Appendix

Disease Fact Sheets

Bovine spongiform encephalopathy
Brucellosis
E-coli 0157:H7
Johne’s Disease
Salmonella
Tuberculosis
Bovine Spongiform Encephalopathy

Bovine Spongiform Encephalopathy (BSE) or what the news media insists on calling “mad cow disease” has now been recognized for more than 10 years as an emerging disease of cattle. Many questions remain regarding this disease; however, there has been progress in the understanding of BSE.

What is Bovine Spongiform Encephalopathy (BSE)?

BSE is a chronic degenerative disease that affects the central nervous system (brain & spinal cord) of cattle, first diagnosed in Great Britain in 1986. BSE belongs to a family of diseases known as Transmissible Spongiform Encephalopathies (TSEs). These TSEs include scrapie (sheep & goats), transmissible mink encephalopathy, feline spongiform encephalopathy (cats), chronic wasting disease of elk and deer, and BSE in cattle. Humans have a number of TSEs and these include kuru, Creutzfeldt-Jakob Disease (CJD), Fatal Familial Insomnia, and Gerstmann-Straussler syndrome (in humans). The clinical signs or symptoms in cattle appear as nervousness or aggression, abnormal posture, incoordination, weight loss, weakness and death. There are no treatments or vaccines available for prevention.

How is BSE recognized or diagnosed?

BSE cannot yet be confirmed in the live animal. It has signs similar to rabies, polioencephalomalacia, *Hemophilus somnus* infection, and a number of other central nervous system (CNS) diseases. Microscopic examination of brain tissue is the technique used to diagnose BSE.

What Causes BSE?

The cause of BSE and the other TSEs in other species is not fully understood. Most of the scientific community feels the cause is a prion or abnormal protein. Characteristics of BSE (like all TSEs) are: (1) a long incubation period (months to years), (2) the agent is smaller than a typical virus, (3) the agent is resistant to sunlight, radiation, and common disinfectants, and (4) the agent causes no detectable immune response in the host.

Why did BSE occur in Great Britain?

No one knows for sure! The epidemiological data suggests that BSE was associated with the feeding of meat and bone meal as a protein source to cattle. The causative agent is suspected to have come from either scrapie-infected sheep or from cattle with a previously unknown TSE. Changes in rendering practices in the U.K., such as lowering the temperature of processing, may have allowed the survival of the agent in the meat and bone meal. BSE had never been identified before 1986, when first isolated in Britain. BSE has been confirmed in native cattle in Ireland, Northern Ireland, France, Portugal, and Switzerland. It is now thought that meat and bone meal exported from the U.K. was responsible for the infection of native cattle in these other countries. BSE has been identified in cattle exported from Britain to other countries. Prior to 1986, a small amount (14 tons) of ruminant protein (rendered products) was imported from the U.K. to the U.S.A. Our current regulations prohibit the import of ruminant proteins from all countries affected with BSE. Overall, 99% of the BSE cases have occurred in the U.K. Currently, the BSE epidemic in Britain is decreasing; however, the epidemic has been devastating to the dairy and cattle industries in the U.K. On September 10, 2001, a first single case was confirmed in Japan.
Do we have BSE in the United States?

**No! There have been no cases of BSE in U.S.A. cattle.**

There was one case in Canada (a cow imported from Britain). Before the ban on British cattle imports into the U.S.A. went into effect in 1989, there were 499 cattle brought to the U.S.A. from Britain. All of those cattle were carefully accounted for and none showed evidence of BSE. Of these 499 cattle, 11 are still alive and are being monitored carefully. These cattle are in Alabama and Pennsylvania and are under close surveillance. Surveillance programs in the U.S.A. are very active and include the Veterinary Services Laboratory in Ames, Iowa, the Centers for Disease Control, the USDA, and all state veterinary diagnostic laboratories. Surveillance of high-risk populations such as disabled dairy cattle continues at a high rate, with more than 1,000 cattle from California alone examined for evidence of BSE to date. So far, there has been no evidence of BSE in cattle in the U.S.A. Also, a number of sheep (more than 300) imported from Belgium and Holland in 1996 to Vermont tested positive for a TSE and were destroyed. Further testing is being conducted to determine the specific TSE involved.

