Lesson 1:
Importance of Animal Health

Billions of dollars are lost every year due to general health problems, costing the average livestock producer 15 percent of annual cash receipts. Animal health is a large factor in the profit or loss of a livestock operation.

Careers Associated With Animal Health

There are many animal health occupations. Veterinarians are involved with many activities, including vaccinations, setting up health programs, deworming, curing sick or unhealthy animals, and detecting livestock diseases. They are also important information sources for livestock producers. Veterinarian services are an important part of any rural community that has a livestock base.

A livestock producer is also part of the animal health field. Most livestock producers do a majority of farm vaccinations and treatments, if they have the right facilities and equipment. Livestock producers are the first step in detecting diseases and administering the proper care before the disease affects the whole herd.

An extension livestock health specialist provides information about animal health problems and preventive measures. The Extension Service is a good resource for producers to use for questions about animal health problems. The service provides information about starting health programs, sanitation, and preventive programs.

An animal health products representative or salesperson offers equipment, medication, and necessary tools for administering on-farm treatments.

A livestock health scientist researches new cures and detects new diseases affecting livestock. Research by scientists reveals new drugs and cures every year. These scientists are usually employed by major universities, the U.S. Department of Agriculture, and in industry.

People in animal health enforcement make sure state or national regulations on transportation of animals, quarantining, and health certificates are obeyed. They also monitor livestock diseases so that they do not enter the country.

The animal health field is growing, especially in the service sector. The demand for specialized services grows every year. To meet this demand, anyone entering the animal health field needs a strong educational and experience background.

The Economic Importance of Animal Health

Literally billions of dollars are lost every year because of animal health problems associated with livestock. It costs the average producer 15 percent of cash receipts from livestock sales to cover losses due to poor animal health. This 15 percent means $11 billion lost every year in the U.S. These losses come from diseases of the respiratory, reproductive, and gastrointestinal tracts. External and internal parasites also cause income loss.

Producer losses - The following animal health facts influence the profit or loss of a livestock operation. Approximately 12 percent of the cows bred never calve due to general health problems. About 6 percent of all calves die between birth and weaning. Approximately 10 percent of all calves have scours, and about 18 percent of dairy calves with scours die. Cow-calf operators spend approximately $26.95 per cow on disease prevention and death losses. Approximately 1.5 million cattle are lost every year in the feedlot due to general health and/or nutrition problems, costing approximately $750 million.

About one in 10 dairy females have breeding difficulties due to general health problems. Approximately 40 percent of dairy cows are afflicted with a form of mastitis, which converts into $225 per year, per cow. Remember, mastitis-infected products cannot be used for human consumption.

About 5 percent of all ewes never lamb due to general health problems. Approximately 20 percent of all lambs die between birth and weaning due to general health problems. Approximately 3 percent of all lambs on a finishing ration die for the same reason.

Nearly 15 percent of all bred sows never farrow due to general health problems. Approximately one-fourth of all pigs die between birth and weaning.

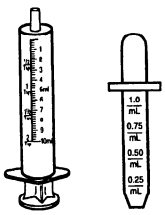
Approximately 50 percent of all bred mares abort or have weak foals due to general health problems. This means that it takes two mares to produce one foal! Approximately 6 percent of all foals die between birth and weaning due to general health problems.

There are also hidden costs associated with animal health that are not figured into the $11 billion lost every year. These hidden costs are reflected by infected carcasses, poor meat quality, added labor costs, retarded growth, salaries for inspectors, depreciation of infected land, and many other costs.

Animal health affects the economics of the average producer, but how does animal health affect the existence of the human race? Some animal diseases can be transferred to humans simply by touching the infected area. There are strict regulations for these diseases because of the effects they could have on humans. Following are some important animal diseases that can be transferred to humans simply through contact and oral ingestion.

Lyme disease - This disease is transmitted usually by a bite from an infected tick or by crushing one on broken skin. The recent increased risk to humans has been caused by more animals bringing the infected ticks closer to human habitations. Human cases of Lyme disease has been reported in the East coast, West coast, Great Lakes, and a few southern states. The closest states to Missouri that have reported human cases of Lyme disease are Arkansas and Tennessee. Human symptoms are a skin lesion around the bite and arthritis in large joints. Sometimes symptoms do not appear until four years after contact. Lyme disease is a curable disease, but there could be some permanent damage to a fetus and some neurological damage, which all can be prevented by early detection.

Brucellosis - Brucellosis is transmitted by touching an aborted fetus, a stillborn fetus, or placental tissues with broken skin; breathing aerosols containing the organism (prominent in packing plants); or consuming unpasteurized dairy products. This organism cannot survive in dry, arid conditions; exposure to direct sunlight; or extreme hot conditions; but under favorable conditions, it can survive 3-4 months. Human symptoms are continued and intermittent fever, headaches, profuse sweating and chills, depression, body aches, and weight loss. Without proper treatment, these symptoms will persist for several months. This disease cannot be transmitted to other members of the family by human contact.



Rabies - Transmitted through the bite of a rabid animal, rabies is a natural disease occurring in animals to regulate over-population. In humans, 90 percent of rabies cases are from wild animals; the other 10 percent are caused by domesticated pets. Pet vaccination is vital in controlling this disease. In humans, rabies is a curable disease if caught in time, but even the cure is very painful.

Salmonellosisis - Transmitted by eating contaminated foods that are not properly stored or cooked. Salmonellosis can be found in pork, beef, poultry, eggs, milk, and even vegetables grown with infected fecal fertilizers. Human symptoms appear as intestinal infections, fever, abdominal cramps, vomiting, nausea, and diarrhea. Salmonellosis is treatable by simply correcting dehydration and electrolyte imbalances.

Trichinosis - This disease is transmitted by eating infested meat. Main sources of trichinosis are under-cooked pork and wild animals, primarily carnivores such as bears. With proper cooking, this disease can be prevented. Symptoms of trichinosis in humans are inflamed muscles or allergic reactions.

Cryptosporidiosis - Cryptosporidiosis is transmitted by eating contaminated food or water, as well as by working around infected fecal material. Generally, people do not even know they are infected by cryptosporidiosis, since the human body develops immunity and gets rid the disease naturally. Diarrhea is the typical symptom. This disease is more prominent in a population infected

with Acquired Immune Deficiency Syndrome (AIDS), since their immune systems no longer fight off disease.

Approval of Animal Health Drugs

A new drug usually starts with the discovery of a new compound or the need for a new drug. At the very beginning, a manufacturer must decide if it has the research capabilities for developing a new compound and the usefulness of the new compound. Once the manufacturer decides it is worth the time and effort, the compound begins a long journey for approval.

The research and development process ensures that the compound is effective, safe, and convenient to use. In 1988, animal health institutions spent $340 million dollars on research and development of new drugs. Every new compound must go through the following steps for approval and compliance.

The first step in drug approval is the discovery of a new compound that is suitable for the animal health field. This discovery could be accidental or could occur through research and development.

A compound must go through some preliminary trials. Three questions must be answered before an intense development procedure takes place: 1) Does the new drug have any undesirable traits? 2) What are the estimated costs for research and the anticipated demand for this new drug? What is the potential activity of the new compound? 3) Can it be confirmed that the new drug will do what it is supposed to do?

Pre-clinical trials are the next step in drug approval. Pre-clinical trials target animals that the drug can be used for. These trials are usually done in a laboratory on laboratory animals. Exaggerated dosages are given to determine effects on animals. If the manufacturer is still convinced of the effectiveness of the compound, the manufacturer notifies the appropriate agencies.

The INAD (Investigational New Animal Drug) and the EUP (Experimental Use Permit) are notification applications for the FDA and EPA. These applications show the results of safety, effectiveness, and toxicity studies of the compound. The applications also include plans for continued testing of the compound, as well as small amounts of the compound. After receiving an INAD or EUP file number, the manufacturer makes the final decision to go on with clinical testing, which is the next step in approval.

Clinical trials consist of full-scale field trials. At this point, the manufacturer has made a sizable investment in the compound and has to determine if it will be economical to continue research. Field trials are done on animals targeted for usage. Studies consist of toxicity levels, dosage, residue studies, effectiveness, and blind studies. Studies where the animals are given the compound and the researchers are unaware of which animals received the compound are called blind studies. The data is evaluated to show the effectiveness of the compound.

When clinical studies are completed, a manufacturer can apply for the right to produce the new drug. The manufacturer files for an NADA (New Animal Drug Application) or a pesticide permit, if the compound is a pesticide. A typical NADA application would fill the average volume of an encyclopedia. This application reveals the results of environmental effects, safety to users, animals, and consumers.

Even after the drug or pesticide is approved and marketed, the manufacturer must monitor and report to federal agencies on their findings. Reports are due every six months for the first year, and once a year for the remaining years the drug or pesticide is produced. Further monitoring is done by veterinarians across the country. They report any adverse conditions that occur when using the drug or pesticide.

Population and Individual Medications

It is easy to distinguish between individual and population medications. Individual medications are given to one individual animal. The label verifies the dosage per individual, which is justified by body weight, age, or type of production. Individual medications can be over-the-counter drugs, extra label drugs, or prescription drugs administered by veterinarians. (Extra label drugs

carry a veterinarian-written additional label. This label includes information on drug dosage change, duration change, instructions for a different disease, and administration location.)

Population medications are mixed with feed, a complete feed, or fed by themselves. These medications are usually classified as feed additives and administered to a group of animals.

To deworm a pen of finished cattle, mix the dewormer into the feed and medicate the whole group. Population medications are usually mixed into the feed by a certain percentage, such as 2 percent of a ton or not more than 12 lbs. per ton.

As mentioned previously, individual medications are approved after going through a long, expensive process. Population medications or feed additives go through a totally different process for approval, with some aspects similar to individual medications. For both medications, federal agencies regulate their approval.

Interstate and Intrastate Regulations

It is a "buyer beware" market when purchasing and transporting livestock within the state of Missouri. Livestock can be transported anywhere in the state without health certificates. A buyer can request health papers, but the seller does not have to provide them. If a producer buys livestock at an auction, some health tests will be run at the sale barn. The types of tests are decided by the operator of the sale barn. Most purebred and crossbred operations have health papers on all stock in the operation.

Most other states have similar intrastate regulations. Each state has different regulations on interstate transportation of livestock. If a producer in Missouri sold some cattle to a producer in Kansas, the seller is responsible for finding out Kansas health regulations before the cattle can be transported.

Once the seller finds out the requirements for Kansas, a veterinarian can run the required tests on the cattle being shipped. If the lot of cattle pass the required tests, a health certificate is issued by the licensed veterinarian for that lot of cattle. The certificate stays with that group through the entire process of interstate transportation. If the lot does not pass the required tests, the cattle cannot be shipped to that state. A health certificate is not necessary for each state that the cattle pass through--just the state of destination.

There are other regulations that apply to interstate transportation of livestock. First, livestock cannot be transported on a rail car for more than 28 hours without rest, food, and water. This rest period must last for five hours or longer before being loaded back up for transportation. Second, livestock that travel by truck or trailer cannot be transported more than 24 hours without rest, food, and water. Again, they must rest for five hours or more before being loaded.

