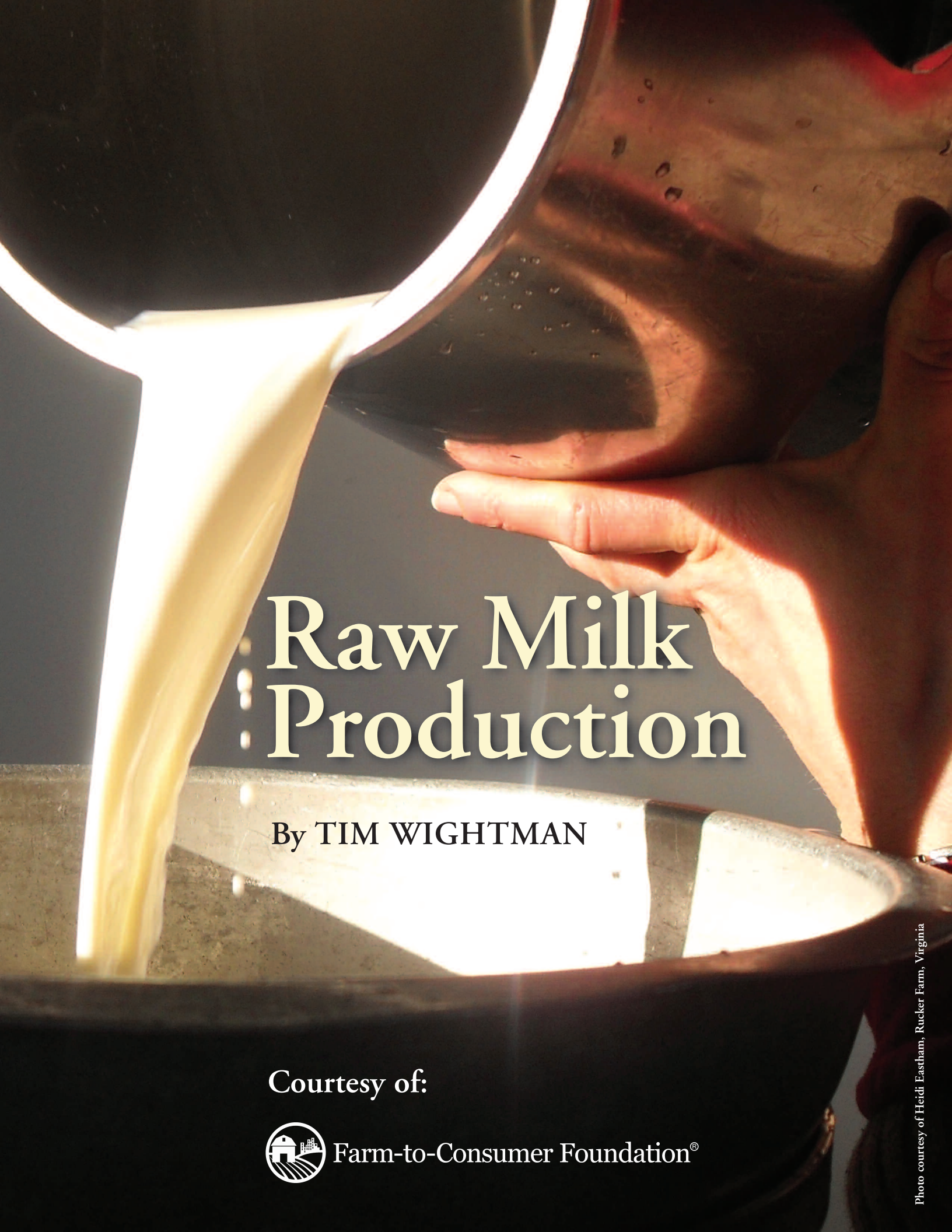

Raw Milk Production

By TIM WIGHTMAN

Courtesy of:

Farm-to-Consumer Foundation®

Photo courtesy of Heidi Eastham, Rucker Farm, Virginia

Introduction

Raw Milk Production was developed in cooperation with Farm-to-Consumer Legal Defense Fund to guide farmers engaged in small scale, pasture-based raw milk production supplied to consumers either through direct sales or through cow-boarding, herd-share or farm-share programs.

The growth of raw milk production has been very rapid during the last several years, reflecting consumer demand for a healthy milk product as well as the considerable economic benefits for the farmer. Raw milk is thus proving to be a boon to both farmer and consumer, sparking a renewal in small farming in many parts of the country and forging important bonds between farmers and their customers.

Even though government and health officials have condemned raw milk as dangerous and unhealthy, unprocessed milk is actually a very safe food, possessing its own built-in safety net of numerous anti-microbial components, most of which are inactivated during pasteurization. These components have the triple function of killing pathogenic microorganisms, strengthening the immune system, and acting as carriers for vitamins and minerals so that these nutrients are completely absorbed.

These components ensure the safety of raw milk under a range of diverse conditions and broad variations in levels of cleanliness. Nevertheless, it is imperative that farmers providing raw milk to consumers pay scrupulous attention to the health of their cows, the cleanliness of their barn and milking equipment, and their processes for milking and storing the product. This high level of care is needed for two reasons.

Firstly, the amazing anti-microbial systems in raw milk can be overwhelmed in situations where the cows are unhealthy or when a strong dose of pathogens is introduced into the milk. But secondly, as a raw milk producer, you have an obligation to all other raw milk producers to maintain a careful and sanitary operation. One major outbreak due to carelessness on your farm could mean a setback for the entire raw milk movement and jeopardize the supply of Nature's perfect food to the thousands who depend upon it for good health.

Raw milk dairy farming is not for everybody—farmers engaged in the production of raw milk and raw milk products need to be careful, observant, patient and systematic. They need to consistently follow good procedures and keep accurate records. They need to pay attention to details. Farmers with these traits can expect to be successful providing raw milk directly to grateful customers.

Raw Milk Production is designed to provide general guidance; for more detailed information on such topics as soil fertility, pasture feeding, animal diseases and non-toxic animal care, see the Resource section on the last page.

Table of Contents

Chapter 1. The Basics of Dairy Cows

The type of cow you select and the source from which you purchase your cow are extremely important decisions that you make as you start your raw milk operation. And remember, after your purchase, tender loving care is needed to obtain the best from your cow.

Before purchasing a cow, make sure your property has good enclosures or fences as she will likely push into the outside world—paying visits to your neighbor's garden or wandering off to other pastures.

CHOOSING THE BREED

You should choose a cow that will do well on grass and produce rich milk. In general, choose the old-fashioned breeds such as Jersey, Guernsey, Ayrshire, Milking Shorthorn, or a cross with these breeds and Holsteins.

PURCHASING YOUR COWS

SALE BARNS: Sale barns sell milk cows daily, often at bargain prices. However, this is not a recommended avenue. These animals are typically at the end of their lives for one reason or another and are not viable milk producers. Most milk cows at a sale barn will have severe mastitis problems or a non-working udder, suffer from lameness, prove to be unbreedable, are possibly ill with Johne's disease or pneumonia, or all of the above.

Nor is a sale barn the place to purchase a day-old heifer calf in hopes of raising it for your milk cow. These are often for sale but are most likely twins to bull calves and have a 90 percent chance of being infertile. These heifers are known as "freemartins" and while they do make tasty beef, they rarely make a milk cow.

Sale barns on occasion do hold dairy cow auctions where producers sell their excess animals on the auction block. It takes a trained eye and careful research to know what you are looking for in hopes of finding the quality cow that you would want to milk for your family, customers and shareholders.

CATTLE LOCATERS: Cattle locators of various levels of honor can find you a cow, but finding an agent who will bring you a cow without problems and at a reasonable cost can be tricky. More often than not, using a cattle locator does not lead to a successful transaction.

EXISTING RAW MILK DAIRIES: The best way to purchase your own milk cow is to approach a good dairy producer who has raw milk customers and ask to purchase one of his animals for your own use. If the dairy is close by, the owners may possibly have selected cows that do well in your particular area and on the local type of pasture.

OTHER SOURCES: Local veterinarians who specialize in large animals are a good resource for finding cows. They will know which dairies they do not have to visit very often thanks to good herd management. Avoid purchasing an animal from a farmer the vet has to visit all the time. Also, chapter leaders for the Weston A. Price Foundation may be able to tell you about pasture-based producers in your area. Another possibility is local feed mills. They may know who has cows in the area, and which farmers are doing pasture-based farming rather than the mill's feeding program.

PHYSICAL CHARACTERISTICS OF A GOOD COW

Try to choose a cow that is docile, not skittish. She should have a straight back and her hair should lie nicely—if the hair stands up and is curly, that may be a sign of mineral deficiencies or just a general lack of health.

The udder should have a squarish shape, with all of the teats at the same height. In some cows, the two teats at the back are higher—such a cow will be harder to milk. Be sure to feel the udder to make sure there are no ticks attached.

Look at her feet for any sign of foot rot and also make sure that her feet are not too small. Cows that look as though they are wearing elf shoes are not the type of cows you want to purchase for your farm.

Also look at her eyes. A good cow will have a nice soft eye, without any sign of wall-eye or any white in it.

If possible you should try to milk the cow before purchase, especially if you will be hand milking, because some cows are harder to milk than others. Some will hold their milk back, only letting down at a certain time, and some cows tend to kick or put their foot in the bucket when they are milked. (If you have a cow that does this, you can hold her two back legs together by tying them with a rope.)

You should enquire as to whether she has ever been sick in any way with mastitis, bloat, milk fever, acidosis or tick bite.

IMPORTANT POINTS FOR PURCHASING A COW

1. Find out whether she has been tested for Johne's disease and TB. You will want to purchase a cow that has tested free of these diseases, or that comes from a closed herd where the cows have not had these diseases.

2. Find out whether the cow has been vaccinated as a calf for brucellosis. While the brucellosis vaccination is not absolutely necessary, a lack of vaccination may point to the farmer's overall herd maintenance program and be a sign of careless attention to details.

3. Pay for the cow to be typed for mastitis. Look for a cow with a somatic cell count (see Chapter 5) below 200,000 with no positives for the three major pathogens (*pseudomonas*, *Streptococcus ag*. or *E. coli O157:H7*).

4. It is a good idea to purchase a cow when she is about to dry up (stop producing milk). Move her during the dry period so that she calves at your farm and has had a bit of time to adjust to the new pasture and surroundings before she is milked again.