**What else has been done to prevent BSE from occurring in the U.S.A.?**

No beef or beef products, including items such as fetal bovine serum for use in research laboratories, have been imported from Britain since 1989. Also, no beef products were imported from Britain to the U.S.A. prior to 1989 because no FSIS approved establishments for export to the U.S.A. existed in the U.K. Current regulations prohibit the importation of ruminant protein from all countries affected with BSE (see chapter titled Bovine Spongiform Encephalopathy & Beef Quality Assurance, page 40).

**What is Creutzfeldt Jakob Disease (CJD)?**

CJD is a slow progressive disease of humans that affects the central nervous system, causing dysfunction, progressive dementia, and death. CJD occurs throughout the world at a rate of about 1-2 cases per million people per year. There has been a major change in Britain since the outbreak of BSE in cattle. This change has been the recognition of a new variant CJD or (nvCJD) in humans. The exact cause of this new form of CJD is not entirely known; however, the evidence suggests that BSE is involved. This is probably occurring through the eating of infected meat prior to the recognition of the BSE epidemic in cattle. The abnormal protein in the brain of nvCJD patients and the abnormal protein in the brain of BSE cattle are very closely related. While the exact relationship between BSE and nvCJD is not fully understood, the prudent course has been to assume a link between the two and work to eliminate BSE in Europe and prevent BSE from occurring in the U.S.A.

*Adapted from: Advanced Quality Assurance Handbook, California Beef Quality Assurance Program*
Brucellosis

What is Brucellosis?

Brucellosis is a bacterial disease of mammals caused by one of the Brucella organisms. In humans it is often referred to as undulant fever. Brucellosis in humans is characterized by fever, sweats, chills, weakness, and general fatigue. Relapses in symptoms are common and the disease can incapacitate human patients. The various Brucella species that can infect humans are Brucella abortus (cattle and bison are natural hosts), B. melitensis (sheep and goats), B. suis (swine), and B. canis (dogs). Brucellosis in cattle (Bang’s disease) is due to B. abortus and causes abortion in cows and heifers. It may also cause mastitis, orchitis (inflammation of the testicles), or lameness in affected herds. In human patients, aggressive treatment with antibiotics such as tetracyclines and aminoglycosides can control the disease and the symptoms in most cases. Treatment of infected cattle is not attempted.

How is Brucellosis transmitted?

Brucellosis agents can be transmitted in unpasteurized milk, through handling of infected tissues from cattle (slaughtering workers), handling of aborted fetuses, infected placenta, or uterine discharges from infected cattle. Therefore, livestock producers, slaughterhouse workers, and veterinarians are at increased risk for contracting Brucellosis from cattle. Brucellosis can also be contracted by veterinarians if they accidentally inject themselves with the vaccine given to heifers as it is a live vaccine and pathogenic for people. This is why the vaccine is administered only by licensed, accredited veterinarians. Brucellosis is a common disease in humans in many parts of the world, particularly in those areas where pasteurization of milk and cheese products is not routine.

How do we control Brucellosis?

In the United States, we pasteurize milk and cheese products. This is done not only for Brucellosis but also for a host of other potential agents that can get into milk. Pasteurization also increases the shelf life of milk. We vaccinate our heifer calves with a Brucellosis vaccine that dramatically decreases their risk of infection with Brucella abortus. The USDA Veterinarians and State Veterinarians have very active surveillance programs for Brucellosis, including, the Market Cattle Testing program.

How do beef producers aid in Brucellosis control?

Beef producers vaccinate their replacement heifers with a modified live vaccine, which increases their resistance to Brucellosis. Their cattle also participate in the Market Cattle Testing program when they go to slaughter. Both of these efforts have been very successful in nearly eradicating Brucellosis from domestic livestock.

What about Calffood Vaccination?

Calffood vaccination is designed to increase the protection of cattle against Brucellosis. Only heifer calves are vaccinated. Vaccine should be given to heifers between four and eight months of age. The only officially recognized Brucellosis vaccines are Strain 19 and RB-51. RB-51 is the new vaccine that does not stimulate the same type of antibody response as that produced by actual infection, and is the vaccine currently used in New Mexico. This different response eliminates any confusion between vaccination and actual infection on standard diagnostic tests. Vaccinated calves must be tattooed in the right ear with the official tattoo identifying the Brucellosis vaccine used. An accredited veterinarian must give the Brucellosis vaccine.

Where is the current status of the Brucellosis Eradication Program?