Summary

It is important to understand the economic importance of animal health and the costs associated with it. As a consumer, it is vital to understand diseases associated with animals and the possible human effects. Consumers and livestock producers should understand the importance of drugs and how they are approved for animal health.

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Lesson 2:
Immune System of Livestock

Diseases in livestock can cause suffering, death, and loss of income to the livestock producer. Fortunately, many of these diseases can be prevented by proper management and by enhancing the animal's natural ability to fight off disease.

Causes of Diseases in Livestock

A disease is any condition that detracts or interferes with an animal's well-being. Diseases are often classified as infectious or noninfectious, depending on whether another living organism enters the animal's body (infects the animal) and by its activity causes disease.

Noninfectious diseases - These diseases are not caused by infectious organisms. However, there are numerous other causes. Nutritional diseases can occur when the animal receives too little or too much of a particular nutrient in the diet. Obviously, if an animal receives nothing to eat, it will starve. Starvation is a nutritional disease; however, most nutritional diseases are more subtle. A deficiency of certain vitamins and minerals can produce a variety of symptoms, such as poor growth, weak bones, weak muscles, poor eyesight, and a decreased resistance to other diseases.

Metabolic diseases can occur when the animal's organs don't function correctly or when the animal undergoes major changes in its life. For example, when a cow gives birth to a calf, she begins producing milk to feed the calf. The cow normally uses calcium from her body to put into the milk. However, some cows use too much calcium from their bloodstream. Since calcium in blood is necessary for normal muscle function, these cows are weak and unable to stand. This metabolic disease is sometimes called milk fever.

Toxic diseases are caused by exposure to poisonous materials. There is a wide variety of poisonous or toxic materials around homes and farms, and the symptoms of disease will differ with the different poisons. Some of the more common livestock poisonings involve farm chemicals (such as insecticides and herbicides) and automotive products (batteries, antifreeze, etc.). Some poisons form when mold grows on grain or hay that is used for feed. Some plants are poisonous.

Certain diseases result from injury or trauma. Lightning strike is one example of an injury that occurs when livestock are on pasture in a thunderstorm. Most injuries are not this dramatic. Some animals become lame after injuring their feet on rough or rocky surfaces. Predator animals (such as wolves and coyotes) may attack and injure livestock. People caring for livestock need to be aware of things that can injure their animals and protect them as much as possible.

Diseases that are present at birth are called congenital diseases. These are often caused by faulty development of the fetus inside the mother's uterus. Some examples are cleft palate (a hole in the roof of the mouth) and ventricular septal defect (an abnormal opening between two heart chambers). If a female calf is twin to a male calf, her reproductive tract may not develop normally. This congenital condition is known as free-martinism and will result in the calf being sterile (unable to reproduce).

Diseases that are inherited from parents are genetic diseases. Symptoms of genetic diseases may or may not be present at birth. One example is porcine stress syndrome. Pigs affected with this disease will become rigid from muscular contractions, and their body temperatures become very high when they are subjected to stress. Additionally, they may have labored breathing, shaking, and blotchy skin. Breeding pigs can be tested for the defective gene that causes this disease. If the parent pigs are free of this defective gene, their offspring will not be affected.

Infectious diseases - Infectious diseases are caused by other living organisms that infect (live in or on the animal) and cause disease. Organisms that can cause disease are sometimes called pathogens. The way that these organisms cause disease varies. Some organisms actually kill the cells or tissues that they infect. Other organisms produce toxins or poisons that have an adverse effect on the animal's body. Sometimes the body's response in trying to rid itself of the infecting organism will cause pain, discomfort, and loss of normal function. Most infectious diseases of

livestock are caused by bacteria and viruses. Some diseases are caused by fungi or protozoa.

Bacteria - Bacteria are microscopic, single-celled organisms. Bacteria are very common; in fact, millions of bacteria live inside every normal person and animal. Most bacteria are harmless, and some may even be beneficial. However, a few bacteria are pathogenic (disease-causing) and can be harmful to the animal. Pathogenic bacteria require moisture, warmth, and nutrients to grow and multiply. An animal's body provides all of these requirements.

Bacteria cause disease when they grow in places where they are not supposed to grow or when they produce by-products that are harmful to the animal's body. Some examples of bacterial diseases are *E coli* diarrhea in calves and piglets, blackleg in calves, and erysipelas in pigs.

Viruses - Viruses are extremely small particles that typically consist of nucleic acid centers (genes) surrounded by capsules of protein and/or carbohydrates. Viruses are so small that they can only be seen under most powerful electron microscopes. Viruses cannot grow or reproduce unless they infect the cells of another organism. Pathogenic viruses can destroy cells or change their function in such a way that causes disease. Some examples of viral diseases in livestock are infectious bovine rhinotracheitis (IBR or red nose) in cattle and transmissible gastroenteritis (TGE) diarrhea in pigs.

Fungi and protozoa - Fungi share some characteristics with bacteria; however, they are usually more complex in form. Fungi can consist of more than one cell with different functions. Most familiar fungi (mushrooms, molds) do not infect animals. However, some diseases, such as ringworm and thrush, are caused by fungi, which can infect animals.

Protozoa are single-celled animals. As with bacteria, most protozoa are harmless and some are even beneficial. Some protozoa live inside cattle rumens and help them digest grass and hay. Other kinds of protozoa, such as coccidia, infect animals and cause disease. (See Figure 2.1.)

Types of Immunity

Animals are faced with exposure to potentially pathogenic organisms every day and usually do not get sick from these exposures. Fortunately, animals have mechanisms to ward off these threats to their health: natural and acquired immunity.

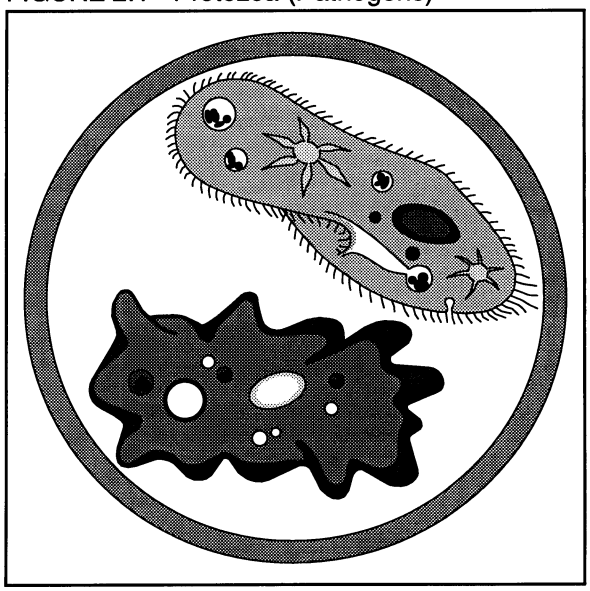
Animals possess natural barriers to infection with disease-causing organisms. For example, the skin is usually an effective barrier and prevents pathogens from entering the body. Mucus from the nose and tears from the eyes usually trap pathogens before they can infect the body.

Also, animals can protect themselves from specific pathogens. Certain body cells examine everything they contact to determine whether or not it belongs there. If these cells come into contact with a pathogen, they recognize that it does not belong, and they then notify the immune system to produce antibodies against that particular pathogen.

Antibodies are protein molecules that bind with the pathogen and help other cells in the body eliminate it. These cells also remember pathogens that they have seen before, so that they will be even more efficient at removing them the next time.

The immune system can be stimulated to produce antibodies against a pathogen by a natural

FIGURE 2.1 - Protozoa (Pathogens)



exposure to that pathogen or by vaccination. This process is called active immunity. In passive immunity, animals may also receive antibodies that another animal has made. This occurs when a baby animal receives antibodies from its mother through the colostrum or first milk. It may also occur when blood serum (which contains antibodies) is taken from one animal and injected into another animal.

Types of Immunizing Agents

Although animals form antibodies against a certain pathogen when they are naturally exposed to that pathogen, it is often better if people help them form antibodies *before* they are exposed to the pathogen. This is done by giving them vaccines. Vaccines are basically a modified form of the pathogen that will not cause disease.

Modified live vaccines are live viruses or bacteria that have been changed so that they will not produce disease. These vaccines are usually very effective at stimulating the animal's immune system.

Killed vaccines consist of viruses or bacteria that have been killed, often by treatment with heat or chemicals. Since the pathogens have been killed, they are not capable of producing disease. Killed bacterial vaccines are sometimes called bacterins.

Toxoids are a form of toxin or poison that has been changed so that it no longer has its toxic effects but it will help the animal produce antibodies against the toxin. The most common example of a toxoid is the tetanus vaccine for horses and sheep. The disease symptoms of tetanus are caused by a toxin, which is produced by the tetanus bacteria, *Clostridium tetani.*

Antisera and antitoxins are antibodies to specific pathogens and toxins that have been formed in the blood serum of another animal. While these antibodies give quick protection against certain diseases, this passive immunity does not last as long as the active immunity stimulated by vaccines and toxoids.

Antibiotics

Antibiotics are compounds produced by microorganisms (often fungi) that either kill or inhibit the growth of other bacteria or fungi. These compounds are most often given either by mouth or by injection to help cure or prevent bacterial infections. Many different antibiotics are available.

Two of the most commonly used antibiotics are penicillin and tetracycline. Some pathogens are resistant to the effects of certain antibiotics, so antibiotics should be chosen based on the susceptibility of the pathogen to that antibiotic. Antibiotics have no effect on viruses; therefore, they are not useful for curing viral infections.

Summary

Diseases can be a significant problem in livestock production. Diseases can be either infectious (caused by a pathogenic organism) or non-infectious. Noninfectious diseases can be nutritional, metabolic, toxic, traumatic, congenital, or genetic in nature. Infectious diseases can be caused by bacteria, viruses, fungi, or protozoa. The animal's immune system fights off infectious pathogenic organisms and can be enhanced by giving vaccines or other immunizing agents. Also, antibiotics can be given to help an animal fight off some bacterial infections.

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Lesson 3:
Respiratory Diseases Affecting Livestock

Livestock producers or those in related occupations should understand the effects of respiratory diseases on a single operation *and* the entire livestock industry. To prevent diseases from spreading throughout the herd and causing extreme losses, a producer must be able to recognize the symptoms of these diseases. Everyone should understand how outside influences can trigger respiratory infection within a herd. Stress can lead to many infections in livestock. Like humans, animals under stress are more likely to be invaded by viruses or bacteria because their bodies are run down.

Swine

Atrophic rhinitis - Atrophic rhinitis is a highly transmissible disease in swine that causes distortion of the nasal passages. It is caused by bacteria *(Bordetella* and *Pasteurella).* Infected swine have lower levels of production and are more susceptible to other respiratory diseases. Atrophic rhinitis is not a fatal disease--just an unwanted disease. It is transmitted as an aerosol from an infected hog to a noninfected one. Carriers besides swine include dogs, cats, rabbits, mice, turkeys, horses, and humans.