5. The age of a purchased cow is a matter of preference, but my advice would be to get one that has been milked before so she can teach you the routine and will put up with a few awkward moments in the beginning. Unless they are the offspring of show cows, fresh heifers can be a bit difficult to train to milk if you are inexperienced.

   Older cows will be cheaper, but depending on the breed, be careful of cows older than five years of age. Such a cow may be around for another five years, but she also may not be. You can ask about the average age of the herd you are buying from, and if the cows in the herd tend to live long lives, then a cow about five years of age may be a good purchase.

   Some farmers do sell off older cows in order to always have a young herd, so each farm will be different. The farmers who have to sell for lack of pasture space are the best to buy from.

TRANSPORTING YOUR COW

Usually, the person you purchase your cow from will know who can move her for you. Remember that cows cannot jump down from a platform. She will need to walk up and down a gently sloping ramp or, even better, walk straight on and off a trailer backed up to a platform or bank.

Cows generally travel pretty well. If your cow is milking, arrangements will have to be made to milk her at twelve-hour intervals. She should be supplied with some good hay during the move.

Most cows will travel over twelve hours without water but make sure she can have access to plenty of water when arriving and thereafter, for she will need to catch up.

CARING FOR YOUR COW

To avoid the common cow mishaps, remove any and all obstacles, equipment, wire and metal objects that are not part of your fences and or holding-area requirements—yes, cows will get into these things and yes they will require stitches. Keeping a neat and tidy farm is good business and wise animal husbandry.

Do not keep one cow alone too long. No fence or wire will stop her from attempting to join the others at some point. If isolated, keep the cow secure in a headlock or strong box stall. At the very least, try to keep your cows as pairs as cows do not like to be alone.

Cows will respect any fence if adequate food is available. No fence will hold them if it is not. If you have a problem keeping cows in a fence, you are not feeding them enough or the ration is unbalanced.

Cows will rush a fence if they are startled, and some cows will push others through an electric fence to get to the other side if they think they need to.

Do check your fence often. Fallen branches on fence wire, broken gate chains and weaknesses in the fence can create a lot of grief.

Milk cows are usually content where you put them. Steers and heifers usually are not and may require more fence to keep them where you want them.

Try to keep your animals in a group of animals the same size. You can have a range of ages in your herd of milk cows, but younger animals need to be with their own age group and size to ensure adequate feed intake for them all. If you put a smaller calf in with big ones, it will not grow or gain weight as the big ones will push it away on a regular basis. If you put a young heifer in with milk cows, the same thing will happen. Cows have a very well defined order of rank and one must honor the nature of the animal and its pecking order.

Fill in the holes in your pasture and fence off standing water. If you have holes and standing water, the cows will always be there. Standing water makes them susceptible to hoof rot and mastitis, and milk quality issues became problematic.

Keep your regimen on schedule. Cows don't wear watches but know what time it is better than we do. Try to do things the same way as you did yesterday, and set up routines so you do not have to change them. Cows are very resistant to change, they will do the same thing every day, day in and out. Bad things often happen to cows when the routine is changed.

When doing hoof trimming or vet work, try to do it in a fashion that replicates the routine the cows are used to. For example, do not try to have the cow exit the barn to the trimming table or vet headlocks from a door they do not regularly go out of. They know that is not right and will suspect you are doing something different. This will cause them to bolt, climb walls, climb over you, etc., and you or the cow may end up getting hurt.

Keep extra gates around to vector cows into the direction you want them to go or when training them. A collection of several used 12-foot gates is one of the best investments you can make.

Keep an eye on the manure of your animals. If the manure of an animal doesn't pad up, that is, if it makes a round pile of oatmeal consistency, add a little hay to her diet to slow and cool things down. If the manure is runny, that means the cow is getting too much protein or the pasture is too lush. If the manure is watery, that means the cow has some kind of digestive distress and the vet should be called in.

Dysentery is common in feed-lot cows or cows moved from farm to farm, but usually is not a problem with pasture-fed cows getting a balanced diet. Dysentery should be dealt with immediately, either using natural methods or antibiotics. Review your management practices, particularly the cow's diet, to prevent the problem long term.

If you are keeping cows indoors, as during a cold winter, they need about 60 square feet per cow. The barn should be well ventilated and not too warm. In very cold climates where the doors of the barn must be kept cold, fans to circulate the air are a must.

For bedding use straw or kiln dried sawdust. Never use green shavings or green sawdust as this serves as great food for microbes and mastitis bugs. Getting the proper amount of bedding is an art. The bedding plus manure will ultimately be composted and if you have too much carbon (straw or shavings), the compost will not break down well.

WEATHER CONDITIONS

Cows really only need protection from two things: cold wet weather, for which a lean-to or shed is usually enough, and blistering heat, for which shade of some kind is a must.

Cows are much easier to keep warm than to keep cool. Cows do not seem to mind cold weather—not even as cold as -20 below—as long as they have a wind break and a dry place to lie down. If they are forced to stay in the wind and blowing snow, they risk frost bite of the udder.

If cold weather persists, your cows will need more energy in their feed to compensate for the energy they must put into generating warmth just to survive, let alone produce milk. Energy can be increased a certain amount by increasing the amount of grain and hay or silage they receive. Grain must be increased in unison with hay or silage, and you should not give too much grain or it will damage the digestive system of the cow. (More on this in Chapter 2.)

You will see a drop in milk production if cold weather persists and cows are out in the open rather than in a sheltered place where they can get together to raise the temperature—by as much as 30 degrees—through body warmth of the herd.

As for very hot conditions, keeping cows cool may require fans, water misters, extra water tanks, shade or all of these. The key to cow comfort in hot weather is a buffer in the rumen. Dry hay of a lower protein content helps a cow function much better in heat and is an inexpensive precaution that works well with the cooling agents listed above. Watch the amount of dry hay given as cows will eat in excess, thus keeping them from eating a higher protein diet when that feed becomes available later in the cooler part the day.

If you have old, established pasture, the dry hay is already present during hot weather in old-growth plants; but if your pasture is young and lush, a few bales to get five pounds a day of dry

hay into the cow will work wonders for your cows' comfort and milk production during very hot weather. Remember that the little ones need dry hay too when it gets hot.

Check your water tanks often in hot weather and wash them often to keep the algae growth to a minimum.

Water is just as important in cold weather. Water must be above 48 degrees for cows to drink enough and maintain body temperature. Chipping ice away and filling the hole till they quit drinking is not adequate water for cold temperatures. Water tank heaters of various types and sizes are great for wintertime water needs. Electric frost-free types of water fountains are available but these usually require a certain number of cattle per model size and winter severity of your area to remain frost-free.

HOOF TRIMMING

All domestic ruminants need proper hoof care to maintain them in good condition. How often cows need hooves trimmed varies on a cow-by-cow and farm-by-farm basis. The main factor that determines the time interval between trimmings is the type of surface the cows walk on.

If a cow is out in pasture, trimming will be needed at a minimum of once every 16 months; if you have a cow on bedding pack or in a tie stall even half time, trimming might be necessary as often as every six months.

If you are unsure when to trim, ask your vet, for when you are around your cows all the time, you do not see the subtle changes in their feet.

A cow's hoof should have a 45-degree angle from the floor. When their hoofs need trimming, the angle gets longer; they look as though they are wearing no-heel Berkenstock clogs, with the heel carrying most of the weight.

Cows are very touchy about their feet. They do not like pain and foot pain is one of the top stressors in cows. If a cow is stressed, she will lie down and refuse to eat. The result is reduced production and a shortened life for the cow.

HORNS

Whether or not you keep the horns on your dairy cows is a matter of taste and preference. There are pros and cons for both options.

One argument for keeping horns is based on the belief that the horns attract certain energies and result in milk of superior nutritional quality; also, removal of horns is tricky and can cause problems for the animal.

On the other hand, horns are the number one reason for human injury by a cow; routine removal of horns has greatly reduced this hazard on the farm. And, obviously, cows can injure each other with their horns. Furthermore, horns take up bunk space and most feed bunk head

gate designs do not allow for the width of horns on cows.

The customary age for horn removal is five months. Removal is not a pleasant task and should not be done by anyone who is inexperienced. Infection and uncontrolled bleeding, even leading to the death of the cow, can occur. Also, with poor removal techniques, re-growth can be a problem. Thus, it is best if dehorning is carried out by a vet or custom dehorning person until you feel comfortable doing it yourself—there is no shame in getting someone else to do this unpleasant job. The results will look much better and reduce the stress on the animal. The best results come from burning the crown area with a dehorning gun, and this must be carried out by someone with experience.

Dehorning should be carried out in early spring or late fall, whenever flies are not a problem, but not when the weather is too cold, for opening the sinuses to extreme cold will create problems for the animals.

Covering the wound with corn starch over a few days will help the area heal and stay free from infection. Do not vaccinate, castrate, remove extra teats and/or dehorn at the same time. Any of these activities can be stressful enough by themselves and if done all together, they may cause stress levels too high for a young animal to overcome, and death could be a result.

TAIL DOCKING

Some farmers like to dock the tails of their cows as this helps keep the barn and pipeline clean, and is said to keep the incidence of mastitis down. The downside is that the cow's main weapon against flies—her long tail—is handicapped. Docking is really not necessary in a small herd, but may be an option to consider in a larger herd.

If you do decide to dock the tail, this is best carried out when the cow has her first calf, around 24-27 months of age. Docking is safe and easy to do by putting a tight rubberband between two vertebrae, usually about two-thirds the way up from the end of the tail, similar to the procedure for castration of bull calves.

An alternative to docking is to just keep the long hairs of the tail neatly trimmed.

EAR TAGS AND BRANDING

When a cow gets her brucellosis vaccination, the vet puts a small tag with a number on it in her ear. In small herds where you can easily recognize your cows, putting a larger tag or branding your cow is not necessary. But in a larger herd, you may want to put a larger tag in your cows' ears so that you can see their numbers from a distance. An alternative to this larger tag is a light chain around the neck to carry a numbered tag.

Some states require you to brand your cows. When branding or tagging, follow best practices as described by your state vet and be sure not to stress your cows by performing more than one operation at a time.

KEEPING YOUR COW TRIMMED

Cows are hairy animals and this hair grows in the most unfortunate places for those who milk them. Some breeds have less udder hair than others but all cows' udders should be trimmed every time you get matter sticking to the hairs on the udder, which makes pre-milking prep difficult if not impossible.

In the summer months, hair is at a minimum, but towards fall, hair begins to cover the udder and teats and should be trimmed to make cleaning for milking easier.

Singeing with an udder torch can be used but clippers work well and are better for a nervous cow.

