putting the cows out to pasture or feeding from bunks will help keep them from laying down as soon as they are milked.
7. Withholding food and water for 24 hours before drying up a cow can ease the transition to the dry period.
8. Commonly recognized routes of mastitis infection are associated with hygiene. Getting to know your resident bacteria can help pinpoint the management changes needed to lower SCC.

Cleanliness

In the vast majority of mastitis cases pathogens enter the udder through the teat. Cleanliness is not just half the battle, it's practically the whole defense department.

| Pathogen | Source of Infection | Common Route of Infection |
|-----------------------------------|--|--|
| <i>Strep. ag.</i> | Other cows in the herd. | Milking equipment, common wash rags. |
| <i>Staph. aureus</i> | Contaminated bedding or skin. | Milking equipment, common wash rags. |
| Non- <i>ag. Strep.</i> | The cow's environment. | Wet or dirty cow yards. Liner slips with back jetting. |
| <i>E. coli</i> /Coliform bacteria | Manure. Infections are more prevalent in hot, wet weather. | Teat injuries, milking wet cows, poor cow preparation. |
| <i>Staph. epi</i> | Normally present on skin. | Poor cow prep. at milking. |

Effective Mastitis Treatments

How certain can a farmer be that a mastitis remedy will be effective? Veterinary research by drug companies, equipment manufacturers and universities have provided partial answers to these questions. Unfortunately, there is very little published information on home remedies that is anything more than the story of a farmer or researcher who used a method and found it worked—unsubstantiated anecdotal evidence. Conducting replicated research with lactating cows is expensive. Universities have shown little interest in investing research dollars in alternative medicine. Organic producers have been relying on one another to find mastitis treatments that work, a situation that is unlikely to change in the near future.

Alternative Remedies for Mastitis

- ◆ Hand strip the affected quarters at least four times a day or milkout with equipment that will be sanitized before using on another cow. The idea is to void the udder of bacteria and endotoxins as quickly as possible. Many farmers feel this remedy requires an unrealistic time commitment. "It's not like that's the only cow you have to take care of," is the general feeling. Replicated research has shown the effectiveness of stripping out cows to cure mastitis. Unfortunately, most of this work was done prior to World War II. Cathy Pulvermacher notes that a cow can be stripped out just before and just after the herd's normal milking. While this timing varies from the ideal, it is possible to vacate the udder more than twice a day without changing the work schedule.
 - ◆ Put a calf on the cow. Some concern was raised as to whether this remedy might spread the infection from quarter to quarter. Veterinarians have called the calf the most efficient milking machine in the world. A calf is less likely to spread infection than clearing the udder with a milking machine.
- Dr. Zimmer reports that *Staph.* may be passed from a cow to a heifer through the milk, which would favor the use of a bull calf if one is available.
- ◆ Vitamin C (ascorbic acid) acts as an antioxidant in large amounts. Farmers use 100cc subcutaneously to clear up high SCC cows not responding to other treatments. Combine this method with frequent milkout.
 - ◆ Intramammary infusions of egg white, aloe vera, or rice oil are common home remedies. Foreign proteins, glycoproteins, and lipoproteins can be antigenic. One farmer uses one 60cc injection of aloe vera, discards that milking and rechecks SCC with a California mastitis paddle at the next milking. He was buying a brand name aloe vera product packaged for intramammary injection, but has since switched to a gel with the same ingredients purchased at a discount store. The producer has also used aloe vera as a dry cow treatment. Another farmer commented on the use of egg whites, "I had good luck with it. I had a cow that was chronic. Nothing helped. I used 25cc [of intramammary egg whites] twice. It cleaned her right up. She still remained hard on the outside of the udder. It isn't soft and pliable, but the mastitis is gone. She doesn't have the clumps [in the milk]."
 - ◆ Bob Johnson of Midwestern Bio-Ag, reports that producers have lowered their SCC with 10 to 20cc intramuscular injections of Vitamin B₁ (thiamine).
 - ◆ One cup of apple cider vinegar poured over the grain has been used as a mastitis treatment.
 - ◆ The organic standards allow the use of commercial whey/colostrum products. The FDA does not yet permit the manufacturers to make medicinal claims, but several organic farmers have been pleased with the results. There are numerous products on the market including Impro®, T-Cell®, Imucon®, and Premolac®.