Sneezing and sniffling are the most common symptoms in swine and are early detections for the disease. Coughing and snorting are other symptoms of Atrophic rhinitis. Inflammation of nose membranes is also a good indication of this disease. As the disease matures, the shape of the nose becomes deformed. The nose turns to one side or the other by as much as 45 degrees.

For prevention, a producer must monitor the herd's contact with outside animals. A producer must also correct environmental deficiencies in sanitation, temperature, humidity, and ventilation. Control dust, drafts, excessive ammonia, and overcrowding.

To treat this preventable disease, a producer must first isolate infected animals to prevent further spreading. Uninfected animals can be protected from *Bordetella* and *Pasteurella* organisms by medicating the feed with sulfamethazine or oxytetracycline.

Mycoplasma pneumonia - Mycoplasma pneumonia transmission occurs easily by contact. Transmission can also occur through infected clothing, dust, and carrying by the wind from shed to shed. Young pigs are most susceptible at 3-9 months. Pigs with Mycoplasma pneumonia that appear to have recovered remain carriers of the disease. Symptoms can reappear if the pigs come under stress. The mortality rates of Mycoplasma pneumonia are relatively low, but secondary infections can increase the risk of death, so treatment is important in controlling the disease.

A dry, hacking, repetitive cough in young pigs is a typical symptom of Mycoplasma pneumonia. Infected pigs remain alert and have a healthy appetite, but they also have reduced growth rates, weights, and feed efficiency. Pigs with acute cases cough and pant and appear to have a fever, little appetite, and a staggering gait.

For prevention, isolate and observe outside animals brought into the herd. This also applies to animals suspected to be infected. After working with infected animals, change and wash clothing worn during the process. Make sure there is appropriate feed and water so the animals do not come under further stress. There are vaccines available to prevent this disease.

There are a wide variety of antibiotics and feed additives to treat animals. It is a good idea to use different medications so that the disease does not become resistant to one specific medication. Keep infected animals isolated in a dry, warm, well-ventilated area with appropriate feed and water.

Pasteurella pneumonia - Pasteurella pneumonia is like most respiratory diseases in that it spreads in the aerosol form. Younger swine are generally affected by the disease. Pigs of 8-24 weeks of age are most susceptible. Mortality rates are high if effective treatments are not administered. If not treated, death can occur as quickly as 5-10 days.

Fever, coughing, depression, mouth breathing, and labored abdominal movements are all typical acute symptoms of Pasteurella pneumonia.

Chronic symptoms are intermittent coughing and signs of ill thrift.

Chilling, dusty conditions, poor nutrition, ration changes, overcrowding, poor ventilation, and poor hygiene can trigger Pasteurella pneumonia. All these factors are signs of poor management.

Infected animals can be treated by injected antibiotics. Other animals that shared the same airspace can be treated with feed or water additives for 5-7 days. Like most respiratory diseases, Pasteurella pneumonia is very treatable and preventable if caught early enough.

Haemophilus pneumonia - Haemophilus pneumonia affects all ages of swine, but generally weaning-age pigs are most susceptible. Like most respiratory diseases, Haemophilus pneumonia transmits in the aerosol form. Mortality rates are as high as 60 percent if not treated quickly.

Severe respiratory distress, severe abdominal respiration, and bloodstained discharge from the nose and mouth are acute symptoms of Haemophilus pneumonia. This particular disease hits fast. Some infected pigs die within a few hours or in couple of days. Pigs that lie and don't want to move show fatal signs of this disease. Chronic cases are usually non-fatal, but they do show signs of ill thrift, persistent cough, fever, and respiratory distress.

There are some good preventive measures for Haemophilus pneumonia. One is to provide well-ventilated, clean, and uncrowded environmental conditions. Treated, infected pigs usually develop immunity to future outbreaks. Also, sows that have been infected and treated will pass immunity to their offspring by colostrum in the milk. It is also a good idea to isolate outside animals for a while to look for any symptoms.

There are several antibiotics available for treatment of secondary infections in affected pigs. Treatments come in the forms of feed or water additives and administered injections. Haemophilus pneumonia is treatable if animals are isolated quickly to prevent spreading of the disease and secondary infections.

Salmonella choleraesuis - This organism enters the body orally, multiplies in the intestinal tract, crosses the intestinal wall, and spreads throughout the rest of the animal. It undergoes its most rapid growth in the lungs and does the most damage there. This disease is most usually seen in pigs from 40 pounds to finish weight but can occur at any age.

The most common sign is sudden death in pigs that had been doing very well. If observation is frequent enough and detailed enough, one may actually see pigs become somewhat listless, experience difficulty breathing, and progress rapidly to severe respiratory difficulty and death. Animals dying from this disease often have purplish discoloration of the ears, belly, and/or feet and lower legs. Clinically, this disease is nearly impossible to differentiate from *Actinobacillus pleuropneumonia.*

Sanitation efforts are extremely cost-effective in preventing this disease because it is transmitted through the feces. Minimizing stress also helps in prevention; many hogs can be carriers but yet will never have problems if they are not stressed enough to lower their resistance. Stressors include overcrowding, drastic temperature fluctuations, feed/water shortages, movement, mixing, etc. While preventive antibiotic therapy and/or use of vaccines can offer some benefit, their long-range cost-benefit ratio will not be as great as improved sanitation and decreased stress.

In an outbreak, water medication and individual injections with appropriate antibiotics are the best approaches. Feed medications can help in long-term control, but sick pigs will simply not eat enough feed to make it a successful treatment method. Antibiotic selection needs to be based on cultures tested in a laboratory and known successes in the local region.

Porcine Reproductive and Respiratory Syndrome (PRRS) - This disease was first diagnosed in the mid-1980s and was originally known as Swine Mystery Disease. It is caused by a type of virus, which produces two known syndromes: a reproductive herd problem and a respiratory syndrome found primarily in pigs younger than 10 weeks old. The virus is usually transmitted by pig-to-pig contact. The virus is shed from the respiratory

system, in the feces, and in the semen. There may be some transmission through the air.

PRRS presents itself primarily as a difficulty in breathing that often progresses to a deep cough, rough hair coat, poor growth, and an increase in secondary bacterial infections of the respiratory tract (e.g., *Pasteurella, Bordetella, Haemophilus, Streptococcus, Actinobacillus, Salmonella,* etc.). Incidence of the disease is variable. Death losses can often be as high as 25 percent within a group of pigs. Deaths are from secondary infections, not from the virus itself.

The best prevention is maintaining a negative herd through tight biosecurity and obtaining replacement stock from a known negative herd. In addition, making use of all-in, all-out pig flows will help prevent the disease from ever reaching its most severe level. A commercially approved vaccine is available to help prevent the disease. It is approved for use pigs that are 3-16 weeks old.

There is no treatment for the viral disease itself, so treatment efforts are aimed at secondary invaders that complicate and worsen the disease. Treatment, therefore, depends on which secondary problem exists.

Cattle

Infectious Bovine Rhinotracheitis or "Red Nose" (IBR) - IBR is transmitted by infected droplets that spread by coughing and by nose-to-nose contact. (See Figure 3.1.) The disease can also be spread venereally or by contaminated examination instruments. The virus can be found in infected tissues of aborted fetuses and in nasal or ocular (eye) fluids of infected animals, but it is rarely found in blood. All ages and breeds of cattle are susceptible. IBR can be fatal, but generally it only causes other respiratory and reproductive problems to appear.

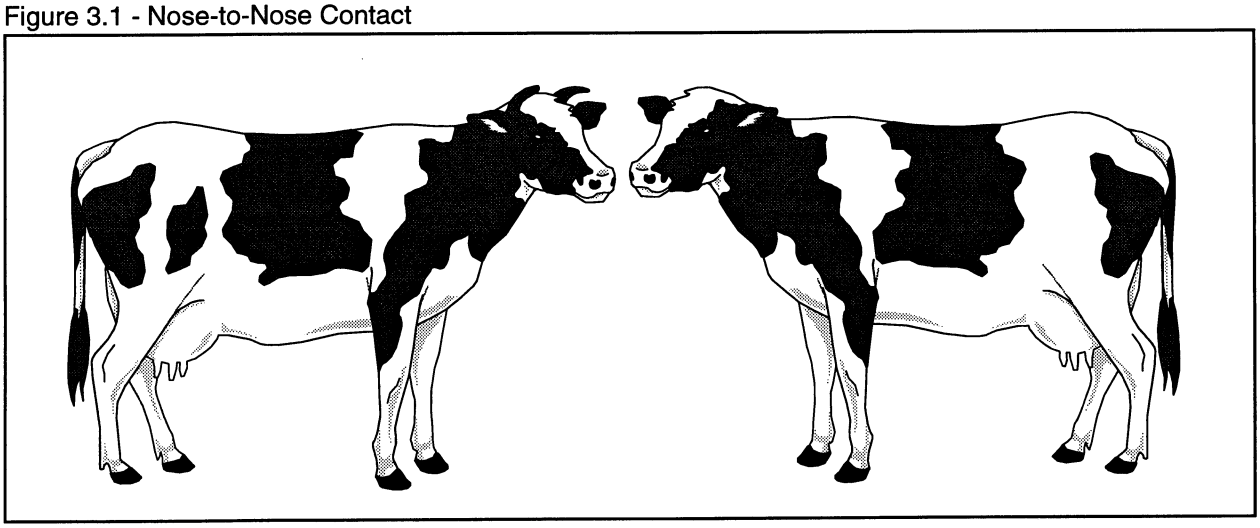
Symptoms associated with IBR are: open-mouth breathing, fever, large amounts of nasal discharge, and a fiery red nose. Other prominent signs of IBR are: depression, lack of appetite, labored breathing, and coughing.

Prevention is difficult since the IBR virus is so widespread; it is hard to find a herd that does not have a carrier. Prevention is usually by vaccines and natural immunity. Less-confined environments reduce chances of an outbreak of IBR. Cattle can develop a natural immunity to this disease, but vaccinations prevent secondary infections and spreading.

Antibiotic treatment of severely affected animals helps suppress secondary infection, but antibiotics have little to no effect on the actual virus. The animals have to rid their bodies of the virus naturally to recover.

Pasteurella infections - Pasteurella is a bacterial infection usually affecting feedlot, grouped, or well-confined animals. This disease can affect all ages of cattle. A Pasteurella infection can spread by droplets in the air, contact, coughing, or feeding

Figure 3.1 - Nose-to-Nose Contact



equipment. This is a very treatable disease, especially in older animals. Fatal cases tend to hit the younger population.

Infected animals show signs of fever, persistent cough, nasal discharge, rapid respiration, and sometimes diarrhea. Other symptoms are depression, lowering of the head, and eye discharge.

Prevention depends largely on good management practices to avoid additional stress on animals. Do not make quick ration changes; avoid overcrowding, outside infections, and stressful movement of cattle. Quickly isolate suspected infected animals.