Currently, New Mexico has no infected cattle herds and is listed as a Brucellosis free state. However, surveillance remains very high at both the state and national level. States are designated as brucellosis free when none of their cattle or bison are found to be infected for 12 consecutive months. As of August 31, 2001, there are no brucellosis-quarantined herds in the United States. Only two states, Texas and Missouri, remain classified as Class A states. They will be designated “brucellosis free” when none of their cattle or bison are found to be infected for 12 consecutive months.

Adapted from: Advanced Quality Assurance Handbook, California Beef Quality Assurance Program
**Why is E. coli O157:H7 important?**

This strain of bacteria (and perhaps several other related bacteria) can cause serious illness in humans. Some people become infected and do not develop any illness or symptoms of disease; however, some cases are very serious. There are three common syndromes known to be caused by E. coli O157:H7. One is hemorrhagic colitis, in which the patients suffer painful cramps and bloody diarrhea. The second is hemolytic uremic syndrome (HUS), in which there is red blood cell destruction, kidney failure, and neurologic complications such as strokes or seizures. The third syndrome in humans is called thrombotic thrombocytopenic purpura (TTP), which is similar to HUS and also causes bleeding disorders. The young and very old are at greatest risk to disease due to E. coli O157:H7. Illness typically occurs 3 to 4 days following ingestion of contaminated material. Bloody diarrhea usually is seen on the second or third day of illness and usually resolves in about a week. Antibiotics are not of very much (if any) benefit in treating human patients. Approximately 10% of the people with bloody diarrhea may develop HUS or TTP and about 10-20% of these patients may die. Asymptomatic infected people and those with illness (diarrhea) can transmit E. coli O157:H7 to other humans. Another important facet of this disease is the low number of organisms needed to cause infection, estimated at less than 50 organisms. This is contrasted to the several thousand to one million bacteria needed to transmit Salmonella infections.

**Does E. coli O157:H7 cause disease in cattle?**

No concrete evidence has been published demonstrating that this bacteria is a disease-causing agent in cattle. Considerable work has been done in cattle and the evidence indicates that E. coli O157:H7 inhabits the intestinal tract without causing disease in cattle.

**How do humans become infected?**

Outbreaks of E. coli O157:H7 infections are usually associated with contaminated water, swimming pools and contaminated foods, while the source of infection in the sporadic cases (individual cases) is rarely identified. Person to person spread also occurs and is particularly important in day care centers or schools where young children congregate. Some of the common foods involved with outbreaks include: uncooked (undercooked) beef products, lettuce, apple cider or apple juice, mayonnaise, cantaloupe, raw milk, sprouts and potatoes. Additionally, drinking water and swimming pool-associated outbreaks have been reported. The total number of cases in the U. S. is estimated to be about 20,000 per year with about 250 deaths per year nationwide. The outbreaks caused by this bacterium in food are often identified; however, approximately one-half of the cases are sporadic and the sources of the sporadic cases are usually not determined.

**What role do cattle play in this disease?**

Cattle have been studied extensively in regard to this condition, partly because of the outbreaks involving undercooked hamburgers in the Northwestern U. S. several years ago. The number of healthy cattle with E. coli O157:H7 in their feces ranges from 0.33 % to 1.8% in most surveys that have been reported. For ill cattle or cattle on premises implicated in outbreaks, the rate has ranged from 0% to 9.5% of the animals with E. coli O157:H7 in their feces. The percent of carrier cattle in the late summer have been reported to be over 50% in some surveys. New methods of detection that are much more sensitive indicate the percent of carriers may be higher than previously thought. There is nothing to indicate the prevalence of this agent in cattle has changed over time. Cattle that shed the E. coli O157:H7 organism in their feces generally do so for only a short period of time. This is in contrast to infected children that can shed the organism for an average of 13-17 days after illness. Cattle feces that contain E. coli O157:H7 could possibly contaminate food and this food could be a source of infection. This could occur in processing facilities such as happened in one instance of contaminated hamburger involved in a multi-state outbreak. This organism survives cold temperatures and is able to
remain viable in an acid environment, such as apple cider and mayonnaise, and thus foods can remain infective for long periods of time. Because cattle have been shown to shed these organisms, even though at low rates, they have become incriminated as part of the problem. From the outbreaks involving lettuce, cantaloupes, apple juice, and other foods, it is obvious that cattle are not the sole source of the problem. Also, the role of insects such as the housefly may be important and more research on this topic is needed.

What are some preventive measures?