- ◆ Support therapies of rehydration and aspirin for coliform mastitis. Dr. Larry Bauman, University of Wisconsin-Riverfalls says, "The more research we have done, the more we find fluids and support therapy are much more effective than reaching for an antibiotic. Fluid therapy is the most important therapy in treating acute coliform mastitis. It is the most important factor in saving the life of the cow." Aspirin helps control the inflammation response, but indiscriminate use can cause abomasal ulcers. Because aspirin is not labeled as a mastitis remedy, it must be prescribed by a veterinarian. A 24-hour milk withhold is often stipulated.
- ◆ Homeopathic remedies for mastitis are listed in more detail on page 38.
- ◆ Massaging the udder with liniments may stimulate blood flow. Liniments can be applied just after the cow is milked out.
- ◆ Staphylococcal vaccines have shown promise. Off-label use at higher rates has cured infected cows. This application must be used under the supervision of a vet.

The Controversy Over Intramammary Infusions

Open the pages of almost any dairy magazine and there will be advertisements for intramammary antibiotics. When farmers try using alternatives to antibiotics for the first time they often want to use an intramammary injection because it is a familiar mode of treatment. Questions have surfaced in the dairy industry about the efficacy of intramammary antibiotics, and some of the same concerns have been raised about non-antibiotic udder infusions.

The theory behind non-antibiotic intramammary infusions is that the foreign proteins inside a cow's body will trigger an immune response. Non-antibiotic intramammary injections may fail for several reasons:

- ◆ If the white blood cells are unable to reach the bacteria, such as a walled off

Staph. infection, calling them to the udder will be of minimal benefit.

- ◆ Cows reacting to bacterial endotoxins are not aided by additional white blood cells in the udder. Endotoxins are normally cleaned from the blood by non-mobile cells in the lymph glands, bone marrow, liver, and kidneys.
- ◆ Introduction of skin surface bacteria from the infusion may counter any positive effects of the treatment.
- ◆ The keratin lining of the teat may be physically damaged by the needle.

Some holistic veterinarians are firmly opposed to the use of any intramammary infusion. Doc Holliday says, "If you're going to do it anyway, keep it in the streak canal. Stay out of the udder . . . I personally have a problem with going up the quarter with anything. I think so often you carry more stuff in than you help. But I know a lot of people do it and they have good results. If it works, fine. Keep using it. I have a hard time recommending it to anyone."

Non-antibiotic udder infusions are listed with the other treatments for mastitis because some organic farmers are using them and having success, but it has not worked for everybody. Without controlled trials, it is difficult to predict the chance of success of any particular treatment. New organic farmers have asked, "If egg whites can cure mastitis, should that be a small egg or a large egg? Does it work better with a brown egg or a white egg?" Really, the first question should be "Is the risk of contaminating the cow's udder worth the benefit of an increased immune response?" If a manager has decided that the risk is tolerable, a small amount of foreign protein is sufficient.

One Farmer's Experience

An organic dairy producer in southwest Wisconsin shared his experience with a combination of mastitis controls including whey products, vitamin C, and frequent milkout. For run-of-the-mill mastitis, the farmer will inject

Udder Health

50cc Premolac® subcutaneously, usually at the tail head or side of the cow. This is followed by two additional 35cc injections twelve and twenty-four hours after the initial treatment. He says, "Sometimes it works right away. Sometimes you have to monkey with them just like you had to with antibiotics." A 250cc bottle of the whey product costs about \$9.80 when purchased in bulk with other dairy farmers.

If the cow has mastitis in more than one quarter, a case of mastitis that is not clearing, or mastitis combined with fever, the whey product is combined with a 100cc subcutaneous injection of vitamin C and frequent milkout. The farmer says, "A lot of times you will clear them up right away." Watching the cows for signs of recovery or continuing disease is important. "A lot of this comes with experience. I can usually tell if a cow isn't right. If you're not sure you can check their temperature." He always waits 24 hours before administering a second injection of vitamin C because he thinks the injections are hard on the cows. After a second injection, they may pass blood in the urine. Injectable vitamin C is labeled as a nutritional supplement. Administering large doses as an antioxidant is off-label use that must occur in the context of a valid client-veterinarian relationship. Veterinarians can aid in monitoring the side effects of the treatment. The veterinarian taught the farmer how to properly administer fluids intravenously. The farmer commented, "It takes practice."