For treatment, keep isolated animals in a dry, warm, well-ventilated area. Use antibiotics and proper environmental conditions to speed up the recovery process.

Bovine Respiratory Syncytial Virus - BRSV usually targets the younger population of cattle in feedlots. Transmission occurs through the aerosol form or by contact. Generally, weaning-age stock is infected the heaviest with the disease. Cattle that are 6-9 months old are most susceptible in feedlot conditions and have high mortality rates. Older cattle can be affected with the disease, but they have much lower fatality percentages.

Coughing, depression, large quantities of nasal discharge, open-mouth breathing, and frothing are true indications of BRSV. Fever, severe respiratory distress, and extension of the neck are other symptoms. The highest number of reported cases are during July through October. Once environmental conditions cool down, the cases decline in number.

For prevention, producers need to keep a watchful eye on weaning-age stock in feedlot conditions, since this is the most susceptible population. Isolate suspected animals as quickly as possible to reduce the spread of the disease. Do not make sudden changes in diet or water supply because this will place extra stress on the animals. Vaccines are available to prevent BRSV.

Antihistamines and vitamins are used for treating animals infected with BRSV. Revaccinating for IBR has been effective against BRSV. Remember, isolating infected animals and providing proper environmental conditions will aid in treatment.

Bovine Virus Diarrhea (BVD) - BVD infection generally occurs by contact, infected urine, or by the aerosol form. All populations can be affected, but the most susceptible cattle are 6-18 months old. More cases of this disease are reported during the winter and early spring months. A persistently infected bull can spread the disease through his semen to uninfected cows and their fetuses.

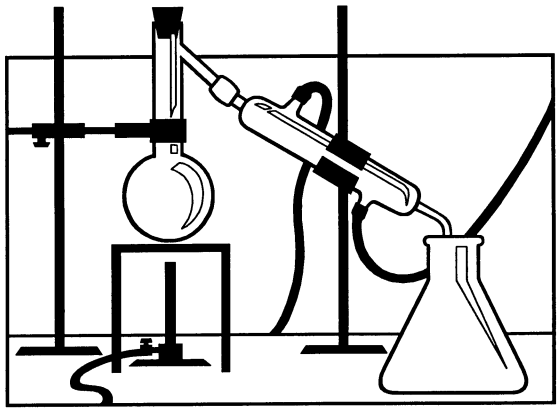
Acute cases generally show signs of a fever, depression, weakness, oral and nasal lesions, dehydration, diarrhea, lameness, nasal discharge, and increased salivation. In acute cases, fatalities usually occur 3-4 days after infection. Since the disease is carried through the bloodstream, pregnant cows can abort their fetuses. Chronic cases can linger for 2-6 months and sometimes past a year. These chronic cases remain carriers for the disease and are a detriment to the herd.

Stress, hormonal changes associated with puberty, and the enhancement of an already existing virus can trigger an infection of BVD.

There are vaccines available to control the spread of the disease. Infected animals usually die, and the ones that survive should be destroyed.

Horses (Equine Family)

Strangles - Due to bacterial *Streptococcus equi,* younger horses are particularly susceptible to strangles, but any horse that has not been infected



before will be susceptible. Infection spreads by inhaling or ingesting droplets breathed or coughed from infected animals. This very contagious bacterial disease affects the upper respiratory tract in horses. This is a very treatable disease, but it can be fatal and spreads quickly.

Animals infected by strangles have a very high fever, coughing, snorting, and thick mucus discharge. The throat, pharynx, and larynx become inflamed, and the animal has difficulty swallowing. Often when food or water is swallowed, these substances are regurgitated back through the nostrils.

Isolating infected animals helps control spreading of the disease. Cold, poorly ventilated, and very confined conditions can lead to an outbreak. Overworked animals and severe weather conditions can also increase the chances for this disease. Since humans can also spread the disease, disinfect all clothing after working with infected animals.

There are several antibiotics for treatment. Early treatment will help prevent abscesses and secondary infections. Isolation of infected animals is very important in treatment and control.

Rhinopneumonitis - This viral disease is transmitted by droplets in the aerosol form. The virus circulates through the bloodstream and localizes in the respiratory tract. Generally, only younger horses contract the disease. It can only be spread in the aerosol form. Horses and donkeys are the only species that are infected naturally. Rhinopneumonitis is a treatable disease, but it has the tendency to abort foals in pregnant mares.

Generally, an outbreak occurs in the autumn and winter months and is usually mistaken for a cold. Horses infected by the disease will have a fever, congestion, and nasal discharge. Sometimes coughing and loss of appetite can be symptoms. This disease is very difficult for a rancher to diagnosis without the help of a licensed veterinarian.

Isolate infected animals from the herd. A rancher could reduce outbreaks by not confining animals to tight, poorly ventilated areas. Vaccinations can be used, but they are not proven 100 percent effective.

There are a number of antibiotics that can be used to control secondary infections. Certain antibiotics are used strictly for nursing mares, and others are used for gestating mares.

Equine influenza - Equine influenza is an acute, highly infectious, viral disease in horses. It is transmitted as an aerosol and has very high mortality and abortion rates. Outbreaks usually occur when moving or grouping horses. This disease is so infectious that horse shows require papers stating that the animal has been vaccinated against Equine influenza.

Symptoms are very similar to other respiratory diseases in horses. These symptoms include: fever, nasal discharge, depression, weakness, dehydration, and loss of appetite. This disease is fatal but can be treated if caught quickly. Death and aborted foals are extreme symptoms of Equine influenza.

For prevention, ranchers and owners must be aware of this disease when grouping or moving horses. They also must be aware of outside contact with other horses. As mentioned before, there are vaccinations to prevent this disease.

Isolating infected horses is vital in treating them and preventing the spread of the disease throughout the herd. Keeping the infected animal in a dry, warm, well-ventilated area will also help in treatment. Antibiotics prevent secondary infections.

Summary

It is important for livestock producers and others in the livestock health field to have a good knowledge base of respiratory diseases, their symptoms, and treatments. The producer is the first step in prevention, treatment, and detection of any respiratory disease because he/she comes into contact with the animals more often than any other person. Everyday observations of livestock are critical for prevention, treatment, and detection of respiratory diseases.

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Lesson 4:
Diseases of the Gastrointestinal Tract

Good management practices can greatly reduce the spread of disease. An example of a good practice is when the producer cares for healthy newborns first, then does chores with the other animals. Sanitation and disinfection are also very important in killing disease-causing agents and keeping them from spreading. Following recommended vaccination and deworming schedules will eliminate many parasite-related gastrointestinal problems. For newborns, receiving colostrum within the first few hours of birth helps ensure antibody protection against many diseases.

In some sections of this lesson, the "diseases" discussed are actually conditions or problems, rather than infectious diseases.

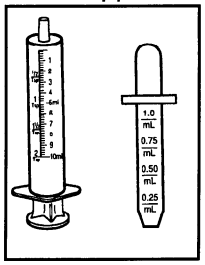
Swine

Baby pig diarrhea - *Escherichia coli* (*E coli*), transmissible gastroenteritis (TGE), rotavirus, coccidiosis, *Clostridium perfringens* type C, and various combinations are the causes of diarrhea in baby pigs. Diarrhea is especially a problem in sows with poor milk flow and in unsanitary, continuous flow farrowing areas.

With any of the baby pig diarrheas, it is better to prevent them with vaccination, cleaning, and disinfection to reduce the number of pathogens in the environment. Vaccines are given to the sow before farrowing so that she will pass antibodies to the pigs through her colostrum.

E coli bacteria adhere to the lining of the small intestine and produce toxins, which cause the intestine to secrete excess fluid. The affected pig has diarrhea and becomes ill from dehydration. Sows can be vaccinated against *E coli* before farrowing. In treatment, antibiotics can help, as can oral or injectable fluids.

FIGURE 4.1 - Oral Syringe and Dropper



The viruses TGE and rotavirus infect and destroy the lining of the small intestine. This prevents the intestines from absorbing nutrients and fluid. The affected pig is contagious and has diarrhea and vomiting, which produces dehydration and starvation. Vaccines for both TGE and rotavirus are available; dehydration can be treated with oral or injectable fluids.

Clostridium perfringens type C is a toxin-producing bacterium that kills the lining of the small intestine. This prevents proper absorption and digestion. The pig can have bloody diarrhea and can die of dehydration and starvation. For prevention, sows can be vaccinated before farrowing. Pigs with diarrhea can be treated with antibiotics and oral or injectable fluids.

Coccidia is a protozoan that infects the lining of the small intestine and eventually causes death with improper absorption and digestion. As with the other pathogens, this produces diarrhea and results in dehydration and starvation. Pigs can only be treated with oral or injectable fluids.

Adult diarrhea and gastrointestinal disease - Causes of these conditions and diseases are swine dysentery, salmonellosis, proliferative enteritis, whipworms, and gastric ulcers. These diseases usually occur after a pig has been weaned but can also occur in adult breeding animals. Good sanitation and all-in/all-out pig flow management will help control these diseases. All-in/all-out pig flow management is farrowing house scheduling in which sows and pigs are moved in and out as groups so proper sanitation and disinfection can keep TGE from spreading to the next group.

Swine dysentery is caused by bacteria. The disease can also be carried by animals that do not show symptoms. Symptoms include bloody diarrhea and inflammation of the large intestine. For control, add appropriate antibiotics to the feed or water.

Salmonellosis is also caused by bacteria—most commonly *Salmonella choleraesuis.* Besides causing diarrhea and inflammation of both small and large intestines, this bacterium can also cause an infection of the bloodstream. Infected pigs often become very sick with high fevers; the skin around their ears, snout, and flank will turn purple.

Antibiotics can be added to the feed or water for control.

Proliferative enteritis is caused by bacteria. It causes an inflammation and thickening of the intestinal lining. This often results in dark, bloody diarrhea. Antibiotics can help with control.

Whipworms are worm parasites. They cause an inflammation of the large intestine and bloody diarrhea. Deworming medicines are the appropriate treatment for whipworms.

Gastric ulcers are caused by several factors, one of which is finely ground feed. Pigs with gastric ulcers do not eat well and can bleed into their stomach. This can cause their manure to look very dark and tarry. There is little practical treatment.

Cattle

There are four major categories that cause gastrointestinal difficulties in cattle: anatomical problems, mechanical problems, toxins, and infections (viral and bacterial).

Anatomical problems - **Displaced abomasum** occurs when the abomasum (true stomach) gets out of position and becomes twisted, thereby affecting the entire digestive system. The exact cause is unknown. Early diagnosis by a veterinarian is important, as a case of simple displaced abomasum can progress to left displaced abomasum (LDA), right displaced abomasum (RDA), or abomasal volvulus, which is life threatening.

Symptoms include decreased appetite, no cud chewing, decreased milk production, abdominal pain, a sprung rib cage, and a temperature. With calves, the main sign is chronic bloating. Diseases such as ketosis, mastitis, and metritis can occur at the same time.