Some states require trimming frequently by schedule, and some states require flank and belly hairs to be trimmed or shaven off particular cows that are not picky about where they lie down.

The last thing a producer wants is thick manure-matted hair on a milk cow. Dirt and manure can be brushed off during the milking process and enter the milking unit. Not only is this unsanitary, is just looks bad!

Recurring problems with matting would suggest that more bedding is necessary, and/or more room for your cows.

BREEDING YOUR COW

Cows come in heat 18 days after calving and then every 22 days after that. They remain in heat about two or three days, during which time they can be bred, although the main period of heat is about 12 hours. You will probably be able to tell she is in season by changes in behavior, such as mounting other cows or being mounted by other cows.

There are two ways to breed your cow—natural or artificial insemination. (Embryo transplantation is out of the question for the pasture-based model as it requires heavy hormone treatment.)

Natural breeding is easy—at least, in principle! Find a quiet bull to put in with her around 60 days after she calves (that is, just before her third heat) and the bull will do the rest. However, bulls can be dangerous and are not recommended if you only have one cow. The bull will see you as a challenge to his girl and will hurt you to prove she is his. Multiple-cow herds are safer to breed, but there is no guarantee that the bull will be any friendlier.

Bulls will breed any cow in heat. If you have one cow that is 60 days fresh and another cow that is 18 days fresh he will breed both. It is not recommended to breed a cow so soon after calving, so you will need to keep the cows ready to breed separate from those who have just calved. Bulls have been known to jump a fence to find a cow in heat whether you want her bred or not.

Separating a cow from a bull is a dangerous enterprise. Bulls enjoy a harem, for a lack of better phrase, and the safest way to remove a cow from a bull is to take her out of a group of cows rather than remove her when she is alone with the bull.

Never take a bull for granted. If you are in a paddock with a bull, keep your eyes on him, especially on his eyes, at all times.

If you see the cow being serviced by the bull again about 21 days later, this means that she did not become pregnant the first time. Repeat the breeding process as necessary. If it fails after three times, call the vet to check her out.

With artificial insemination, you will need the services of a specialist in AI (artificial insemination) whom you will call when the cow is in heat. You will be able to choose the semen used and will pay the specialist or company for it.

You will probably be able to tell whether a cow became pregnant by the absence of behavior indicating she is in heat 22 days later. However, if you want to make sure, 35 days after breeding, you can have the cow checked. Have the vet palpate her to determine whether she is pregnant. (Note: A farmer can learn to palpate a cow, but it is a real skill to do this and not cause an abortion. Even vets who do this every day can cause periodic abortions.)

If you have only one cow, it may be difficult to tell when she is about to cycle because you do not have the same behavior clues that you have with a herd. When she does cycle, mark that day on the calendar and about 21 days later she will be ready again. The AI specialist or the vet can stop by to palpate the cow in question to see where she is in her cycle. Generally, cows cycle with regularity, so once you know when she is cycling, it is easy to determine when she will cycle again.

A common problem for cows is a cyst on an ovary, which will cause the cow to be in heat all the time. This condition is usually easily treated with various brands of hormone shots. Cows are very responsive to this treatment and there are no side effects.

If a cow is failing to come into heat, the vet or AI operator can apply via insertion a small amount of iodine or other medication on the cervix. She will have a false heat within 24 hours and then a genuine heat 21 days later.

UDDER SWELLING BEFORE GIVING BIRTH

Some cows or heifers will have extreme swelling in the udder and under the belly before giving birth and may even leak milk before the birth of the calf. This is nothing to worry about, but it does create a problem at times for attaching the milking machine. You just have to work with it till the swelling goes down.

The swelling is not milk; rather, it is fluid and it takes several weeks to go away once she calves.

In cases of udder swelling, do not over milk in first milkings of the lactation. Start slowly with just enough for the calf at the first milking and then work up from there. Usually after three milkings, you can milk out the udder normally.

Some cows will dump milk and colostrum right away after giving birth but heifers usually do not, so take it slowly and let them come into their milk instead of pulling it out of them.

If the cow or heifer begins to leak milk before giving birth, that is normal as well. You can relieve the pressure by milking her just a bit, about one minute. Do not start milking her as you would if she calved, for you will pull all of the colostrum out of her and may shorten the milking lactation and/or volume once she calves.

Discard this milk and, once again, don't overdo it, as you may interfere with the oxytocin response and she will have a hard time calving. If you are worried or inexperienced, call the vet and he can explain the variables about swelling and inform you whether milking off a bit would help or not.

BIRTH AND CARE OF CALVES

In most cases, cows can give birth to calves without assistance. In a normal birth, the calf should have its nose on its feet when beginning to exit the birth canal—it should look like it is praying or like a dog with its head on its feet.

If you see only the calf's feet sticking out of the cow, and the situation remains like this for some time, you should call the vet, probably within three-quarters of an hour if the situation does not improve.

Likewise, if you see two hooves with bottom side up, the calf is coming out backwards. It may do fine without help but you may also have to pull to help get the calf out. If you have never done this before, call the vet, for it sometimes takes a lot of pull and tools to do it. Sometimes the vet can turn the calf around, which is a good idea because a breach birth is difficult.

If you have twin girl calves, count yourself lucky. But if the twins are a boy and a girl, the girl calf has a 90 percent chance of being sterile.

After the calf is born, catch it and treat the navel with an iodine solution of 27 percent (available at pharmacies, cow supply houses and vet offices) to prevent infection. It is also a good idea to give the calf a shot of a pre-mix containing selenium, vitamins A, D & E, and also vitamin C. This shot is known as Bucsi. A pre-calving shot equivalent for the cow is called Musci (available from the same sources).

You can either let the calf nurse directly from its mother, or milk the cow and feed the calf with a bottle. Obviously in a pasture-based operation that provides raw milk to humans, calves should get their mother's raw milk also—not formula or milk replacement.

For the first milking of your cow after she gives birth, milk only about 45 seconds to reduce any chance of inflammation in the udder. After that, you can gradually increase the amount of time milked. For about four days or so the cow will give colostrum, not milk.

Make sure the cow expels the afterbirth or look for it if you were not around to witness the birth. If she does not expel the placenta after a few days, call the vet to check her out.

If the cow is lying down and not getting up and her ears are cold, she probably has milk fever. Call the vet—the sooner the better. He will treat her with a fluid calcium and potassium IV to get her up and going again.

By the way, sometimes bull calves are born without an anus—it just happens and there is not much you can do about the situation. Save the iodine and selenium shot as the animal will not live long.

Bottle-fed calves should receive a quantity of milk commensurate with their weight, usually one-half gallon of milk morning and evening per 100 pounds of calf. Most calves weigh around 80 to 100 pounds at birth, although Jerseys weigh only about 45-60 pounds, so bottles for Jersey calves are usually of the half-gallon size (as opposed to the larger three-fourth gallon size) and filled only half full.

Be careful not to over-feed a calf, which will cause scours (diarrhea), loose stools and dehydration in the early stages of growth. You can increase the amount of milk for the calf over time, but do so only as needed—do not force-feed the calf.

Offer water in a bucket from day one and over time the calf will begin to drink from it.
Keep the calves warm and dry and out of the wind. If you are bottle feeding, keep the calves in a group of their own size. Throwing them in with larger animals will only cause them to be pushed around and not grow as well as they could in a grouping of same-sized animals. Furthermore, their nutritional requirements are different than those of larger animals, even animals only 50 pounds bigger.

Watch out for coccidiosis, which is severe diarrhea caused by an organism in the ground. It can be spread between animals very quickly and cause severe weight loss and stunting of the young animals that contract it. It is treatable with a water treatment called a coccidiostat and direct-fed coccidiostat microbials. Animals weighing over 400 pounds do not carry a risk of infection. If the condition takes hold in your herd, you will have a problem with it forever and will have to treat constantly to control it.

Heifer calves should be vaccinated between four and eight months for brucellosis. At that time a state ID tag will be put on by the vet performing the task.

The average age of first heat cycle (that is, puberty) is 12-14 months, and as late as 16-18 months, depending on the breed. Gestation is nine months. The general rule of thumb is to breed at 15-17 months, so that the first calf will be born at 24-27 months of age. If a heifer is underweight from a poor feeding program, she will not be ready to breed until she reaches about 65 percent of her adult weight. For a Jersey this would be about 650 pounds (65 percent of the adult weight of 1000 pounds); for a larger breed, the heifer should reach 850 pounds before you breed her.

If you have a heifer that comes into heat before she is ready, say, at 12 months or before she has reached the right size, you will need to keep her away from the bull. If you breed her before she is ready, you will shorten her lifespan.

Chapter 2. The Basics of Pasture Feeding

Cows, sheep and goats are ruminant animals with digestive systems designed to digest plants, specifically pasture plants or forages, such as grass, young weeds and legumes. This is the kind of diet that allows your animals to be healthy, their milk to be safe and nutritious, and your farm to be sustainable and profitable. The vast majority of the diet of your cows should be forage—green pasture, hay and silage.

Dairy cows in particular require high-quality forage. They will not do well on the kind of low-quality forage that supports sheep and goats. You will need from one-half to three acres of pasture per cow depending on the quality of your pasture and the breed and size of your cows.

The following section is only a summary of the vast subject of pasture feeding and cow nutrition. If you are new to pasture-based farming, you will probably need the services of a consultant to help you get started and to periodically assess your pastures and livestock. Above all, pasture-feeding requires constant observation on the part of the farmer, always on the alert to the quality of his or her pasture and the health of the grazing animals.

MANAGED GRAZING

Many farmers use controlled grazing plans instead of continuous grazing in order to increase the quality of their pastures and to maximize production from their animals. In a system of controlled grazing, pastures are subdivided into paddocks, often using moveable electric fences. Livestock are moved between paddocks at frequent intervals, giving animals access to a limited area of pasture over a short period of time. The animals do not return to a paddock until the plants have recovered and regrown to the desired height for grazing (usually six to eight inches). As a result, the plants have time to recover, the roots maintain energy reserves, and the livestock always have high-quality forage.

Rotations can vary from once every couple of weeks to every 12 hours. Decisions about when to move livestock are based on the seasonal amount of forage available, the rate of forage growth, and the number and type of animals grazing the paddock. Typically, grazing animals are moved quickly through paddocks during periods of rapid plant growth. In the fall, quick rotations keep grasses from going to seed and preserve forage quality. This strategy can delay harvesting of forage as hay for several weeks, allowing hay to be put up during a dryer time of the season.