The most serious threat to a cow's life is acute, environmental mastitis or watery mastitis. If a cow has a high fever and watery discharge, this producer will sterilize an I.V. needle and tubing in warm water and bleach. He warms up a mixture of 125cc Premolac, 250cc vitamin C and 25cc vitamin B complex to body temperature in a used calcium bottle. The bleach and water mixture is used to clean the hide at the injection site before running the I.V. The producer says, "If you have a watery

case you have to vein them. Don't run it in cold. It should be body temperature."

Frequent milkout is also essential to curing watery mastitis. "I will keep them in the barn and go back to milk them at noon and around 3 PM. Then I'll milk them again at the evening milking. It's best if you can keep them stripped out. It would probably be good to milk them again at midnight, but I don't do that."

Referring to the seven or eight years since he stopped using antibiotics in the herd, the farmer says, "I never lost a cow to watery mastitis." He has occasionally lost a quarter. In one particular case, a first-calf heifer freshened with watery mastitis and one quarter had to be dried up. In retrospect, he thinks the quarter might have been saved if diagnosis and treatment had started earlier. The herd experienced death losses when his veterinarian was still administering antibiotic treatment to cows with watery mastitis, so he thinks the current treatments are generally more effective.

Does he miss antibiotics? The farmer says, "The colostrum whey is more dependable and more consistent."

Additional Resources

"Mastitis treatment consists of fluids, frequent milkout, and aspirin." *Hoard's Dairyman*. Vol. 139. No. 19. p. 784.

"Why use antibiotics on *Staph. aureus* mastitis?" Roger Mellenberger. *Hoard's Dairyman*. May 25, 1992. pp. 10-11.

Bovine Mastitis. E. Munch-Petersen. Subtitle: Survey of the Literature to the end of 1935. Published 1938. Imperial Bureau of Animal Health. England.

"Lack of testing of teat dips is cited at veterinarian meeting." Kitz Cleary. *The Country Today*. Wed. Sept. 22, 1993. page B-5.

"MSU Finding Success in Mastitis Battle, Without Antibiotics." Jane Fyksen. *Agri-View*. Thursday, Nov. 3, 1994. Section 2. Pages 1 and 3.

Mastitis Controls Listed by 80 Farms Applying for Organic Dairy Certification*

| <u>Basic Method</u> | <u>Control</u> | <u>Number of Farms Using Control</u> |
|-------------------------------|---|--------------------------------------|
| Strip out the cow. | Strip out the cow. | 47 |
| | Put a calf on the cow. | 3 |
| Vitamin Injections | Vitamin C injections. | 14 |
| | Vitamin B injections. | 1 |
| | Vitamin E injections. | 1 |
| Alternative Systems | Homeopathics. | 10 |
| | Radionics. | 3 |
| Topical Ointments. | Liniments (White Liniments or Ben Gay) | 7 |
| | Herb Poultices | 1 |
| Intramammary Injections | Probiotics injected in streak canal. | 9 |
| | Colostrum-whey injections. | 9 |
| | Egg whites in the streak canal | 5 |
| | Aloe vera injected in the streak canal. | 2 |
| | Rice oil and olive oil in the streak canal. | 1 |
| | Melaleuca injections. | 1 |
| Aspirin | Non-Steroidal anti-inflammatory drug | 7 |
| Ration Changes or Oral Dosing | Drench with colostrum. | 1 |
| | Cut the grain out of the ration. | 1 |
| | Probiotic boluses (oral). | 1 |
| | Apple cider vinegar and castor oil. | 1 |
| | Drench diluted food-grade hydrogen peroxide | 1 |
| Whey Product | Impro injections | 16 |

*Numbers do not total to 80; most farms use more than one control.

Why isn't this information more specific? An organic inspector allowed the authors to tally herd health information from 80 farms. Because inspectors promise confidentiality for all production information revealed by a farmer, we were not able to ask for names and follow up with more detailed questions. The table is presented to give the reader an idea of the types of alternative treatments and their frequency of use in a sample of organic dairies in Wisconsin.

Talking About Udder Edema and Mastitis Prevention

- A conversation at KORN's Alternatives to Antibiotics Meeting, April 6, 1994, Viroqua, Wisconsin.

Charlotte Cannell: "I have some heifers that are ready to calve and they have a lot of edema. My husband said, 'You should bring them in and pre-milk them.' To me, it's just against nature's way. But I have agreed to let him do it."

Bill Zimmer: "Doc Holliday has some experience with that, saying it does not affect the quality of the colostrum. I haven't had enough experience with testing colostrum to find out. When I was in practice I did recommend people pre-milking cattle that had severe edema. . . . The risk is so high for mastitis from high edema that you have to do it. I tried Naquazome and all these different things to reduce edema. It's better if you milk it, get that blood flowing again, and get that edema out of there."