The best precaution against this condition is good feed management. Do not change feed rations too rapidly just before, or immediately after, parturition. Make sure the dietary fiber needs are met in both quantity and fiber size. With simple displaced abomasum, laxatives or antacids can be effective, as can a "rolling" technique. Surgery is usually required for valuable cattle with LDA, RDA, or abomasal volvulus.

Vagus indigestion occurs when the main nerve (vagus nerve) controlling gastrointestinal movement (motility) is damaged or pinched. Clinical signs include lack of appetite and lack of intestinal sounds.

Some cases cure themselves spontaneously and a few respond to veterinary treatment, but many never recover and subsequently die.

The most common **dental problem** is the extreme wear or loss of teeth. This occurs naturally with age and can occur very rapidly, depending on the geographic region and feeding practices. Some diseases, primarily nutrient deficiencies or excesses of calcium, phosphorus, and Vitamins D and A, can affect proper dental development.

Intestinal tortions, intussusception and **hernias** can result in loss of appetite, blockage of the intestine, severe pain, and eventual death. With intussusception, part of the intestine slips into a nearby area, causing obstruction. A veterinarian is required to surgically correct these abnormalities.

A **prolapsed rectum** generally occurs as a result of severe coughing/respiratory disease, diarrhea, or straining from constipation. Correction of the slipped rectum and proper healing requires early recognition, surgical repair, and correction of the true cause.

Mechanical problems - **Hardware disease** is most frequently seen with dairy cows, which are the most haphazard eaters among cattle. Debris that is consumed with forage can include wire and nails. The reticulum/first stomach traps most foreign objects, but a sharp object can perforate the reticulum, liver, or nearby heart. Sharp objects can also affect the lungs or cause leakage of digestive fluids.

An animal with hardware disease will lose appetite, prefer to stand quietly with an arched back, have impaired milk and other body functions, urinate frequently, breath with difficulty, and have a slight temperature. A grunting sound might accompany the pain, especially if pressure is applied to the

reticulum area (sternum). With chronic cases, the disease becomes difficult to diagnose because of confusing signs as the hardware moves through the body. An X-ray or exploratory surgery is needed for definite diagnosis.

Hardware disease can be prevented by passing a magnet into the reticulum, where it attracts and holds harmful metal objects. Without the magnet, the animal might heal on its own, or it might have complications and even die. Inexpensive treatment involves reducing feed intake and allowing the animal to remain still. Broad-spectrum antibiotics fight infection. For valuable cattle, surgery to remove the object and drain abscesses is an option.

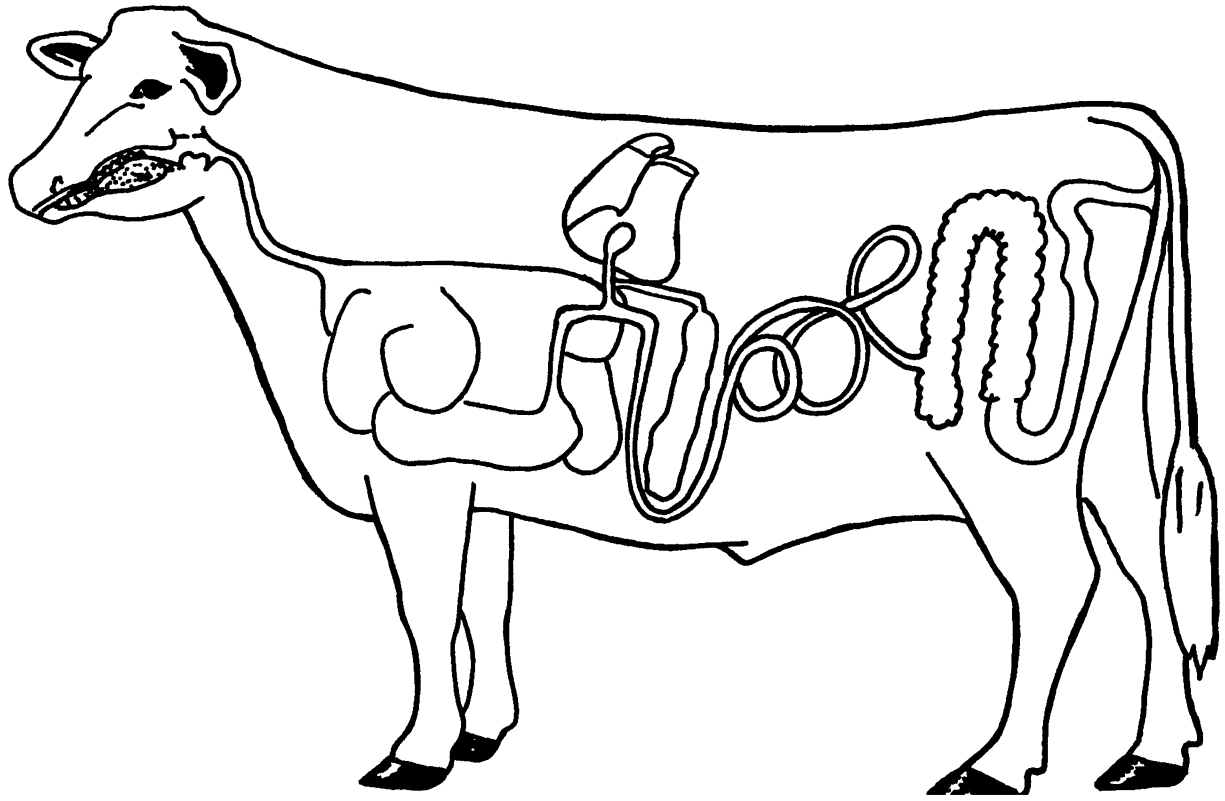
Bloat occurs when the esophagus becomes blocked where it opens into the rumen; this blockage prevents the animal from burping normal rumen gases. The cause can be something lodged in the esophagus, such as a hedge apple; a cancerous growth; overeating of grain or legumes, such as clover and alfalfa; or injury.

Affected animals are off their feed and have a ballooned left abdominal wall. Severe cases cause both sides of the abdomen to balloon and can result in death due to pressure on the diaphragm and prevention of normal breathing.

Treatment is accomplished by passing a tube down the esophagus to release the gas and by placing supporting medication into the rumen. Severe cases might require surgical release of the gas through the left abdominal wall. This should not be attempted without proper training.

Ulcers can occur at any point along the gastrointestinal tract of cattle. They can be caused by ingested toxins, viruses, or improper diets. True stomach ulcers, like those in people or pigs, occur only in the abomasum. Affected animals are off their feed and can pass dark feces if bleeding is occurring. Treatment usually consists of supportive care and medication until the ulcers heal themselves.

Toxins - Toxins affecting cattle can be from manufactured sources, such as lead, insecticides, herbicides, fertilizer, etc., or naturally occurring plants, such as yew bush trimmings, wild cherry leaves, etc. They are most often taken in orally, but some can be absorbed through the skin.



The effect of toxins on the digestive tract of cattle varies, depending on the type of toxin and the amount. Clinical signs vary from mild lack of appetite to severe constipation or diarrhea. In addition, other organ systems can be affected, making treatment and recovery very difficult.

Successful treatment requires the help of an experienced veterinarian. The proper use of antidotes, laxatives, and absorbents requires professional diagnosis and training. The best treatment, of course, is to prevent exposure to toxins.

Infectious problems (viral and bacterial) - **Scours/diarrhea** is a problem for all ages of cattle, but it is particular deadly for calves younger than 10 days old. Three categories are generally responsible for scours: (1) bacteria—*E coli, Salmonella,* and *Clostridium perfringens* types A, B, C, and E; (2) viruses—rotavirus, coronavirus, IBR, and BVD; and (3) contributing environmental factors, such as overcrowding, lack of colostrum, vitamin deficiency, and parasites. *E coli*-triggered diseases are the largest cause of calf death. Determining the specific cause of diarrhea often requires a veterinarian and diagnostic laboratory.

Symptoms include watery feces, weight loss, dry skin, weakness, and depression. Animals that lose 15 percent of body weight from dehydration generally go into a coma and die.

Dehydration is the main damage caused by scours. It can be treated through oral fluids and electrolyte therapy, much like drinks professional athletes consume after hard exercise. Antibiotics are effective for some causes; consult a veterinarian. For sick calves, milk replacer and electrolytes are used to rehydrate and nourish the calf while it fights the infection (with the help of antibiotics).

Proper management is extremely important, both in treating sick animals and eliminating factors that enhance bacteria and virus growth. Infected animals should be isolated and handled last. Keep newborns from having nose-to-nose contact. Keep birthing pastures or pens clean, treat navels to eliminate infection, and prevent overcrowding.

Many cases of scours can be prevented. Vaccinate pregnant cows against colibacillosis 6-2 weeks before parturition and provide adequate vitamins and minerals. If calves do not receive sufficient colostrum soon after birth, they will not have enough antibodies to fight off infection. Cattle can be vaccinated against *Salmonella, Clostridium,* rotavirus, coronavirus, IBR, and BVD.

Proper internal parasite control is also a must. Parasites (worms and coccidia) cause intestinal irritations that make the occurrence of other infectious diseases much more common. (See Lesson 6 of this unit for more on parasites.)

Horses

Colic - It is the most frequently seen gastrointestinal problem in horses. Colic is not a single disease, but a symptom of pain in the abdomen, usually in the intestines, and is caused by a variety of diseases. Even with the best treatment, some cases of colic can result in death.

Feral or wild horses eat high-fiber/low-energy diets continually as they roam, unlike living conditions in captivity. A horse's relatively small stomach; inability to vomit; and large, free-moving intestines are not well suited to human management, where improper feeding and watering results in colic.

Common causes of colic are sudden changes in feeding or watering, too little forage, overfeeding/overwatering recently worked horses, working horses immediately after a full feeding, moldy grain or hay, and parasite buildup. These factors result in abnormal bowel movements, spasms, or a physical obstruction of the intestine's interior. Spasmodic colic, which accounts for approximately 40 percent of all cases, is a particularly common problem for nervous horses but luckily is the most easily treated.

Symptoms of mild abdominal pain generally include depression, pawing, lack of appetite, decreased bowel movement, yawning, looking toward flanks, excessive lying down, repeatedly getting up and down, frequent attempts to urinate, tail twitching, and kicking at the belly. Moderate

pain is indicated if the horse rolls or thrashes dangerously, has patchy sweating, or has rapid breathing. A horse in severe pain will roll and thrash uncontrollably, have profuse sweating, and ignore attempts at restraint. As a species, horses have a very low pain threshold, but no two horses have the same pain threshold. Therefore, similar causes of abdominal disease can cause widely different levels of pain in two different horses.

The horse *must* be kept on its feet while waiting for the veterinarian so that it does not twist an intestine or injure itself by rolling or thrashing on the ground. Walking the horse slowly might help control the pain. In dealing with colic, the biggest problem is determining whether it is **medical** or **surgical** (less than 4 percent of cases). Medical colics can be treated successfully by administering medication and general nursing care. Surgical colics will cause death without surgery. The veterinarian uses many factors, including circulation and intestinal position by rectal examination in an attempt to make this diagnosis.