A change to controlled grazing involves a modest capital investment. This may include buying and installing electric fencing systems and systems to provide water to each pasture subdivision.

SOIL FERTILITY

Grazed pastures need less fertilizer than those dedicated to hay production. Animals actually use up very few of the nutrients from the plants they eat. Most minerals are returned in animal wastes as part of a natural cycling of nutrients. Phosphorus is excreted primarily in manure, and nitrogen and potassium return in manure and urine. As long as wastes are evenly distributed throughout the grazing area and biological agents such as earthworms, dung beetles and soil bacteria are active, the system should be relatively stable.

It is important to have a variety of plants in your pasture as many different plants have a role to play in contributing to soil fertility. Legumes increase the total nitrogen content of the soil. Deeply rooted plants such as alfalfa, warm-season grasses, trees and even some weeds bring up nutrients from deep in the subsoil. These nutrients remain in the top layers of the soil when the vegetation decays and then become available to other plants nearby—and to the animals that feed on them.

Periodic soil tests and forage analyses are tools to monitor a pasture's status. Soil test results indicate the levels of mineral nutrients in the soil. Forage analysis is a way to test whether nutrients present in the soil are actually being used by the plants. Many extension offices offer forage analyses and there are private consultants you can use as well.

It is important to encourage the buildup of organic matter in your soils. Items that add organic matter include plant roots, plant residues, green manures, animal manures, other organic wastes and hay and other feed brought in.

Tillage and bare ground, pesticide and herbicides, compaction and continuous cropping will destroy organic matter. With good pasture management, the organic matter in your soil can be greatly increased.

Many farmers use a brix meter (refractometer) to measure sugar levels in the plants. High sugar levels indicate good mineral status. The brix meter is a useful tool but you cannot use it to determine the specific minerals that your soil needs.

SOIL AMENDMENTS

You should consider very carefully whether purchased amendments are economically justified. If soils are the limiting factor, buying input to improve the soil is a wise, long-term investment. In such cases, improvement in soil fertility is the key to building a dense, lush and healthy pasture. Such pasture provides good nutrition to grazing animals whose wastes contribute to further productivity of the land.

A simple pH adjustment can increase mineral availability in most soils. Lime is used to raise the pH and further provides an important source of calcium—and when you have usable calcium, your plants can also better use the other minerals in the soil. Lime is also less expensive than many other purchased fertilizers.

The type of lime to use depends on the magnesium and sulfur levels in your soil. Dolomitic lime (soft lime) is the most common type of lime. It has a high magnesium content (about 34 percent) and should only be used if your soil has a magnesium deficiency.

High-calcium lime (only about 7 percent magnesium) usually comes from limestone processing of various sorts. It is low in magnesium and should be used if you have a high-magnesium situation.

If you have a high calcium-to-magnesium ratio in your soil, then gypsum is the answer. Gypsum is calcium sulfate, also called plaster of Paris. Magnesium binds with calcium if there is inadequate sulfur in the ground. Gypsum has 17 percent sulfur and 34 percent highly available calcium, which the plant can use right away until the sulfur releases the magnesium from the calcium to free the calcium locked in the soil. Then the calcium can do the work of moving trace minerals to the plant and on to your herd.

The application rate for the various types of lime is not more than 2000 pounds (one ton) per acre, once every two years—more frequently if testing shows the ground needs it. For gypsum, apply half that amount, or 1000 pounds, per acre.

As for trace minerals, you will need a comprehensive soil test to determine whether your soil is deficient in any one of them. Very specific applications of minerals (such as copper, cobalt, boron, etc.) may be needed.

A soil specialist can help you with an amendment program. Composted animal manure or compost teas might also be an excellent investment because these add fertility and support the proliferation of soil microbes. However, if manure is applied to the same pastures over many years, phosphorus can build up. Excessive phosphorus levels in soils and the threat of phosphorus-saturated soils leaching soluble phosphorus are serious concerns in some parts of the country.

LEGUMES IN PASTURE

Legumes such as clover increase soil fertility improve overall feed value of available forage and extend the grazing season. Bacteria that live in nodules on the legume roots convert nitrogen in the air to a form the plant can use. After the nodules separate from the roots or the plant dies, this nitrogen is available to nearby plants. (Another source of nitrogen in a pasture system is dead leaves that fall to the ground.) Compared to grasses, legumes have higher digestibility and higher mineral and protein content.

When introducing legumes into an established grass pasture, first be sure that magnesium and potassium levels are suitable.

If the legume is established and maintained at about a third of the total pasture, the plants won’t need additional nitrogen fertilization.

One problem with legumes, however, is that hungry animals introduced to highly leguminous or wet legume pastures may develop bloat. Bloat is a buildup of gas in the abdominal area, usually on the left side. The skin become very tight, and without preventive measures or quick action, bloat can kill a cow very quickly.

To prevent this problem, provide hay to animals before they are given access to a legume pasture. Another preventive measure is to put peanut oil in the water troughs or brush it on the cow so she licks it off. Some farmers have even sprayed peanut oil on pasture to prevent bloat.

If you catch bloating in early stages, immediately remove the cow from the paddock and administer a combination of water and peanut oil in a long-necked bottle—just force the bottle into her throat and pour down the mixture. If a cow is badly bloated, use a special tool called a trocar to poke a hole on the left side in the middle of the triangle made by her hip bone. This will release the gas that is building up. If gas does not come out and the hole seems blocked, then you have a case of frothy bloat, and you will need to poke her in the same place with a knife. The froth will spew out in a rush—often up to ten feet! Obviously it is better to prevent bloat than to find yourself in a position where you have to treat it!

MANAGING WEEDS

In a controlled-grazing system, livestock can help control tall weeds that re-seed themselves. Because animals have access to a limited area for only a short period, they often become less selective in their grazing. They tend to eat the same weeds in the young, tender growth stages that they reject as the weeds mature. Many weeds provide good nutrition during this period of palatability.

Mowing before weeds flower and produce seed also helps to control them, although the cost is higher.

Another weed management strategy is to graze different kinds of livestock together. Sheep will complement grass-eating cattle in the pasture by consuming broadleaves, blossoms and seeds, while goats prefer brushy vegetation high in cellulose.

A growing range of beneficial insects is becoming commercially available to control thistles and some other perennial weeds. These weed-eating insects are especially adapted to a perennial pasture where habitat is not destroyed or disturbed by annual cultivation.

Also on the market are backpack flaming devices that actually burn the weeds and provide a non-toxic option to control difficult weeds.

IRRIGATION

Efficient water use is crucial for sustainable irrigated pasture management. Pastures require about 24 inches of water per growing season. What is not supplied by precipitation needs to be made up with efficient irrigation. Grasses and legumes require about 0.20 and 0.25 inches of water per day respectively throughout the growing season.

Frequency of irrigation depends on soil texture and, in turn, on water-holding capacity of the soil. Heavier (clay) soils hold more water, up to 2.5 inches per foot of rooting depth, and coarser (sandy) soils hold less water, around 0.75 inches per foot. Pastures have an effective moisture depletion allowance of about 65 percent, which means plants begin to suffer stress after 65 percent of the soil's water-holding capacity has been depleted. For example, pasture soil with a water holding capacity of 1.5 inches per foot, and a rooting depth of four feet, can hold a total of six inches of water. At a 65 percent depletion allowance, 3.9 inches remains available to the plants. If the plants use 0.25 inches per day, an irrigation that saturates the soil will last about 15 days.

Understanding the basics of soil-water dynamics helps producers make good decisions on when to irrigate, especially in areas where water is scarce or energy costs for pumping are high. The Agrimet system is an excellent resource for producers making irrigation scheduling decisions. In addition, the Natural Resource Conservation Service (USDA-NRCS) district offices have access to each county's soil information and can assist producers in determining the water-holding capacity of soil types on area farms.

Always remember to irrigate a pasture immediately after the livestock have been moved from it, and never irrigate and graze at the same time. Hoof action on wet soil can destroy its structure, resulting in compaction and decreased soil productivity for years to come.

If you have heavy rain, the cows can stay on the pasture if it is old and well established. But if the pasture is young, the cows should be taken off the pasture and put onto a lot or in the barn until the excess of moisture has drained from the soil.

SPECIES SELECTION

The importance of choosing the right plants in an irrigated pasture cannot be overstated. The high cost of irrigation, including initial equipment purchase, and energy and maintenance costs, require the right selection of the most productive plant species for the region. In fact, in some situations, short season problems and low yields can be addressed though proper species selection. Choose long-lived, winter-hardy forage plants adapted to your specific soil type. Plants should be capable of high yields, have the genetic potential to withstand grazing and be able to re-grow quickly.

Species diversity is also important. Greater productivity and increased biodiversity are fostered through grass-legume mixes. A grass component in a legume pasture can also minimize health problems associated with bloat.

HAY

Providing good-quality forage throughout the year saves considerably on feed costs. Year-round grazing is possible in some parts of the country and is a realistic goal in some regions.

When spring pastures produce more than livestock can use, machine harvesting to make hay is one strategy to ensure good quality forage later in the grazing season. Ideally you will make hay after the weather has been dry for at least one week.

It is expensive to maintain equipment and to harvest forage for hay or silage, so it is sometimes more economical to buy hay or hire a custom baler. However, it can be difficult to find someone to custom harvest and process spring growth at the optimal time.

A big challenge to a spring hay harvest is the weather. A spell of good haying weather, if it comes at all, rarely arrives at the perfect time. One option in wet conditions is to harvest, pack and seal the excess spring grass in bunkers for fermentation. Livestock controlled by a single wire of electric fencing can then have direct access to the silage bunkers.

If you are feeding hay exclusively, as in winter, you should figure up to 50 pounds per day per cow, depending on the size and condition of the cow, and the quality of the hay.

SILAGE, BAYLAGE AND HAYLAGE

Silage is fermented, high-moisture forage that can be fed to ruminants. It is fermented and stored in a process called ensilage and usually made from grass crops, including maize or sorghum, using the entire plant, not just the grain. Silage can be made from many other field crops, and other terms (oatlage for oats, haylage for a mix containing alfalfa) are often used. Silage may be a mix of two crops, such as oats and peas.

Haylage means ensiled forages made up of grass, alfalfa and alfalfa/grass mixes. This is used extensively in the Midwest and Northeastern areas of the United States. It is also used widely in Europe for dairy cattle diets.

Baylage is another form of stored forage. In this case hay, alfalfa or grass is cut and baled while still fairly wet, that is, it is too wet to be baled and stored as hay. In this case, the dry matter is around 60 to 70 percent. The bales are wrapped tightly in plastic wrappers. The material then goes through a limited fermentation in which short chain fatty acids are produced which protect and preserve the forage.