The E. coli O157:H7 organism is easily killed by heat. Cooking at 155°F for eight seconds will kill the organisms present in contaminated food products. This is easy to accomplish for meat products such as hamburger or sausage. However, for products consumed without cooking such as apple cider or lettuce it presents much more of a problem. Foods such as milk, apple cider, and apple juice should obviously be pasteurized—this is not only important for preventing infection by E. coli O157:H7, but also for Salmonella, Campylobacter, and other pathogens. Also, the issue of cleanliness by food handlers is central to prevention of any food safety concern. Another area of concern is with ground beef products. Modern beef processors grind huge amounts of beef at one time, so if contamination of the equipment or contamination of the beef occurs it creates a large and widespread problem. Packing plants are researching and adopting many new technologies to reduce the risk of E. coli O157:H7 and associated bacteria from contaminating beef products. These include chemical de-hairing of beef carcasses before skinning, washing of cattle before slaughter, steam vacuuming of carcasses, organic acid washes of carcasses, and irradiation of beef products such as hamburger. The use of irradiation may prove to be very beneficial in prevention.

What is the future of this issue?

There is obviously much to learn about this organism and where it normally resides in nature, how it makes its way into the various food products, and how we can prevent the E. coli O157:H7 diseases in humans. As producers of quality food, we have an obligation to continue to be on the leading edge of this battle for safety of beef and beef products. There are other bacteria that can possibly contaminate beef products. These include common organisms such as Salmonella. The methods used to control bacteria such as E. coli O157:H7 should also be effective against Salmonella and many others.

Adapted from: Advanced Quality Assurance Handbook, California Beef Quality Assurance Program
Imagine a thief sneaking into your herd and subtly robbing economic returns for years before you even suspect a problem. Once discovered, imagine having to spend several more years to rid yourself of the culprit. That’s how Johne’s disease (pronounced yo-nees) works. Left to its own devices, this bacterial infectious disease can wreak havoc on the performance of individual cow herds, can increase the liability of anyone selling breeding stock and could jeopardize consumer confidence in the entire beef industry.

The good news is that herds free of Johne’s disease today can guard against infection through preventative management that begins with awareness. Unfortunately, recent surveys conducted by the National Animal Health Monitoring Service (NAHMS) indicate 92 percent of beef producers and about half of all dairy producers are unfamiliar with the disease, if they’ve heard of it at all.

**How Could It Impact Me?**

Johne’s is a disease with a long incubation period that can creep into your herd and spread before cattle show any clinical signs. While the primary mode of transmission (fecal-oral) poses the greatest threat to dairies and more heavily confined beef herds, all beef and dairy operations are at risk. With that in mind, prevention is paramount since controlling it or eliminating it from infected herds is a time-consuming, costly process.

**Beef**

Although researchers believe the majority of beef herds are free of Johne’s today, producers already fighting the infection are seeing costs escalate with necessary testing and control management, while decreases in performance and premature culling are depressing revenue. What’s more, anyone selling breeding stock – be it commercial replacement females, registered seedstock or recipient females – faces increased liability. The outcome of recent court cases underscores the fact that sellers shoulder the responsibility for knowing the Johne’s status of any cattle they sell. Imagine spreading the disease to a customer’s herd by unwittingly marketing an animal infected with Johne’s. Especially in the seedstock business, which is built on reputation and integrity, the results could be devastating. As buyers become more aware of the disease, they may demand to know the Johne’s status of any breeding stock they buy.

**Dairy**

According to NAHMS, in test positive herds with at least 10 percent of animals culled in the past year with clinical signs of Johne’s, the disease is costing dairy producers more than $200 per cow in inventory each year, due mostly to decreased milk production and premature culling. Furthermore, NAHMS estimates at least 22 percent of the nation’s dairy herds have cows infected with Johne’s. Also, NAHMS data indicate at least 40 percent of the herds with 300 or more cows have Johne’s disease. Besides these direct costs and the expense associated with controlling the disease in infected herds, dairy producers who sell breeding stock also face the same liability issues described for beef producers.
What Is Johne’s Disease?

Johne’s disease (also called paratuberculosis) is an infectious bacterial disease, primarily affecting the intestinal tract. It is caused by a distant relative of the bacterium that causes tuberculosis (TB) in humans and animals. Johne’s affects ruminant animals and has been found in numerous species of ruminants. This disease should be considered a whole-herd challenge, as much as an individual animal problem.

What Are the Symptoms?