Treatment for most cases includes pain relievers, laxatives, withholding feed, and/or a follow-up examination. Second opinions, surgery, intensive care, or putting the animal to sleep (euthanasia) might be needed in severe colic cases. If surgery is necessary, 40 percent of the small intestine and at least 50 percent of the large intestine can be safely removed without special dietary considerations.

Diarrhea - Although it is not as common in horses, diarrhea can result from strongyle infestation, too much milk, bacterial and viral diseases, sudden changes in feed, or at the first normal heat after foaling. Animals with diarrhea can be quite contagious and quickly contaminate the area.

Treatment can involve antibiotics and medicines containing kaolin or pectin. Consult a veterinarian if anything stronger is needed.

Summary

The symptoms and causes of many digestive disturbances are very similar. Correct treatment depends on identifying the specific disease properly. Prevention, through proper sanitation and management, seems to be the key to controlling GI diseases.

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Lesson 5:
Reproductive Diseases in Livestock

Abortions in animals represent genetic and economic losses and often cause a serious disposal problem, especially if abortion resulted from an infectious disease. All reproductive diseases mentioned in this lesson have abortions as one of the symptoms.

Swine

Pseudo-rabies - Pseudo-rabies is an acute, fatal disease occurring in all ages of swine. The most susceptible population consists of pigs less than two months of age. This disease is usually spread by a virus in the sow's milk or in the boar's semen.

Young pigs usually die right away or are aborted by the sow. Older pigs or weaning-age pigs show signs of fever, incoordination, walking sideways, tremors, mouth frothing, eye discharge, and sometimes convulsions. Vomiting, diarrhea, and death will soon follow. Adult swine show signs of fever, vomiting, muscle spasms in limbs, convulsions, or intense itching. Adults might also have respiratory problems. The most prominent sign in female swine is aborting of young.

The only preventive measure is to test all incoming stock for pseudo-rabies. Any stock that tests positively for pseudo-rabies must be destroyed. When restocking the herd, use only stock that tests negatively.

The only treatment is to destroy infected animals to prevent further spreading of the disease.

Leptospirosis - Leptospirosis affects all populations of swine. It is transmitted by wallowing in muddy areas infected by contaminated urine. Other methods of transmission are infected dead pigs and infected outside animals entering confined quarters. The organism usually confines itself to the area of the bladder. The organism can survive for several months in stagnant waters. Infection usually occurs through the nasal and oral passages by nosing at urine or eating contaminated fetus, food, soil, or water.

Reproductive disorders usually appear as abortions, infertility, stillbirths, fever, reduced milk, and neonatal mortality. Acute cases show signs of dullness, diarrhea, hindquarters weakness, incoordination, staggering gait, and stiffness of neck.

Vaccinations are available to prevent leptospirosis. Vaccinations for sows should be given prior to mating and just before farrowing. This method is very beneficial for confined farrowing operations. Animals entering new herds should be isolated, vaccinated, and vaccinated again 4-6 weeks later. Pigs should be vaccinated at weaning and again 4-6 weeks later. Good management practices, such as cleaning pens and eliminating stagnant waters and rodents, are also good preventive measures for leptospirosis.

Feed additives can eliminate carrier animals. Treat the entire herd for 8-11 days. There are several drugs available that are effective in treating infected animals.

Brucellosis - Brucellosis attacks all breeds, classes, and ages of swine. There is no lasting immunity for brucellosis. Infected, recovered animals can be reinfected with the disease later in their lifetime, usually 6-12 months after their first infection. There are several modes of infection. The germ can be present in the urine of both sows and boars, semen, vagina discharges, food and water troughs, sow's milk, and even in the soil. The germ enters the body through the mouth from any of the above sources. The germ can be transferred from pen to pen by human clothing, boots, farrowing crates, and feed buckets. Transmission can also occur when hogs eat or come in contact with infected, aborted fetuses. The disease can be readily transferred from the boar to sow during mating.

In boars, symptoms show up as swelling of one or both testicles. If not caught early enough, the boar generally becomes impotent. An infected sow's symptoms appear in her offspring not in the sow herself. Since each fetus has its own placenta membrane, some pigs are born normally developed, but others might be born dead and underdeveloped. Abortions can occur but are rare in swine. If abortions do occur, the sow generally eats her young.

Isolating and testing sows that have abortions or stillborns are good preventive measures. These measures help prevent further spreading. Good sanitation practices, such as cleaning and disinfecting farrowing crates and other farrowing equipment, are good preventive measures for confined breeding stock. Isolating and testing outside animals entering the herd will prevent an outbreak of brucellosis.

No drugs are available at this time to treat brucellosis. The most effective method of treatment is to destroy them in the proper manner.

Parvovirus - Parvovirus is probably the most infectious virus that affects swine because of its resistance to heat, cold, acidity, alkalinity, and disinfectants. parvovirus affects all breeds, classes, and ages of swine. Infection occurs venereally, by inhalation, and by ingestion. Pigs infected with parvovirus in their adolescent years will develop a natural immunity for the remaining years of production.

Symptoms of parvovirus appear as reproductive problems in swine. Sows have stillbirths, problems conceiving, reduced litter sizes, and mummification of fetuses. Boars will show infertility problems.

Isolate and test suspected infectious animals and outside animals entering the herd. Good sanitation practices are important for prevention because infected animals generally shed the virus in their fecal matter. There are vaccinations available for parvovirus.

Cattle

Brucellosis - Brucellosis is a very contagious bacterial disease in cattle. It is a major concern in the livestock industry because transmission to humans can occur very easily. Bacteria enters the body through the mouth or venereally. Transmission occurs by licking genital organs, infected fetus, infected placenta, or by licking vaginal discharges. Transmission can also occur during natural servicing of females, but is rare. Females are more susceptible than males, and older animals are more susceptible than younger animals. Time of year, climate, and weather have little influence on the brucellosis bacteria.

Abortions in cattle are a significant sign of brucellosis, but this is not always true for every infected female. Other symptoms are weak calves at birth, retained placenta, and vaginal discharge. These symptoms lead to a period of infertility for both the female and male. An infected male will usually have a reduced sex drive and enlargement of one or both testicles.

Calf vaccination is vital in preventing brucellosis from entering a herd. Good sanitary practices and annual brucellosis testing are good additions to a herd management plan.

Isolating infected animals is important in preventing the disease from spreading. Currently, there is no effective means of ridding the disease except through the destruction of positively tested animals.

Mastitis - Mastitis is more common in dairy than in beef cattle because the dairy cow's udder comes in contact with more outside sources. All breeds of dairy and beef cattle are susceptible to mastitis. Mastitis is a reproductive disease because it appears only after birth. Infection usually occurs by bacteria transfer from the milker's hand, milking equipment, flies, or by lying on infected ground. The bacteria enters the body through the hole at the end of the teat. Cows that have been infected with the disease will not build a natural immunity to mastitis; it can reoccur again and again throughout the cow's production lifetime.

Mastitis changes the nature of milk. Infected milk has thick, white, pus-like clots in it. Clots resemble paper spit-wads. The milk usually becomes paler and thinner in nature. Infected milk has a very unpleasant odor since it is infected with pus. The udder becomes hot to the touch, tense, and painful for the animal. The udder might also develop lumps that can be felt by the producer.

There are several teat dips available for prevention of mastitis. Dipping the teats after milking is a good management practice, as are good cleaning procedures in the milking parlor and of milking equipment.

There are several drugs available for treating mastitis. These drugs should be administered to the infected animal until the animal fully recovers.

Infected milk must be disposed of properly. There is usually a waiting period until the milk can be returned to the herd's milk supply.

Metritis - Metritis means inflammation of the uterus or breeding bag. Metritis is not a specific disease but a symptom of a variety of bacterial diseases. Infection can occur venereally, by contaminated obstetrical equipment (calf pullers and chains), by human contact after working with infected animals, and improper clean-up. Predisposing causes for metritis are manually removing or rough removal of afterbirth, and even removing afterbirth before it is ready to be taken away. The retained placenta acts as a wick to the uterus for infection.

Females infected with metritis have inflammation of the mucus membrane lining of the uterus. This inflammation creates outward signs of vaginal discharge in the forms of excess mucus, pus flakes, or excess pus. Breeding problems usually occur, such as conception difficulties, missed heat cycles, and fertilized eggs that cannot attach themselves to the uterus wall. These problems occur because of the inflammation in the uterus. Bulls are usually unaffected by metritis but can be carriers of the disease.

Good sanitation and feeding practices are good preventive measures. If an outbreak occurs, isolate infected animals and make sure equipment and clothing are cleaned after working with them. An outbreak of metritis is more likely to occur in confined areas like calving barns. (There is a higher concentration of infectious diseases than is found outside.)

Several drugs are available for treatment of infected females. Consult a veterinarian for the most effective treatment of metritis.

Leptospirosis - Leptospirosis affects all classes, breeds, and ages of cattle. As with swine, the disease is transmitted through infected urine. Transmission generally occurs by inhaling infected urine droplets that are present in the air. Animals that recover from leptospirosis generally develop a high resistance to reinfection. Low-lying ground with swampy conditions and stagnant bodies of water are predisposing causes of leptospirosis.

Acute symptoms of leptospirosis are fever, depression, failure to eat, and reduced milk production. Some chronic symptoms are abortions, breeding difficulty, death, and retained placenta.

Isolate infected animals to reduce transmission of the disease. If there is an outbreak of leptospirosis in the herd, be aware of any stagnant bodies of water. There are vaccinations available for the prevention of leptospirosis.

Several drugs are available for treatment of cattle. Consult a veterinarian for an effective treatment.

Horses

Metritis - Metritis affects all classes and breeds of equine breeding stock. The most susceptible horses are breeding mares. Infection can occur venereally, by contaminated obstetrical equipment (such as foal pullers and chains), by human contact after working with infected animals, and improper clean-up. Infection generally occurs by retained placenta membranes. The retained placenta acts as a wick for infection directly to the uterus.

Symptoms of metritis are more difficult to detect than other reproductive diseases because they usually appear as breeding problems. Mares show no signs or symptoms of vaginal discharge. The only signs are failure to conceive or maintain pregnancy. Another sign of metritis is repeated service to a known fertile stallion. Sometimes a mare appears to have conceived by missing a heat cycle, but 2-3 months later a fetus is not found (because the fertilized egg could not attach itself to the uterus wall).

If an outbreak occurs, isolate infected animals and make sure equipment and clothing are cleaned after working with infected animals to prevent spreading of the disease.

The following are effective treatments for metritis: local antibiotic therapy, systemic antibiotics, topical antiseptic therapy, uterine flushes, plasma infusion, and a combination of plasma infusions and antibiotics.

Fescue toxicity - Fescue toxicity affects female breeding stock in horses. Infection occurs when gestating mares eat fungi-infested fescue grass. By eating infected fescue, less of the hormone prolactin is produced. Reduced prolactin decreases or eliminates milk production in the mare. This process generally takes place in the last 60 days of gestation.