This method has become popular on smaller farms as it is one way to harvest on time in wet springs. However, specialized equipment is expensive for one producer to own and operate, and rental may not be available. Several producers in an area with similar needs might recover some costs through contractual arrangements among themselves. The amount of plastic used to seal cut forage is a concern for many farmers as well, since it must be disposed of after use.

The main uses for silage are to balance high-protein diets (that is, diets containing high levels of grain in conventional operations) and also as an energy source for cows in extremely cold climates, where it is needed to maintain body weight, warmth and production.

In these situations, the amount of corn silage should be in the range of 40 percent of the ration, with dry hay and grain making up the rest. (As a rule, commercial dairies have cows on a diet of 65 to 70 percent corn silage, with high-protein by-products making up the other 30 percent, including about 28 to 30 pounds of grain (including soy) per day per cow, and about 5 pounds per day of high-protein alfalfa hay.)

As an example of winter feeding for Jersey cows during lactation, she requires about 70 pounds of feed a day. Sixty percent or 42 pounds of this total should be of a forage type grass, such as alfalfa mix hay, baylage or pasture. Of the balance, she should get about eight pounds of dry hay, 12 pounds of corn silage and, if you need to feed grain to your cows to maintain their conditions, eight pounds of grain. All of this should be spread over two or three equal feedings. All-at-once feeding of any of the ration will cause digestion problems in the cow.

This type of ration would have to be adjusted for the individual cow, where she is in her lactation, the weather conditions, etc. The general rule is no more than 12 to 16 pounds per day of corn silage per milking cow. The best thing for dry cows during the cold season is dry hay, low in potassium, not silage, baylage or haylage.

Be sure when feeding silage, baylage or haylage to your herd that they all have access to it evenly; be careful you are not feeding only a portion of your herd.

For pasture-based operations in most climates, silage is not necessary. Baylage works well in most cases because with baylage, you only expose one bale or 1000 pounds of it at a time. Note that with baylage, you need to feed a bale within seven days of opening it in temperatures over 50 degrees. The higher the temperature the faster it will decay.

When cows are on pasture, baylage should be fed in moderation for the combination of moist baylage and wet pasture will result in most of the feed value of your pasture and baylage going right out the rear end.

In the spring, it is important to combine dry hay with lush pasture in order to maintain the progression of the pasture through the cow. Corn silage can be given, but most cows will refuse it, preferring dry hay. Thus, very little silage is fed during the pasture months, with an increase as weather gets colder to the maximum explained above.

Brown mid-rib sorghum or Sudan grass can replace corn silage if it is cut at the proper time, that is, just before the seed heads are formed, and then baled and wrapped. You will have to limit the amount of Sudan grass per day or it will make the rumen too acidic and cause digestive problems.

When you make silage or baylage, wait two weeks for proper fermentation to occur before feeding it to the cows. The important thing with silage is storing it in a way to prevent spoilage before you can feed it. Silage keeps well in the winter but if the temperature gets over 40 degrees, it will quickly spoil, unless you are using a goodly amount of it every day.

On small operations, say under 20 cows, corn silage is almost impossible to have on hand and feed properly unless you can get it from a nearby farmer and seal it up in air-tight containers as you feed it. Also, the farm you are purchasing it from should use it at a fast enough pace to keep it fresh.

A twelve-foot diameter silo will need 25 cows eating from it to maintain fresh feed and reduce spoilage. Any less and the reduced number results in wasted feed and increased problems, including reduced production, due to the cows eating spoiled feed.

THE GREAT GRAIN DEBATE

Should pasture-fed dairy cows get any grain? That is the big question! To answer, first we need to emphasize that there is a big difference between feeding grain to dairy cows and "grain-fed" dairy cows. The latter have a very large portion of their ration as grain. They produce a lot of milk but their lifespan is greatly shortened and the quality of the milk is not as good.

In principle, dairy cows getting good pasture and high-quality hay should thrive and produce plenty of milk without any grain. However, a small amount of grain fed as a form of starch may be necessary to nourish the rumen bugs, which in turn digest the forage that the cow turns into body mass, milk and energy. In a natural setting, the cow would be getting a small amount of grain by eating maturing grasses from early summer to late fall, although these seed heads cannot be considered the same as modern grains.

The rule of thumb, in order to manage rumen activity in cows, is to feed no more than one percent of body weight per day as grain. Thus, for an 800-pound Jersey cow, you would feed a maximum of eight pounds of grain per day. But each cow is different and each cow has individual needs, as do different breeds. And remember, if you feed corn silage, there is some grain in the silage that must be accounted for.

Grain should preferably be given over three feedings a day, although it is common to give it at two feedings, during the morning and evening milkings. A typical grain ration would contain about 65 percent roasted or cracked ground cob corn with about 10-20 percent as rolled oats and/or spelt, with the balance as protein, if any is needed. Some farmers soak the grain before feeding it, usually in water with a little apple cider vinegar added.

Unfortunately, today soy is added to the standard ration as the protein source—and soy as a component of your grain ration should be strictly avoided as the plant form of estrogens in soy can end up in the milk. Before soy came along, a standard protein ration consisted of a mixture of flax and field peas. These are no longer available in a standard ration mix, so you would have

to source these locally and do the mix yourself. A qualified ration consultant can help you get started with this.

The amount of protein needed will vary. Again, there are dairy consultants who can help you figure out rations and it helps greatly if that consultant understands pasture and a forage-based diet. However, in the final analysis, it will be the cows that tell you the best balance.

The large grain companies have dairy consultants, but also have a lot of grain to sell—and an arsenal of remedies to combat the negative effects of that grain. Hopefully, you will not need to add any high-protein foods to the grain ration.

When milk cows are on good pasture you can eliminate the protein part and replace it with more fiber (hay) and starch (grain) to balance out the ration. And when the pasture is good, you can drop total fed grain to one-half percent of body weight or less. You just have to find the right balance and adjust properly based on your individual situation.

Cows will pasture in standing corn as long as it is green, but will quit till killing frost once the nitrates get too high, that is, when the kernels start to dent. Then they will only go after the ears and maybe chew on a leftover leaf. This is a good thing to remember if drought is an issue and feed is short and crops are not worth harvesting. Remember to set out dry hay with the pastured corn so the cows can balance the feed out themselves.

OTHER FEED FOR YOUR COWS

Some experts recommend squash, pumpkins and root vegetables for cows as a supplement in late fall and winter. Cows seem to love them and these high-pectin foods are said to be good for the rumen.

In late-season pasture, one can also plant root vegetables such as turnips or diakon radish varieties that provide forage into the early winter and help with compaction issues. Cows will also graze in kale and similar green leafy vegetables but care must be taken that they do not overeat as these crops have thyroid-suppressing effects. Cows will develop blood in the urine if they are overeating these types of crops.

SUPPLEMENTS FOR YOUR RUMINANTS

Supplements such as salt, seaweed, trace minerals, rumen buffers, rumen enhancers, yeast, probiotics for rumen health, and minerals such as calcium, phosphorus, selenium, magnesium and—most important of all—sulfur, help keep a ruminant standing strong and long. Until we can build our soils again with the proper saturation of minerals, these types of supplements will be necessary for dairy cows.

Your minerals should be from the purest sources, purchased from a dealer who specializes in supplements for organic and pasture-based operations. For example, sulfur should be a mined product, not an industrial by-product. Sulfur-based mined products and ocean-based feed

supplements work well. Choose a salt that is low in iron if you live in an area with high-iron soils.

Here are a few pointers to help you sort out which minerals you are short in and what to do about it:

1. Test your soils. You should do a comprehensive 18- to 20-point soil analysis that includes trace minerals. Without testing for trace minerals, you are only getting half the picture of your soils. The trace mineral half is just as important as the macro-mineral half that most soil tests address. Your county agent and commercial fertilizer dealers cannot help with this—they will only give you results for NPK and organic matter. Instead, call on a qualified forage-based soil consultant to help you understand what your soils are lacking and which additional minerals your cows will need.

2. Test your crops. Your soil test may show high calcium levels but if you have high magnesium levels, you will have very low levels of calcium in your pasture and crops.

3. Feed your soils and your crops (and supplement your animals) until the two are at the correct levels for your soil type.

Remember that supplements should only be a stop-gap measure. Your ultimate goal should be to correct deficiencies in your soil so that your animals get everything they need in their forage.

One rule to remember is that most products will fill a need for a period of time and cows will consume high amounts of any product that corrects a deficiency. But no one product will fix everything and most problems usually have more than one cause. Wonders in a bag are usually just that—you end up wondering why you bought it in the first place.

Managing soils and the animals on them is all about balance. Your soils are only as good as the minerals they contain. All soil compounds work in cooperation, and if one mineral is short or tied up or missing, the soil will not produce to its potential—and neither will your animals.

Chapter 3. The Basics of Milking

THE MILKING AREA

The milking area should be clean! Cleanliness is a relative term, but at a minimum, do not allow other animals in the milking area—no chickens, pigs, birds, dogs, etc., during milking or at any other time. (You might make an exception for cats, which are very clean and hard to keep out of the barn anyway.)

The floor of the milking area should be an impermeable material, usually concrete. Metal is also fine, but rather costly, and it weakens over time. Wood absorbs pathogens and water and therefore is not an appropriate flooring.

The milk house should be dedicated uniquely to the activity of milking. It should have washable walls, a wash vat for cleaning milking supplies and dry storage for milk house supplies. There should be plenty of light to see what you are milking and whether you have prepped properly.

The milk house should have good ventilation to remove moisture and prevent mold buildup. If you use water to clean up the milking area, the area must be able to dry between milkings in normal conditions.

One way to keep the milking area clean without using water is to use a layer of kiln-dried shavings in the milking area. These can be replaced often with clean shavings. The old ones, mixed with urine and manure, can be composted. Use of kiln-dried shavings is a normal practice for tie-stall barns or small milking areas that replicate larger milking barns.

Water for washing the milking equipment must be 165 degrees F leaving the water heater and no less than 145 degrees F leaving the item you are washing. When purchasing a water heater, make sure it can reach these temperatures—most cannot.

You can milk by hand into stainless steel buckets or milking cans, or you can milk by machine—it is possible to have very clean milk using either of these methods. And there are many choices for milking machines, from easy-to-clean portable milking units that run on 110 volts to pipeline systems of varying levels of complexity. Qualified technicians can help you choose the best milking system for the number of cows you are milking and the available support for repairs. They will also install and service your equipment and help you trouble shoot the problem areas that are a concern.