Johne’s is a slow, progressive disease. Infected animals may show no signs of the disease until years after the initial infection. When they finally occur, the signs of Johne’s disease can easily be confused with those of other diseases – long-lasting diarrhea and weight loss despite a good appetite. Affected cattle usually don’t have a fever. Some infected animals appear weak and unthriftly, while others only have chronic diarrhea. In an infected herd, noticeable signs commonly begin following a stressful event like calving.

If you don’t see symptoms of the disease, it doesn’t mean animals in your herd don’t have it – it is easy to miss signs of the disease, unless you investigate whether it’s there, specifically.

How Does It Work?

Bacteria invade part of the small intestine (ileum) where nutrients are absorbed from feed. As the body works to eliminate the bacteria, immune response causes the intestinal lining to thicken, which prevents normal function and leads to poor nutrient absorption and eventually diarrhea.

How Does the Infection Spread?

Within the herd, the most common source of infection is feces or manure. Bacteria excreted in feces can contaminate soil and water (it can survive over a year outside the animal) which is then ingested by other animals. Studies suggest 36 percent of cows in later stages of the disease could transmit Johne’s microbes to calves, via colostrum and milk. These studies also suggest 8 to 40 percent of fetuses were infected in the womb of cows in the latter stages of the disease. Between herds, the most common source of infection is introduction of an infected animal into the herd.

In other words, Johne’s disease is typically brought into herds by importing an infected animal not yet showing signs of the disease.

How Do I Prevent Johne’s?

Since the disease typically enters Johne’s-free herds via the introduction of an infected animal not yet showing signs of the disease, closing the herd or securing additions only from other low-risk or Johne’s test-negative herds can prevent the disease from entering a herd. Keep in mind, since current Johne’s tests are not 100 percent accurate, knowing the risk status of a herd is more powerful than knowing the test results of a specific animal.

Management aimed at controlling the disease in infected herds can also reduce the risk for Johne’s and other vexing cattle diseases spread by animals shedding pathogens in their feces (such as BVD, E. Coli, and Salmonella). Since the primary route of Johne’s transmission within a herd is fecal contamination, bio-security measures aimed at reducing or eliminating fecal contamination of calves is the most powerful tool available. For instance, calving in clean,
uncrowded environments with minimal fecal contamination; avoiding fecal contamination of feed by using feed bunks and troughs and using different equipment to handle feed and manure. Infections can also be reduced through colostrum management by cleaning udders and teats before collecting colostrum, and using only colostrum from Johne’s negative dams to supplement other calves. In dairy herds, calving in a clean environment, then taking calves off the cows and placing them on milk replacer is another bio-security step that can be taken.

What If I Suspect a Problem?

Any producer suspecting a Johne’s disease infection should consult with a veterinarian. Blood and fecal tests are available. Briefly, none of the tests available today are 100 percent accurate at identifying the Johne’s infection. While fecal cultures are the most accurate – they don’t turn up false positives – they will identify only about half of the animals that are infected. They are also the most costly ($10 to $20 per head) and require three to four months to obtain results. The commonly used ELISA blood test is less costly and quicker, but it can produce false positives. It too cannot identify every cow that is infected.

It’s important to make sure the lab testing your herd samples for Johne’s disease has been approved by National Veterinary Services Lab (NVSL) located in Ames, Iowa. That’s why consulting with a veterinarian is key. A veterinarian can help determine if a problem exists in the herd, then help design an effective management plan. Keep in mind, the sooner a prevention plan is put into place, the better the chances a low-risk herd can remain free of the disease. Likewise, now is the best time to begin control in low prevalence herds.

What About Vaccinations?

While a Johne’s vaccine is available, it is not recommended for routine use in most herds. Use of the vaccine requires permission from the state veterinarian since it can interfere with TB testing results. Vaccinations can reduce the number of cows shedding the Johne’s microbe, but spread of the infection continues. In other words, vaccinations will not eliminate the disease. As well, use of the vaccine interferes with testing for Johne’s. Therefore, the vaccine can impede rather than help Johne’s disease management in many herds.

Can People Contract Johne’s Disease?

While there is no conclusive evidence, researchers are examining the similarity between Johne’s disease and human Crohn’s disease, a chronic intestinal disease. Epidemiological studies have not established any connection between human contact with Johne’s-infected animals and Crohn’s disease. Moreover, pasteurization and proper cooking eliminates opportunities for contamination.

What Does It Mean to Me and the Industry?