Fescue toxicity is hard to detect until it is too late. If the mare's diet consists of fescue forage and the mare is gestating, the lack of udder development is a good sign of fescue toxicity. After foaling, signs of fescue toxicity are stillborns and thick, discolored placenta.

A good preventive measure is to take gestating mares off a fescue diet 60 days before foaling to reduce fescue toxicity chances.

Since fescue toxicity is not an infection, treatment for the disease is not necessary to aid in recovery. Good management practices are the most effective way to prevent fescue toxicity.

Summary

It is important for livestock producers and others in the livestock industry to understand the impact of reproductive diseases on the industry. The producer is the first step in detection, prevention, and treatment of reproductive diseases. It is vital that a producer understands the impact of health on the herd.

Credits

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Abortions can be caused by thousands of factors, so diagnosis of the cause can be very difficult. The diagnostic success rate for abortion is only about 30 percent. Researchers say abortion losses of 2-3 percent can be tolerated without undue concern in well-managed livestock operations. The following factors are obstacles to accurate abortion diagnosis:

1. Abortions generally occur as the result of an event that occurred several weeks or months earlier. If the cause was present at conception, it is usually undetectable by the time of the abortion.
2. The mare usually retains the fetus in the uterus for several hours or days after death.
3. Fetal membranes, which are commonly affected first, are usually unavailable for examination.
4. Toxic and genetic factors can result in abortions but are very hard to discover.
5. Many factors causing abortions are still unknown and are very difficult to detect.

The following factors are considered causes for abortions in livestock:

1. Venereal infections
2. Nonvenereal ascending infection
3. Septicemia - a systemic disease caused by pathogenic microorganisms and their toxic products in the blood
4. Anemia - lack of or reduction in red blood cells
5. Nutritional problems
6. Trauma
7. Genetic defect
8. Toxicity problem
9. Endocrine abnormality
10. Other

Lesson 6:
External and Internal Parasites

Each of the major livestock parasites will be discussed in terms of their hosts, life cycle, damage to the host, symptoms, and control.

External Parasites of Livestock: Their Symptoms and Treatments

Ticks - Ticks attack all classes of livestock but are of greatest concern to cattle and horse producers.

After leaving the host, adults lay eggs that hatch into larvae in 10-21 days. The larva becomes a nymph and attaches to a host until it becomes a mature adult, which ranges from a few days to several months, depending upon the species.

The greatest damage to hosts by ticks is the sucking of blood, which can cause anemia, weight loss, and even death. They also leave a wound that allows for bacterial infection or other injury. Infestations usually are found by visual inspection.

Extreme temperatures and pasture rotation help control ticks. The most effective method of control is chemical treatment.

Louse - Lice are species specific, and only one species affects swine--the hog louse.

In the life cycle, the adult female glues eggs to the host's hairs. The hatching range is 1-2 weeks, when nymphs are produced. In two weeks to a month, the nymphs become mature adults.

Blood-sucking lice can cause the hosts to become anemic. Irritation and discomfort cause rubbing and scratching. This decreases feeding and grazing time, resulting in loss of gains, unthriftiness, and even death. The primary symptoms of lice infestations are rough hair coats, rubbing, and scratching.

Chemical control with pesticide sprays, dips, dust, and self-treatment devices are most effective.

Mites - Mites attack all classes of livestock. They spend their entire life on the host. The adult female lays its eggs on the surface of the host's skin. Eggs hatch in approximately four days and larvae emerge. The larvae molt, become nymphs, molt again later, and become adults. The entire life cycle takes 12 days or less.

The host's hair comes out and the skin becomes rough and crusty. Symptoms are falling hair and rough, crusty, red skin.

Mites can be chemically controlled. Animals having this pest are placed under quarantine.

Screwworm - The screwworm affects all livestock. Infestation usually is only through wounds; however, some infestations have been found without wounds.

A screwworm is the larva stage of a blowfly. They feed on living flesh for 5-7 days, drop to the ground, and pupate. The larvae or maggots live on live flesh and can cause weight loss, permanent injury, or even death.

The primary signs of screwworms in a wound are an unpleasant odor, enlargement of the wound, and seepage of blood serum (mostly plasma) from the wound.

Topical sprays are available for the treatment and prevention of screwworm infestation.

Heel fly or cattle grub - Cattle are the primary hosts for the cattle grub; however, they have been found in other species of livestock.

The adult fly lays eggs on the host's leg hairs and lower parts of the body. Eggs hatch into larvae that penetrate the hair follicles and enter the animal's body. During a period of months, the larvae migrate through fleshy tissues of the animal's body until they reach the back.

The primary damage is to the hides by causing decreased values from the holes. During the grub's migration to the back, animals can injure themselves trying to get rid of the grubs. There is

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also damage to meat that must be trimmed away as waste. Egg laying is the most visible symptom of the heel fly. There are visible swellings of the grubs once they arrive in the animal's back.

The best control method is with systemic insecticides before heel flies reach the animal's back.

Horn fly - Cattle are the main hosts, but horn flies will attack other species.

The adult female lays her eggs in manure, where they hatch in nearly 24 hours. Larvae mature in 5-10 days and then pupate. Young flies emerge from the pupae in 3-7 days and become adults in a few days.

The adult fly bites and sucks blood from the head, neck, back, and belly of cattle. The biting results in the transmission of disease, annoys the animal, and indirectly causes weight loss. Horn flies are easily seen on infested animals. Unless they are controlled, horn flies will cover the backs and necks of cattle during spring and summer.

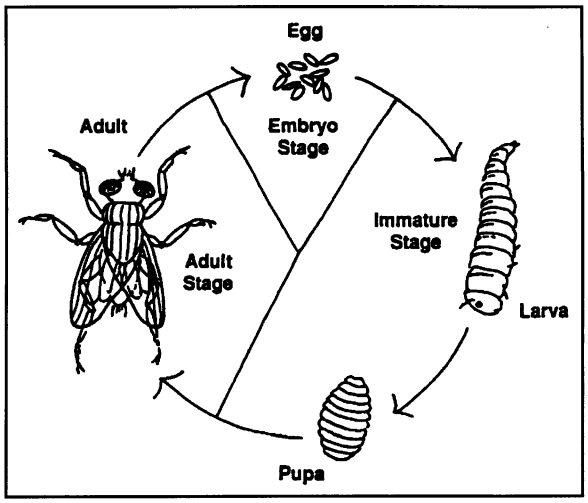
Chemical control is the best method. Feed additives and ear tags are available for controlling horn flies.

Other flies - Flies are parasites of all classes of livestock.

The adult female lays eggs in manure, debris, and other dead and decaying organic matter. Eggs hatch into larvae in approximately 24 hours. The larvae mature and pupate in 5-10 days. Flies emerge from the pupae in 5-7 days, becoming adults in only a few days.

Besides biting, sucking blood, and transmitting diseases, flies annoy animals, indirectly causing lowered feed gains and weight loss. Flies are easily seen, and heavy infestations are common around lots and barns.

Most flies can be controlled with chemical sprays and dusts or feed additives. Because most species build up an immunity to nearly all chemicals, rotation in the use of chemicals is recommended.



Nose bots - The nose bot is a parasite of horses and sheep and is closely related to the heel fly.

The adult fly emerges from the pupae, which lies dormant in the feces and other debris until the first warm days of spring, late summer, and early fall. While grazing, animals rub their noses against the ground, and the fly deposits eggs on the nose and chin of the animals.

Damage results when large bot infestations in the animal's stomach reduce digestion and usually leave an ulcerated area. The presence of the adult fly is very obvious because of the irritation it causes the animal.

Chemical control through deworming is the only method of control.

Internal Parasites of Livestock: Their Symptoms and Treatments

Internal parasites affecting livestock are divided into three major groups: roundworms, tapeworms, and flukes.

Roundworms - From an economic standpoint, roundworms are the most important parasites. There are many types of roundworms, which affect almost every species of livestock. Although there are species that attack every system in the body, the ones of greatest concern are found in the digestive system, mostly the stomach and intestines.

Stomach worms - There are several species of stomach worms, but the twisted stomach worms and the brown stomach worms are most important. Stomach worms are found in all classes of livestock but commonly affect cattle, sheep, and horses.

In the adult stage, stomach worms live as blood-sucking parasites attached to the stomach wall. Eggs pass in the host's feces and hatch into larvae in 15-20 days, depending on temperature and humidity. The larvae crawl up a blade of grass, are eaten by the animal, and travel to the stomach lining until they mature.

While penetrating the stomach lining before maturing, stomach worms cause severe damage by reducing the host's digestion of nutrients and producing poisons. Young, undernourished, or disease animals are hardest hit.

The most common symptom is anemia. In light infestations, the animal will have a dull hair coat, an unthrifty appearance, and will sometimes have scours. In severe infestations, there will be persistent scouring, weight loss, anemia, weakened condition, and possible death.

Sanitation and pasture rotation are good control measures. Chemical dewormers are used to treat infested animals. The type of dewormer used is dependent upon the class of livestock. Drenches and injectable dewormers are most used in cattle and sheep. Feed and water additives are generally used for swine. Liquid dewormers, administered by tubing, are the most effective treatment for horses. Feed additives are also effective.

Strongyles (bloodworms) - There are several species of strongyles, which normally inhabit the small intestine but also are found in the abomasum of ruminants. Strongyles attack all species. They have a greater affect on young animals in each species. After cattle and horses reach an age of 4-5 years, they build up a partial immunity and are less affected.

In the adult stage, bloodworms live as blood-sucking parasites attached to the lining of the intestines. Eggs pass from the host in the feces and hatch into larvae within five to 20 days, depending upon temperature and humidity. The larvae then attach to a blade of grass, are eaten by an animal, pass through the stomach, and attach to the wall of the intestine. The larval stage can live for months in the grass before being eaten. Larvae pass through the arteries and other internal organs, sometimes causing irreparable damage.

Strongyles (bloodworms) are the most detrimental of all internal parasites. Besides sucking blood, which results in anemia, their presence and the scar tissue left by them greatly reduce digestion in the intestines. They are the major cause of colic in horses. Chronic infestations result in unthriftiness, poor feed conversion, weakened condition, and even death.

The most common symptom is anemia. Weight loss, rough hair coats, scouring, loss of appetite, colic, and weakness are seen in moderate and severe infestations.

Sanitation and pasture rotation are effective control measures. The use of chemical dewormers in a regular deworming program is the best method of control. When deworming cattle and sheep, boluses, drenches, and injectable dewormers are the most effective. For swine, water and feed additives are most often used. For horses, tubing at regular intervals plus feed dewormers between tubings give the best results.

Ascarids - Ascarids are primarily parasites of cattle, sheep, hogs, and horses. Younger animals are most often affected.

Eggs are passed in the feces and contaminate pastures, lots, and stable areas, where they are ingested by susceptible hosts. The larvae burrow into the wall of the intestines and migrate through the liver, heart, and finally the lungs, where they are coughed up and swallowed. After reaching the intestines the second time, they develop into the adult stage. Here, they reach a length of 8-15".