All milking equipment should be sanitized before use. To sanitize, use food grade bleach in very small amounts to run through the system prior to milking. This is quite easy to do with a vacuum system. Food grade bleach is often available from swimming pool supply companies.

If you are hand milking into a milk bucket, just fill the bucket with water plus the appropriate amount of bleach, then dump the water. For a bucket of warm water, one-half a capful will do; for a whole pipeline system, use 1/8 cup. Rinsing may be beneficial in removing residual germicide that could damage beneficial natural bacteria in milk that is added later.

MILKING PROCEDURES

When it is time to milk a cow, remove any excess dirt or other material from the teats and the bottom of the udders without using much water to do so and without opening the teat end (that is, without squeezing the teat the way you do when you are stripping her in prep for milking.)

After cleaning, then strip each teat (squeeze and pull down) to check for clumps in the milk--small clumps that look like cottage cheese--before applying teat dip and wiping dry with a clean paper towel.

To clean the teats before milking, pre-dip and wipe each teat dry with a single paper towel. The towel will serve for two teats, one per side. For the dip, use an appropriate teat dip—iodine- and aloe-based dips are the most common. Never use a common rag and bucket—all you do is spread infection.

Never wet-milk a cow by using water to clean the teats or leaving the pre-dip still on the teats. After cleaning, place the milking cups on immediately, or immediately begin milking by hand.

After milking you should post-dip the teat in the iodine or aloe-based product.

Use only labeled pre- and post-dip solutions for that purpose. Any solution not designed as a dip may be abrasive and will cause teat injury and even permanent damage.

If you are using a milking machine that puts the milk into a bulk tank, empty the tank no less than every three days and wash thoroughly every time it is emptied.

There are several high-quality milk equipment washing solutions on the market designed to remove milk from equipment. Bleach or dish soap will not do the trick. Wash everything, even if you think it does not need it, and store the equipment so that it remains clean until the next milking time.

HAND SANITATION AND GLOVES

Most dairy extension literature suggests wearing latex gloves during milking, in order to stop the spread of disease. But wearing gloves is a matter of preference. Gloves do protect the hands from the cleaning and prep chemicals, which tend to dry out the skin on your hands severely. However, some people are allergic to latex.

Whether or not you use gloves, it is always a good practice to wash your hands upon entering the milk house and prior to handling any milking equipment. In fact, it is a good idea to have a

hand-wash sink separate from the wash vats of the milking system, in order not to contaminate the wash vats with whatever you are washing off your hands. Simple soap and hot water is sufficient to clean hands properly. I would not suggest any anti-microbial or anti-biotic soap. We want our hands clean, not sterilized!

Dairy farmers should always practice diligence in hand cleaning and be vigilant to all vectors of dirt and contamination, in order to reduce the chance of getting a foreign substance in your product, especially if you are doing your own bottling. In fact, it is a good practice to limit traffic flow to one direction into the milk house, ideally entering from the door that does not connect with the barn or parlor, to reduce any tracking of dirt and other material from the barn into the milk house.

If you hang the milking units and return to the milk house to warm up the separator, it is imperative that you wash your hands before you go near the separator, to clean any contaminants from your hands that may have been picked up hanging the units. If you go back to switch units and then back into the milk house, wash your hands again prior to going near any equipment such as separators, bulk tanks, etc.

You should also wash off your boots before going into the milk house from the parlor or barn, and pay attention to your clothes. Remove any soiled clothes, such as jackets or sweatshirts, before entering to reduce the chance of contaminating the milk with brushed-off dirt you picked up in the barn.
These precautions apply for those who do not use a pipeline but hand carry the milk into the milk house. Always pay attention to any material you might pick up so as not to carry it into the milk house.

Ideally—but for the most part unattainable—is a system whereby one person is designated for milk house duties, another designated for the milking duties, and another designated for feeding and outside chores, with no cross-path interaction. At the very least, you should do your feeding and barn-cleaning activities only after you have finished milking and completed your milk house activities.

It is of utmost importance to have a clean milking environment, clean cows and reduced mud around the farm, especially around the milk house. Good bedding practices will reduce the likelihood of cows leaning on you and getting you dirty.

FLY CONTROL

The key to fly control is keeping the milking and holding areas scrupulously free of manure. All manure should be removed from the milking parlor and holding area immediately after milking. This is one reason cement floors can be such an advantage because they can be scraped clean and hosed down. All the manure you remove should be composted in another location—flies will not breed on compost.

In the fields, your best ally for fly control is pastured poultry, especially ducks. As a general rule, bring the poultry into a paddock three to four days after the cows have been there; they will search out the fly larvae in the cow paddies and eat them. Ducks can actually capture the flies and eat them.

If you do have flies around your milking house, sticky tape and zappers are non-toxic ways to get rid of them. Another ingenious method is to hang balloons filled two-thirds with water all around your barn and holding area. The flies will only land on a water-filled balloon once—the static electricity on the balloon surface keeps them away.

Another way to deal with flies is to encourage swallows to make nests in your barn. Swallows will. . . swallow. . . half their weight in flies every day. They will make a nest on a large nail, sticking out about four inches from the wall, so if you want swallows to take up residence, install nails on the upper part of the posts in your barn. Swallows will not frequent farms where pesticides are used.

However ultimately, nothing can take the place of cleanliness for fly control.

MILKING HOW OFTEN?

Cows bred to produce large amounts of milk, as in the confinement dairies, are milked three times per day. Most farmers engaged in grass-based farming will milk twice a day.

Some farmers milk every 18 hours or even just once a day. Once-a-day milking can be a boon to the farmer with just a few cows, or one who has a day job. The yield will be less, of course, although butterfat yield may remain about the same, but the hours needed to do your farm work will be significantly reduced, as will the feed requirements for your cows.

For once-a-day milking, keep the calf away from the mother during the night and milk in the morning. Then during the day, allow the calf to be with the mother so you do not need to milk her in the evening. When the calf is weaned, the cow will adjust to once-a-day milking.

Chapter 4. Storage and Handling

The key to a long shelf life for raw milk is quick cooling. If you are milking into a bulk tank, check the bulk tank often to make sure the milk is cooling down quickly. If you are milking into small containers to then cool down in a refrigerator, put milk into half-gallon rather than gallon containers. Smaller containers hasten the cooling process. The milk should be chilled down to 42 degrees within 45 minutes. Some farmers immediately put the bottled milk into an ice water bath to bring the temperature down as quickly as possible.

It is important to impress upon your customers the need to keep the milk cool. Milk that gets warm will become sour very quickly. This milk is still safe to drink, but many will not like the taste.

Your customers should transport their milk in very clean glass containers or in food grade plastic containers. Never reuse the type of gallon milk jugs that have handles, for the handle can never be cleaned well enough to prevent contamination of your new product.

When picking the milk up at the farm, customers should carry it in an ice chest with ice or ice packs. It should be stored on a lower shelf of a refrigerator turned down as low as possible.

An excellent resource for raw milk customers is *Safe Handling: Consumers' Guide to Fresh, Unprocessed Whole Milk (see Resource section)*.

By the way, raw milk may be frozen. Freezing will not harm the nutritive value. Frozen raw milk should be thawed slowly in a refrigerator to prevent clumping of the cream.

Before serving raw milk, shake the container to mix the cream and milk so as not to leave only skim milk at the last pour.

Chapter 5. Milk Testing and Sample Taking

For those farmers providing raw milk to the public, a program of regular testing is essential. This will give you peace of mind, knowing that your product is a healthy one, and assurance that the farming methods you are using are health-promoting. Regular testing will furnish you with a paper trail should the state lab results indicate a problem. Be sure to keep good records of all tests results, stored in a secure place, preferably in a fire-proof box or safe.

Whenever the state takes a sample to test, you should ask for a "split sample," that is, half of the sample they have taken, and then send the sample out to an independent laboratory for testing. This will keep the state honest and provide reassurance for your customers.

The five main testing parameters are somatic cell count, plate counts, preliminary incubation, coliform counts and pathogen contamination. These should all be taken at the bulk tank.

SOMATIC CELL COUNT (SCC): This is the white blood cell count present in the milk. This indicates the general health condition of the udder and levels of mastitis infection, as well as the overall health of the cow and environmental pressures affecting the animal. Somatic cell count should be under 300,000 per ml.

PLATE COUNT: Indicates the overall cleanliness of milking equipment and the bacteria levels within milking equipment. Plate count should be less than 10,000 per ml.

PRELIMINARY INCUBATION (PI): This is a test for a family of equipment bacteria, which grow in cold temperatures. This test is similar to the plate count and gives another perspective on how clean your equipment is. The bacteria on equipment are not harmful to humans, but they shorten the shelf life of the milk. The counts should be less than 50,000 per ml.

COLIFORMS: A test for general air- and ground-borne coliform bacteria (which includes not only *E. coli* but also beneficial lactobacillus), gives a good indication of the cow prep prior to milking and the quality of the environment the animals are exposed to. Coliform counts should be 10 per ml or less for milk in the bulk tank. Coliform are not dangerous, but high counts can result in milk that spoils rapidly.

SPECIFIC PATHOGENS: Testing requirements vary by state. *Listeria monocytogenes*, *Salomonella spp* (especially *Staphylococcus aureus*, the strain that causes staph infections in hospitals) and *E. coli O157:H7* are considered the most dangerous. You should begin by having an independent lab test your samples monthly for these pathogens. Levels should be zero. If these pathogens are consistently absent, you can transition to testing once every three months. (Note: *Listeria monocytogenes* is the only pathogenic variety of listeria; other forms of listeria that may show up in the milk are not harmful.)

Table 1 lists normal, moderate and high levels of common non-pathogenic micro-organisms in raw milk which are cultured in the standard bulk tank culture test.

Table 1

Type of Bacteria	Normal Levels	Moderate Levels	High Levels
Number of Colonies on Plate (x100) = CFU*/ml			
Staphylococcus aureus	0	100-500	>500
Staphylococcus sp.	1,000	1,000 – 2,000	>2,000
Streptococcus agalactiae	0	100 – 5,000	>5,000
Non-Ag Streps	<1,000	1,000 – 1,500	>1,500
Coliforms	<500	500 – 1,000	>1,000
Miscellaneous Organisms** (Pseudomona sp., Bacillus sp., A. pyogenes, Yease, Pasteurella sp., Proteus sp., etc.)	<500	500 – 1,000	>1,500

* Colony Forming Units

** Usually considered contamination from the environment.

ON–FARM TESTING

Note: This section was contributed by Mark McAfee, President, Organic Pastures Dairy, Fresno, California.