Besides decreasing herd performance, the risk of Johne’s disease adds liability to the sale of breeding stock. As well, public concern about the potential link between Johne’s disease and human diseases demands the industry document its success in identifying and controlling Johne’s. Learning about Johne’s and taking steps to prevent it from entering low-risk herds, or controlling it in herds already infected with the disease, is one more step in total quality management that the industry can take to ensure consumers they are receiving a wholesome and safe product.

How Do I Prevent Johne’s?

• The surest way to prevent the introduction of the disease is by closing the herd to cattle from other operations or by purchasing test-negative animals from low-risk herds that have documented their low-risk status.

• Producers can also minimize risk within-herd by taking a variety of bio-security measures that include reducing or eliminating fecal contamination of calves, the same management that helps prevent the spread of other profit-robbing pathogens.

What If I Suspect a Problem?

• The most important thing producers can do is learn more about the disease, how it can impact their individual operations and how they can reduce risk of infection.
• Take action immediately.
The longer a producer waits to identify Johne's infection in the herd, the more opportunity it has to spread.

• Work with your veterinarian to establish a protocol for Johne's assessment and Johne's management. Even if the infection does not exist in a herd today, it will pose a risk to all herds until the disease is eradicated from the industry.

Where Do I Start?

Step 1 – Education.
Producers and their veterinarians need to be well informed about the disease and the pros and cons of various surveillance and management techniques in order to formulate a farm-specific approach. Producer decisions should be based on knowledge. Producers should be aware of their options and realistic outcomes of their choices.

Step 2 – Consider State Policies and Regulations.
Each state needs to have a coherent policy that supports Johne's disease identification and control. Ideally, programs should be voluntary and propelled by the benefits that derive from reducing or eliminating the disease in a herd. If your state does not currently have a well-defined program, there are opportunities to become involved in helping to establish one.

Step 3 – Establish a Herd Plan.
A reasonable approach to a herd Johne's disease program includes the following:

• Assess Herd Management – Special emphasis should be placed on risk factors for acquiring and spreading the disease – manure management, maternity pen management, calf rearing practices and new herd additions.

• Establish a Herd Management Plan – Management to control or prevent Johne's disease is also good management to control other infectious diseases. The plan should include steps to prevent introduction of infected animals, prevent spread of infection to susceptible young animals in the herd, and eliminate currently infected animals from the herd.

• Determine Herd Infection Status – This important step tells producers where they stand, whether they have a low-risk or disease-free herd they need to keep free of the disease or have infection in the herd they want to reduce or eliminate. This can be done crudely by close observation for clinical disease signs, but it is more accurately performed with testing. Testing should be done in the context of a herd plan, as an aid to accomplishing herd goals.

Ultimately, it is producers who will control this disease. Veterinary practitioners must be key players in this effort. It is important that both are well informed about the disease, its identification and control, what is happening at the state and national level and how to get additional information when needed.

"Johne's Disease: Should You Be Concerned" was contributed by the National Cattlemen's Beef Association, P. O. Box 3469, Englewood, CO 80155-3469.
Salmonellosis is an infection caused by the bacterium Salmonella enterica, of which there are over 2,000 serotypes. Salmonella bacteria are found in the gastrointestinal tracts of many species of animals, birds, reptiles, and humans, and also in the environment which may be contaminated by the feces of animals and people.

**Salmonella food poisoning**

Salmonella is one of the most common causes of food poisoning worldwide. After contaminated food has been eaten the bacteria multiply in the intestines and within 12-36 hours usually cause diarrhea, stomach cramps and sometimes vomiting and fever. The symptoms usually continue for several days. Salmonella infection rarely results in very severe illness or even death, particularly in the elderly, the very young, or someone who is already suffering from another disease. Even when all the symptoms have disappeared the bacteria may remain in the gut and thus in the feces. When this occurs the people are called carriers and they pass the infection on to others unless their hygiene practices are good.

**How is it spread?**

Generally salmonella bacteria’s route of entry into a host (human or animal) is oral, i.e., the host ingests salmonella bacteria directly. For example it is possible to come into direct contact with manure if dirty hands are used to wipe your face/mouth/eyes, when smoking, or even to get splashed with manure in the face from a cow’s tail. It is also possible to indirectly come into oral contact with Salmonella on some object that has been contaminated with salmonella bacteria, such as a cigarette, a cup, a pen placed into the mouth, and especially when eating food or drinking fluids contaminated with fecal matter. Cattle most often ingest Salmonella in their water or feed, or otherwise pick it up orally from the environment.