Richard Holliday: "I would like to raise this question, too. You say it's not a natural thing to do. That's probably true if you are milking a Hereford. . . . The modern dairy cow is bred to produce milk. And most of that edema that you are seeing is because she is ready to produce milk and is in fact producing milk. But being much smarter than she is, we refuse to take it until she calves. . . . Regardless of whether you save your colostrum first or after—whatever—if you have udder edema, I would sure pre-milk those cows. You will not only relieve that temporarily, you will save a lot of cows from having mastitis. You will save a lot of udders breaking down the ligaments. You will have a lot less trouble. I would also like to add that a whey product at that time in a rather large dose, about 100cc or so, also would benefit that."

Cannell: "I save all my colostrum. We've milked for 14 years and I have never bought a bag of milk replacer. I lose very, very few calves. But, this winter and the feed I had . . . my heifers have a lot of edema."

Zimmer: "That's one thing I would bring out is prevention. I'll harp on it again. Potassium, I've seen it cause a tremendous amount of udder edema. Too much grain, too much energy going into those animals. Most guys, most farmers, I should say, when they're talking about springing heifers, they don't treat them like a dry cow. The nutrient requirements at that point are more similar to a dry cow than to a heifer. I do see people overfeeding heifers and getting edema from that."

Vicki Braun: "A homeopathic remedy can be used for udder edema. I used it for after calving and that worked. I've never used it before [calving], but I'm sure that it's useful. It's called Apis mellifica. It's from the honey bee and it reduces swelling. Now, the time that I used it on two cows that had huge udders after they calved, the book says give them a dose every 20 minutes or something like that. . . . I gave them a dose every 20 minutes. I set my alarm, my little kitchen timer. . . . I went to and from the barn and the house and did a few things in between. I carried my timer. I just did that. At the end of four hours I could feel the difference. So it does work."

Managing For Low SCC: A Producer's Perspective

— by Vicki Braun

I'd like to share some common management practices that we have been using to lower our somatic cell count (SCC) and also enhance our overall milk quality:

1. Regular maintenance and check up of the vacuum system by qualified service people every year or twice a year.
2. Regular cleaning of the vacuum regulator foam filters. Foam filters must be washed, rinsed and dried every time they get dirty. Where we have ours located, we need to wash it every two weeks. Replace any rubber or cardboard type filters every time they get dirty or show wear. The regulator itself can be cleaned depending on type; some of the parts should only be replaced by dealers or service people.
3. Clean pulsators regularly. We check ours every week in winter because of the dust in the barn.
4. Replace all rubber parts such as inflations, hoses, gaskets, etc., every time they start getting cracked and worn.
5. There are many ways to prepare cows before milking which varies from doing nothing to pre-stripping several squirts of milk from each quarter, spray or dip, then, work the dip into the teats well especially the tips, allow the dip to work 15 to 30 sec. and finally wipe with individual paper towels. If quality measures such as SCC or standard plate counts (SPC) are not as good as what the farmer or milk plant wants, the above procedure may be recommended. We also use a glove, like Doc's nitrile gloves[®], in prepping our cows. These gloves allow excellent tactile preparation, are reusable, and help prevent transmission of bacteria from milkers' hands to cows' teats.
6. Singe the cows' udders. We singe them in the fall right after freshening; then two to three times over winter and into spring. It only takes a few minutes.
7. Cow bedding can affect cow comfort and SCC. A number of farmers are using sand as bedding for their confinement cows. It definitely increases cow comfort with drastic reductions in hock problems and stepped on teats. In addition, because sand is inorganic, bacteria can not survive as easily as in organic types of bedding like straw and sawdust.
8. Use DHIA testing services to identify high SCC cows.
9. Culture high SCC cows or ones with lumps or hard areas in the quarters. I personally believe there is a high incidence of *Staph. aureus* mastitis and it is being transmitted from cow to cow through poor vacuum systems and/or milking order. Cows' quarters can easily be ruined by *Staph. aureus* infections. Change the milking order if cows are positive for *Staph. aureus*.
10. Permanently dry off quarters of cows that are repeat offenders or cull the cow.

Managing for a low somatic cell count is possible on dairy farms (unless there are extraneous factors i.e. stray voltage), but it requires great attention to detail.