On-farm testing for bacteria standards compliance is now possible, thanks to new and simpler testing techniques. On-farm testing allows the farmer selling raw dairy to have a high level of confidence in the safety of his raw milk and an assurance that it will have a long shelf life. However, such testing is probably only appropriate when you have a large herd, especially if you are selling the milk in retail establishments, as is allowed in California. On-farm testing requires special training and a dedicated testing room on your farm.

The basic tests now possible to do on-farm include the following:

1. Pathogen detection. Testing can monitor the presence of *Listeria monocytogenes*, Salmonella, *E. coli O157:H7* and possibly Campylobacter. Tests for these pathogens are of the pass-fail variety. Any levels higher than zero are not tolerated and are grounds for an immediate recall and a round of herd tests for manure assessment to find out which cows are sloughing the pathogens. Sloughing can be seasonal and is often stress-related or due to nutritional deficiencies. High grain use, crowded conditions, high heat and antibiotic use are associated with pathogens in raw milk. Test the milk and also test the manure.

2. SPC or Standard Plate Count is used to assess the total level of living bacteria in each milliliter of raw milk. It is a test that is associated with cleanliness of milking and how cold the milk has been kept. A high SPC is associated with slow cooling of raw milk, allowing bacteria to grow. Raw milk doubles its SPC every 22 minutes at room temperature. The SPC bacteria are generally good beneficial bacteria that eat lactose sugars and create lactic acids. The end result of this process is fermentation and the creation of cheese or yogurt. The target for raw milk producers is less than 15,000 to 20,000 SPC per ml (depending which state you are in) at the time of sale to the consumer. With time the SPC grows. This is normal. A normal SPC at time of milking is generally about 500- 3000 per ml. These numbers are very low but will grow if the raw milk comes in contact with dirty milk lines, warm temperatures, etc.

3. Coliform Counts: Coliform bacteria come from the feces of mammals. Some states require a coliform count. Most coliforms are beneficial, but a few coliforms can make some people very sick. Chief among these pathogenic varieties is *E. coli O157:H7*. Coliform counts are not pathogen counts, and the test should not be considered a pathogen count at all. *E. coli* is a family of more than 230 strains of which 99 percent are beneficial and critical to life. They create such important vitamins as K, B1, B2, B6, and B12. Without them we would die very quickly. A common coliform count standard is 10 per ml or less. Many states do not require a coliform count at all.

The most critical bugs to watch are Salmonella and *E. coli O157:H7*. Salmonella does not do well in the presence of good *E. coli* and it takes a pretty big load of these bacteria to make most people sick. Conversely, just a few bacterial cells of *E. coli O157:H7* can make some people very ill. This is the one to watch in addition to your basic SPC. If SPC is low then expect a long shelf life if the milk is kept cold continuously.

On-farm testing of SPC is generally not done because it requires plating and growing bacteria. SPC is sent to a lab and requires that the sample to be kept at a temperature just above freezing. *E. coli O157:H7* can be tested on farm using at least two common systems:

1. Strategic Diagnostic Inc.: The SDI pathogen test systems require an incubator which costs about $350. Each test takes eight hours and is very accurate. The indicator is a rapid reacting reagent test strip, like a pregnancy test. It gives a plus or minus, yes or no. One caution is that this test requires a careful handling of the waste. You do not want to grow this bug and create an incident where you did not have a problem before.

2. Litmus just came out with the Rapid B test system that literally takes 15 minutes for a detection of a whole series of pathogens.

Testing of the other pathogens is generally done at a lab but is not done as frequently, at least not in California. If you have lots of waste water washing down concrete, watch out for Salmonella. If you feed silage, watch for *Listeria monocytogenes.*

KEEPING SAMPLES

In addition to regular testing and record keeping, it can be a good idea to keep milk samples from every milking, especially if your farm is located in a state where officials are particularly hostile to raw milk. This will allow you to verify the safety of your milk later should anyone consuming your milk become sick.

To keep a sample, use a sterile container to take the sample. Cap and label the container with the date of the milking and place in a cold refrigerator. The sample may be discarded after two weeks. Thus, every day you will be adding one or two current samples, and discarding one or two two-week-old samples.

SUMMARY OF THE SAFETY REGIME FOR A SMALL FARM

1. Johnes-Free Herd with 100 percent of herd tested.

2. TB-Free herd.

3. Brucellosis Vaccination for heifers between four to eight months. All purchased cows meet same requirements before brought on farm.

4. Somatic Cell Count less than 300,000 on yearly average.

5. Plate Count less than 10,000 p/mL. On a clean, well-managed farm, it should be 1000 or less.

6. Coliform count less than 10 p/mL in the bulk tank.

7. PI Count less than 50,000 p/mL.

8. Pathogen Tests Monthly of *E. coli O157:H7*, Salmonella, *Listeria monocytogynes*, and Campylobactor for a period of six months; if the tests show clean, then you can drop to quarterly tests.

9. Monthly Bulk Tank Cultures that identify mastitis types, equipment bacteria, as well as environmental contamination the cows are exposed to.

10. Mastitis Type Testing on questionable quarters; cull all *Staph. aureus*-positive cows.

11. Milking System Checked by professionals every six months.

Chapter 6. Bovine Diseases

MASTITIS

The most common problem in dairy cows is mastitis, which is a bacterial inflammation of the udder. The symptoms include inflammation of the udder and clotted, bloody milk. If gangrene develops, death can result.

To avoid any mastitis, it is imperative to purchase a cow without problems. If she does develop problems, identify them by having her mastitis tested and typed and then treat accordingly. Most vets will have a lab that can do the testing locally but whether the lab is local or far away, you will probably have to ship a cold milk sample.

To prevent the spread of mastitis, cows with suspected mastitis problems should be milked last or the milking units should be disinfected before they are hung onto the next cow.

It is general practice of responsible producers to dump milk from suspect cows till the mastitis type has been identified through testing. Once the type has been identified and treated (see below) then the milk can be offered to consumers once again.

There are many natural probiotic- and whey-based products available that help cows reduce mastitis and in some cases remove it completely. Here are a few used with good results by dairy farmers:

1. Homeopathic Phytolacca Belladonna Hepar Sulph and Silica in a mixture or individually as described in the manual by G. MacLeod called *The Treatment of Cattle by Homeopathy.*
2. A 2-5 ml tincture of garlic in water, administered to the vulva using a syringe and cut-off AI sheath.
3. A 2-5 ml colloidal silver in water, administered as #2.
4. A product called Udder Mint helps reduce swelling and can heal mastitis to a certain extent.
5. An old-fashioned remedy is to drench the udder in a quart of the cow's own sour milk, twice a day, for as long as needed.

In tough cases you will have to consult with a veterinarian or even cull the cow. See Table 2 for conventional views on the causes and control methods for mastitis-causing bacteria.

Table 2 indicates the different types of mastitis-causing bacteria, their source and conventional control methods. If your counts consistently exceed the normal levels in any bacterial category and you have been unable to control the problems with non-antibiotic methods, you should consider using the mastitis control measures suggested.

Table 2

Type of Bacteria	Source	Means of Infection	Control Methods
Staph. aureus (contagious)	Infected udder, teat lesions commonly found on udder skin, which readily colonize the teat end	Cow-to-cow by contaminated udder wash rag, teat cups, hand, or anything that comes in contact with milk from infected cows.	Milk clean, dry teats. Use separate paper towels to wash & dry. Teat dip, dry cow teat, identify & segregate infected cows and disinfect units between milking. Antibiotics often ineffective. Consider culling cow.
Staph. sp (Refers to all Staph. Other than Staph aureus)	Normal inhabitant of skin. These organisms will not turn into Staph. aureus.	Poor udder preparation, milking wet udders & teats.	Milk clean, dry teats, use a good teat dip & dry cow teat.
Strep. agalactiae (*Strep. ag.)* (contagious)	Infected udders. Can survive for short periods of time in environment & on hands	Same as Staph. aureus.	Same as Staph. aureus. Except antibiotics more effective.
Miscellaneous organisms (*Pseudonoma sp*, *Proteus sp*, etc.)	Contaminated water, milk hoses, bedding & manure	Same as *Strep*. non ag.	Same as *Strep*. non ag.

Type of Bacteria	Source	Means of Infection	Control Methods
Strep. non ag. (Environmental)	Multiple locations on cow hair, lips, vagina, feces, etc. Also found in bedding, muddy lots & intestinal tracts, dirty equipment & worn rubber parts.	Environment to cow by wet, dirty lots & bedding, milking wet teats, poor udder preparation	Improve calving area, barn & lot sanitation. Milk clean, dry teats. Use adequately heated wash water. Often infection, self limited.
Coliforms (Environmental)	Manure, bedding, especially sawdust, soil & contaminated water, dirty equipment.	Same as *Strep*. non ag.	Same as *Strep*. non ag. Keep cows standing for at least 30 minutes after milking.
Pasteurella sp.	Animal origin: respiratory tract, uterine & vaginal discharge.	Unknown, but probably cow to cow.	Care in clean udder infusion. Segregate infected animals. Infections usually sporadic.
Candida sp. (yeasts) & molds	Yeast normally found on cows' skin & in digestive tract & environment.	Although mastitis is rare, using contaminated antibiotics may contribute.	Segregate infected cows, milk separately. Often self-eliminating in 6-8 weeks.
Prototheca sp.	Farm ponds, wet areas contaminated with feces, bedding or haylage.	Same as Strep non ag.	Treatment usually unsuccessful. Potential sources should be fenced off.

BOVINE LEUKEMIA VIRUS

Some commentators have warned against the consumption of raw milk because of the presumed presence of bovine leukemia virus (BLV), claiming that this pathogen is present in the milk of 80 percent of dairy cows. This figure is no doubt taken from cows in confinement situations.

At present, there is no information on BLV testing of pasture-raised dairy cows, but a 1980 study of Canadian beef herds traditionally on pasture till fatting time indicated a positive test for BLV in 0.5 percent of the animals.

Only 5 percent of all infected cows become full blown cases of BLV, but the virus can be present even though the signs may never appear.

The USDA admits that there is no proven relationship of BLV to human illness and our experience indicates that the disease is rare to non-existent in pasture-raised herds. However, we cannot be flippant about BLV. Tests to detect it are available, but they are expensive. Like Johne's disease and scrapie, BLV may very well be a symptom of poor management and stress-related issues. As BLV becomes more of a problem for big dairies and new and better tests come along, the price for testing will drop. Meanwhile, this emerging problem provides yet another reason for dairy farmers to be careful about where they purchase their cows.