**Conditions under which Salmonella survive in the environment?**

Salmonella bacteria love wet environments shielded from the sun. They have the remarkable ability to survive under adverse conditions. They survive between pH’s of 4 to 8+, and can grow between 45 and 112 degrees F. Salmonella are facultative anaerobic bacteria that can survive under low oxygen tension such as in manure slurry pits. Salmonella are known to survive for long periods in soil and in water. Salmonella in manure that is spread onto fields may survive for long periods, although ultraviolet irradiation from the sun can have a bactericidal effect. Salmonella are no more or less sensitive to the effects of commonly used disinfectants than are other fecal bacteria. Chlorine solutions, iodines, quaternary ammoniums, phenolics, etc., are very effective at killing Salmonella.

Salmonella are difficult to eradicate from the environment. However, because one of the major reservoirs for human infection is poultry and livestock, ranchers and others who are in close contact with livestock should take precautions to minimize chances of oral intake of salmonella. Workers should be encouraged to practice good personal hygiene conduct, to minimize contact with fecal material, and to avoid contamination of eating utensils, both in the outdoor environment and in the home. Attention should also be given to good kitchen practices including refrigeration and thorough cooking of potentially contaminated foods.

Adapted from: Advanced Quality Assurance Handbook, California Beef Quality Assurance Program

New Mexico Beef Quality Assurance Program
**What is Tuberculosis and why is it a public health concern?**

Tuberculosis is a bacterial infection in mammals, including man, caused by one of a group of *Mycobacterium* organisms. The common causes are *Mycobacterium tuberculosis* and *Mycobacterium bovis*. *Mycobacterium africanum* is another strain that occurs in Africa and other parts of the world. These *Mycobacterium* species can cause infections in man, cattle, and other mammals that result in development of small tubercles (granulomas or fibrous abscesses) in the lungs and other tissues. Without successful treatment, Tuberculosis is a chronic debilitating disease that results in early death of the affected patients. Tuberculosis has been a major public health problem in the past and could potentially become one again. There are thousands of new cases of human Tuberculosis every year in California. Most of these cases originated from human exposure in foreign countries.

**What is Bovine Tuberculosis?**

It is an infection in cattle caused by *Mycobacterium bovis*. This bacterial agent is closely related to *Mycobacterium tuberculosis* and both agents can cause tuberculosis in humans. The agent of Bovine Tuberculosis (TB) can infect many other mammalian species in addition to cattle and man. The infection in cattle mainly affects the respiratory system and can be easily spread by a number of methods.

**How do cattle producers aid in TB control?**

Cattle going to slaughter are routinely examined for evidence of TB. If any TB is found there is a traceback system employed to find the herd(s) of origin and to test the cattle in that herd. Additionally, milk from dairy cattle for cheese or fluid milk is pasteurized to kill the TB organisms.

**What is the current status of Bovine TB?**

There has been an ongoing eradication program for Bovine TB in the U.S. for many years. Currently, all states are free of Bovine TB except certain zones within Texas and Michigan. The discovery of TB in wildlife in Michigan has been a major setback for the TB eradication program.

**Where is the infection in Michigan?**

For the most part, bovine TB has been found in the northeastern portion of the Lower Peninsula of Michigan. In 1975 a wild white-tailed deer was found to be infected with Bovine TB. Bovine TB has also been found in coyotes, raccoons, a black bear, a red fox, and a bobcat. Most recently, deer infected with Bovine TB have been found outside of Michigan's known infected area.

**What is Michigan doing?**

The Michigan Department of Agriculture (MDA) has been testing all livestock in the area where TB had been identified in deer. They have tested more than 150,000 livestock on over 6,000 farms. Several beef herds and one captive deer herd that were positive have been depopulated. The area affected with Bovine TB has been quarantined. Surveillance by the MDA and other agencies such as the USDA continues in livestock, white-tailed deer, and other wildlife in Michigan.

**TB in New Mexico**

There have been no cases of TB in New Mexico cattle herds for several years. New Mexico is a TB Free state. This means that there is no test required for movement of cattle out of state. Because of the prevalence of TB in some dairy herds in the El Paso area and in Mexico, New Mexico continues to maintain strict TB surveillance efforts.

*Adapted from: Advanced Quality Assurance Handbook, California Beef Quality Assurance Program*