JOHNE'S DISEASE

Johne's is a destructive and invasive intestinal bacterium of cows. In Europe, it has been linked to Crohn's disease in humans. It seems to be resistant to the high temperatures of pasteurization. Studies indicate that 19 percent of pasteurized milk contains the Johne's bacteria.

Needless to say, it is best to buy your cows from a certified Johne's-free herd, and to get bulls for service that have passed the test as well. It is not good enough to hear the words "we have never had it here." A test is the only way to confirm that a cow is free of the virus. Testing requirements vary from state to state, but all state vets have access to testing facilities for Johne's.

There are two types of tests of Johne's. The milk test—called the Tye Milk Test—merely provides evidence of the presence of Johne's in the herd and whether there are any active cows. Only a blood test can determine whether an individual cow has Johne's.

The blood test is only applicable to animals over 30 months—apparently infection cannot be detected in the blood until that age. This test should be performed yearly on cows over 30 months old.

Johne's can be spread through milk to heifer calves and to other animals by feeding manger sweepings from infected cows. Infected bulls can also be a vector for the disease. Thus, testing of animals that you want to bring into your herd is an important precaution.

The cost of the test varies from state to state. Some states reimburse you partial costs, other do not. The average blood test cost per cow most recently carried out by the author was $10 per cow, not including vet fees.

When you get the blood test results back, each cow will have been assigned a category of infection as a result of the test. There are three categories:

1. Full blown Johne's and actively shedding.
2. Some chance the cow may get active Johne's at some point in her life. A percentage will be given—23 percent, 50 percent, 75 percent, etc.
3. Free of Johne's and not a carrier of infection.

A category-3 cow may be free of Johne's but she could be infected later on from a cow or bull that is in category 1 or 2. Thus, yearly testing is needed to preserve her category 3 status.

Some states allow you to test a percentage of your herd, which will give you a different classification system:

A. All the cows in the herd are tested and found free of Johne's.
B. Half the herd is tested and found Johne's-free.
C. 10-25 percent of the herd is tested and found Johne's-free.

A producer must rotate the cows in the yearly test to maintain categories B and C. Thus, over time, all the cows will be tested. At the time of testing, if a cow does not have a state ID tag, she will be given one in the ear to identify the individual cow and the number of the sample.

TRANSMISSIBLE SPONGIFORM ENCEPHALOPATHY (TSE)

TSE is a fatal degenerative disease of animals affecting the central nervous system. Called "scrapie" in sheep and goats, and bovine spongiform encephalitis (BSE) or "mad cow disease" in cattle, it was first recorded in the United Kingdom in 1732. A huge outbreak in the UK during the late 1990s brought worldwide attention to the disease. As a result, any animal with TSE or exposed to the disease must be kept out of the food chain.

TSE symptoms vary greatly and include intense itchiness, behavior changes, alterations in gait or coordination, and tremors.

There is no approved test to detect TSE in live animals. Currently to determine TSE, animals must be humanely euthanized and their brains submitted for testing. The brains of animals with TSE are characterized by holes in the tissue (hence the term "spongiform") and the accumulation of abnormal proteins called prions.

The conventional thinking is that TSE is a transmissible or communicable disease, initially caused by the feeding of infected bone meal and other animal tissue to ruminant animals.

However, the work of the late Mark Purdy indicates that the degeneration of the nervous system is due to the application of certain pesticides, or diets high in toxic metals like manganese in the absence of magnesium and copper. Of particular concern is the use of salt licks and mineral supplements that contain high amounts of manganese.
For more information, see:

www.westonaprice.org/mythstruths/mtmadcow.html and
www.westonaprice.org/mythstruths/mtmadcow2.html

In spite of all the publicity on the disease, it is actually rare in the US. A good soil amendment program, avoidance of pesticides and drenches, and careful choice of supplements given to your cows is your best protection against TSE.

TUBERCULOSIS

Tuberculosis is a chronic, progressive disease that can cause gradual debilitation. In animals, bovine TN shows up as emaciation, depression and intolerance to exercise. Because infection often involves the lungs, coughing, nasal discharges and difficulty breathing can occur in severe cases. Infection can occur in other parts of the body. In some instances, superficial lymph nodes in the neck will develop large abscesses that may rupture and drain through the skin.

Bovine TB is not the same kind of TB that humans can contract. In the past, there was considerable debate as to whether the bovine form of TB is transmissible to humans by drinking milk from an infected cow. Most who have carefully looked into this problem have concluded that it is not (See www.westonaprice.org/farming/raw-milk-and-tb-michigan.html); however, most agriculture officials believe that humans can contract TB by drinking milk from a TB-contaminated cow. Therefore, if you are producing raw milk, maintenance of a TB-free herd is an absolute necessity.

TB testing in cows is relatively simple: the vet comes and gives a cow a pin prick at the base of the tail and returns a week later to see whether there has been any reaction. If there is no reaction, the results are sent to the state for recording and you have no more worries.

When the test results are reactive, subsequent actions vary from state to state. Usually the next step is a blood sample to confirm or disprove the reactive result from the skin test. (The initial skin test is a screening test but some animals give a reaction even though they are not infected or have never been exposed to TB.) Meanwhile your herd may be quarantined to the farm. If the blood test is positive, all the cows in your herd may be destroyed. (Again, details vary from state to state.)

Needless to say, it is best to purchase a cow from a known TB-free area, and best to have a confirmed TB-free herd. But even these precautions do not guarantee that your herd will remain TB-free.

The work of the late Mark Purdey indicates that TB is a disease caused by excess iron. See www.westonaprice.org/farming/tuberculosis-alert.html

If your farm is in an area where bovine TB has occurred, such as Michigan, where the soils contain an excess of iron, it is important to work with a soil specialist to get the right balance in your soil, for example, by occasional liming or adding a copper amendment.

Another precaution: make sure the salt you are giving your cows is low in iron. If the salt has a red or pink tinge, that is a sign that it contains a lot of iron and should be avoided.

FOOT ROT

Foot rot is usually the result of poor management in holding pens or wet pastures. Cows should never be allowed to stand in still water, which can breed the bacteria that cause foot rot. (Cows can also get liver flukes this way.) If you have ponds, they must be fenced off, and your barn and holding pens should be well drained.

Foot rot must be treated immediately or it will infect the whole herd and can never be eradicated. Antibiotics are the usual treatment, though natural methods of various types are available. Probably the best of these is a solution of copper sulfate, which the cows step into as they enter or leave the barn for milking. The solution must be disposed of carefully as it can be toxic if it accumulates.

WORMS, PARASITES, LICE AND MANGE

Inherited internal worm populations and parasites are also the result of lax management, over-grazing and poor pasture rotation. Treat as needed using advice from your vet. Some farmers have used Basic H, available from your local Shakley dealer, for deworming. Many other natural methods are available, which tend to be specific to the locality.

Lice and mange are, once again, signs of poor management. There are herbal and natural treatments for these conditions, but if you are having problems with these, the first thing that needs attention is your topsoil and supplement regimen.

OTHER PROBLEMS

High rates of aborted cows or calf mortality are usually the result of mineral deficiencies in the cows or soil. A good soil specialist or holistic vet should be able to help.

Low performance (low yield) is also usually the result of mineral deficiencies. Not all grass is good grass. When purchasing a cow, ask whether the selling farmer manages trace minerals in his pasture and crop soils. On your own farm, it is important to work with a soil specialist to ensure that your cows are getting the right nutrition from your pastures and hay. Use of rBGH (genetically engineered bovine growth hormone) to increase milk yield is not appropriate with this model.

Antibiotics should only be used when necessary to save the life of an animal and after they are administered, she should not be milked until she has her next calf. Hormone injections and use of drug-based therapies for fertility and health problems are not acceptable.

Finally, a word on hardware disease: this is what happens when a cow swallows a nail lying around the barn, a staple in the haylage or bit of metal in the feed. Hardware disease can cause much distress and even death in a cow. As with all other health problems, when it comes to hardware disease, an ounce of prevention is worth ten pounds of cure. Keep your place tidy, be alert and careful when feeding haylage, and purchase feed that has been treated with a magnet to remove any metal pieces. It is particularly frustrating for a farmer to lose a valuable cow to hardware disease.

Resources

For information on raw milk safety and health benefits, visit www.realmilk.com. The latest information plus references are included in the PowerPoint presentation posted on the home page.

To help consumers find your raw milk, contact the nearest local chapters of the Weston A. Price Foundation, posted at www.westonaprice.org or phone (202) 363-4394; you can also post your information at www.realmilk.com

To receive expert legal advice about your raw milk operation, request legal defense against charges from a local, state or national government agency or to support lobby and legislative work to change existing raw milk prohibitions, contact the Farm-to-Consumer Legal Defense Fund at www.farmtoconsumer.org or by calling (703) 208-FARM (3276).

Considering starting a cow-share operation? Shorten your learning curve with three teleseminar classes sponsored by the Farm-to-Consumer Foundation covering legal and operational aspects to consider. For more information, call (703) 208-FARM (3276) or visit www.farmtoconsumerfoundation.org/csc

For information on grass-based farming and farming in general, consult books and literature from Acres USA through www.AcresUSA.com, phone (800) 355-5313; also the Stockman Grass Farmer through www.stockmangrassfarmer.net , phone (800) 748-9808.

For information on pasture and forage management, see the website of the National Sustainable Agriculture Information Service at http://attra.ncat.org/attra-pub/sustpast.html.

Informed consumers are an important part of the food safety chain. An excellent resource for raw milk customers is *Safe Handling: Consumers' Guide to Fresh, Unprocessed, Whole Milk* available from Peggy Beals Consulting, LLC for $5.00. For bulk order discounts, contact pegbeals@msn.com. Also available at the Farm-to-Consumer Legal Defense Fund website www.farmtoconsumer.org/fs (credit cards accepted).

For a history of pasteurization versus raw milk, see *The Untold Story of Milk* by Ron Schmid, ND, available from NewTrends Publishing, (877) 707-1776, www.newtrendspublishing.com.

To order a hard copy of this handbook Call 703-208-FARM (3276) or visit the shopping cart on www.farmtoconsumer.org/shop

This free edition of *Raw Milk Production* is provided courtesy of the

Farm-to-Consumer Foundation®
Education ◆ Charitable Relief ◆ Legal Support