Affected animals can develop pneumonia and lung damage due to the larval migration through the lungs. Unthriftiness, weight loss, and colic due to intestinal blockage are common in heavy infestations. Symptoms include weight loss, dull hair coat, general unthriftiness, and colic.

Ascarids are generally controlled by the same means as other stomach and intestinal roundworms. Pasture rotation, sanitation, and deworming programs are the best control measures.

Pinworms - Pinworms are small roundworms usually found in the colon and rectum of horses.

Adult females lay eggs around the anus of the horse. These eggs drop off and contaminate pastures, stables, and watering and feeding areas. After eggs are ingested by the host, they pass to the colon and rectum, where they mature.

Damage by pinworms is minor. However, they do cause severe irritation around the tail area, which causes horses to rub their tails. Tail rubbing is the most noticeable symptom. Also, white scaly deposits are visible around the anus.

The chemical worming programs used to control other species of roundworms will control pinworms. Sanitation measures around barns and lots are effective in reducing infestations.

Habronema stomach worm - The horse is the major host of the *Habronema* stomach worm, but the house fly is an intermediate host.

This species affects the host in two stages. The adult stage is found in the horse's stomach, where little damage occurs other than an occasional tumor. Larvae are passed in the feces, which are ingested by house fly maggots. The *Habronema* stomach worm remains in the fly when it emerges from the pupal stage. The larvae of the *Habronema* are deposited on the lips of the horse by the fly, are swallowed, and mature in the horse's stomach.

Real damage of the *Habronema* does not involve its normal life cycle. If the larva is deposited on an open wound, a summer sore develops. These summer sores are difficult to heal and are the result of the migration of *Habronema* larvae throughout the wound. They can permanently disable or disfigure horses. These sores also develop around the medial canthus (corner of the eye nearest the bridge of the nose), especially in stabled horses.

A summer sore is easily detected by a seepy, hard-to-heal crusty sore. In the eye there is excessive tearing and running, which later forms an open sore. The larvae can be seen upon close inspection.

As with other roundworms, disruption of the life cycle is necessary. The best control is a regular deworming program. Sanitation is important, along with a fly control program in and around the stable area.

Lungworms - These roundworms affect the circulatory system and lungs. Lungworms affect all species of livestock.

Eggs are laid in the lungs, then coughed up and swallowed. The eggs hatch in the stomach or intestine, and the larvae are passed in the feces. After a period of development in moist earth or water, the larvae are ingested by the host and pass to the intestine. There, they burrow through the intestinal wall into the lymph nodes and are carried to the lungs, where they mature into the adult stage.

In heavy infestations, there can be mechanical blockage of the lungs, causing a collapse of the infected area. This furnishes an ideal location for the invasion of other organisms. Lungworms can also cause blockage of the windpipe and bronchia.

Coughing is the first indication of this parasite; it is accompanied by faster and more forceful

breathing. In severe cases, the animal breathes with its mouth open and its tongue protruding. It is reluctant to move, usually develops a fever, goes off feed and water, and becomes gaunt.

Sanitation and pasture rotation are the best control practices. Chemical control is relatively effective.

Broad tapeworm - In general, tapeworms are far less important than roundworms. The broad tapeworm is a parasite of all classes of livestock, as well as humans.

The adult lives in the small intestine, where it can reach a length of 10' or more. Tapeworm segments containing eggs break off continuously and pass out in the feces. Eggs are eaten by the oribatid mite, which lives in grass and weeds and serves as an intermediate host. The eggs develop in these mites, then are eaten by livestock and hatch in the small intestines. They feed on foodstuff eaten by the animal and grow to maturity.

There is no physical damage to the host. However, the tapeworm is in competition with the host for food. Unthriftiness, loss of weight, diarrhea, and emaciation are the major symptoms. Chemicals can rid the host of tapeworms.

Beef tapeworm - Although the beef tapeworm is a parasite of cattle, humans are the necessary intermediate host.

Beef tapeworm eggs contaminate the feed of cattle and pass down into the intestines. There, the eggs hatch out, bore through the intestinal wall, and lodge in a muscle, causing a cyst. Beef affected by these cysts are called measly beef. The parasite is then passed to humans when infected, undercooked beef is eaten.

There is little economic damage to cattle by the parasite; however, it is a problem for humans. Adult beef tapeworms only live in humans and can reach a length of 25'. There are almost no visible symptoms in cattle except in the carcasses of slaughtered animals.

Since humans are the necessary intermediate host and the beef tapeworm is transferred through the meat, the best control is eating only well-cooked beef.

Pork tapeworm - This tapeworm is the same as the beef tapeworm, except that the larvae live in the muscle tissue of pork.

Liver fluke - The liver fluke is a parasite of cattle, sheep, goats, and humans. It is especially damaging to young animals.

The adult lives in bile ducts, where eggs are laid, pass down into the intestines, and leave in the feces. Eggs must land in water to hatch. The larvae that hatch from these eggs swim about seeking a snail, which is necessary to complete the liver fluke's life cycle. Larvae develop for a period in the snail, then emerge and attach to plants along the water. Livestock eat the water plants and become infested. The young flukes pass to the intestines and burrow through the abdominal cavity and into the liver, where they live principally on blood. Egg production begins about three months after entering the animal.

The fluke causes irritation, thickening of the bile duct, and fibrosis of the liver, making it unfit for human consumption. The usual symptoms are anemia and weight loss. Highly infested animals might die.

Pasture rotation and using water troughs help in control. Chemical treatment will kill adult flukes in the animal. Control of snails will break the cycle, but that is difficult to do.

External Parasites of Poultry: Their Symptoms and Treatments

Poultry producers lose millions of dollars annually to damage caused by external parasites. These parasites transmit pathogens or kill birds, decrease egg production, increase feed costs, reduce weight gains, and lower carcass quality.

Lice - Lice are more abundant in summer than in winter months. Lice are permanent parasites of their hosts. They spend all life stages on the same bird. Sometimes, they will pass from one bird to another, particularly from an older bird to a younger bird.

Although lice eggs are laid singly, they can be abundant enough to form dense clusters on the fluffy area of a bird's contour feathers.

Eggs cemented to the bird's feathers are oval, white, and sometimes beautifully ornamented with fine spines. Eggs hatch in a few days or weeks. Young nymphs immediately begin running about and feeding on the host. After a few weeks, they gradually become adult sized in form and color.

All lice infecting poultry are sucking and chewing types. Lice irritate, cause weight loss, reduce egg production, decrease carcass quality, and can even kill birds. Several species of lice attack poultry. These include: body lice, head lice, wing lice, and fluff lice.

Mites - Mites vary in size and structure. Poultry are susceptible to many types of mites.

Mites usually occur on or under the bird's skin or feathers. A few can exist in body tissues, feather quills, or nasal and respiratory passages such as the air sac. Mites feed by piercing the bird's skin or tissue, sucking blood or body fluids, or by biting bits of skin or feathers.

Mites slow the growth of birds, reduce egg production, lower vitality, damage plumage, and even kill birds. Much of the injury, consisting of constant irritation and loss of blood, is unapparent unless one examines the bird.

Ticks - Several species of ticks affect poultry. These include the fowl tick, Lone Star tick, and Gulf Coast tick. The tick is a bloodsucker and injures poultry by transmitting disease, causing weight loss, lowering egg production, and causing skin blemishes that reduce market value.

Ticks are difficult to eradicate. Houses and surrounding areas require thorough pesticide treatment.

Mosquitoes transmit poultry diseases, including malaria and fowlpox.

General parasite control - Many pesticides exist to control external parasites of poultry. Because the list of approved material changes rapidly, consult a poultry specialist for a recommendation.

Besides applying pesticides, producers can apply good management practices to their operations. Poultry houses and surrounding areas should be free of foreign materials, including manure and stagnant water.

Internal Parasites of Poultry: Their Symptoms and Treatments

Various worms are major internal parasites of poultry. The number of worms that occur in any given bird depends upon the number of infectious eggs that the bird ingests. Worms do not multiply within the host bird. The three major types are roundworms, tapeworms, and flukes.

Large roundworms - Chickens, turkeys, ducks, geese, and pigeons are susceptible to large roundworms.

The large roundworm has a simple and direct life cycle. The female lays thick, heavy-shelled eggs in the bird's intestines. Eggs are expelled in the feces. Poultry eat the eggs, the eggs hatch, and the larvae develop into mature worms to complete the life cycle.

Heavily infested birds exhibit droopiness, emaciation, and diarrhea. Very heavy infestations result in death. Primary damage is reduction in efficiency.

Cecal worm - These exist in the ceca of chickens, turkeys, and other birds. A cecal worm's cycle is similar to that of the large roundworm. This common worm parasite does not affect the bird's health seriously. There are no marked symptoms or pathology occurrences due to the presence of cecal worms.

Capillary worms - Capillary worms occur in the bird's crop and esophagus. The life cycle is direct or bird-to-bird. Worms lay their eggs in the bird's feces. Poultry eat the infected eggs.

The worm produces a mucous membrane inflammation and sometimes causes hemorrhaging. The bird's intestinal lining might erode extensively and result in death. Heavy infestations, especially in houses with deep litter, reduce growth, egg production, and fertility of birds.

Tapeworms - These differ from roundworms because they are flat, ribbon-like, and segmented. They also differ from other worm parasites by

having both male and female sexual organs on each segment.

Worms attach to the intestinal lining by suction cups located on the worm's head. Symptoms of tapeworm infestation in poultry include weakness, unthriftiness, and poor growth. Diarrhea develops in some cases.

Tapeworms affect young birds more severely than older birds.

Flukes - Flukes are leaf-like flatworms that affect various parts of a bird's body. Flukes do not cause significant losses in poultry.

Parasite control - Prevention and control of worm infestations involves more than treatment. Proper diet, sanitation, and medication are essential. Poultry should receive feed rations adequate in vitamins A and B complex. Rations lacking these vitamins make poultry more susceptible to worm infestations.

Sanitation practices are essential to prevention and control of worms. Remove poultry litter regularly. Avoid overcrowding birds. Treat infected birds with commercial drugs.

Summary

Proper management and sanitation are the best control measures for both internal and external parasites in all species of livestock and poultry. Proper identification of parasites leads the way to appropriate prevention and treatment. There are many drugs available commercially to help control parasites.

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Lesson 7:
Quality Assurance Programs

Livestock associations have developed programs to ensure quality in animal products. Quality animal products start on the farm with the producer; producers should be responsible for their products. This responsibility will instill consumer confidence in animal products and (hopefully) increase demand for these products.

Pork Quality Assurance Program

The pork industry's Quality Assurance Program was developed into three levels. A swine producer interested in the Quality Assurance Program can request information about the program from the National Pork Producers Council (NPPC). The producer must begin on level I and work through the system. The NPPC will send the producer a booklet to read. Afterward, the producer takes an evaluation at the end of the booklet. Once the producer has taken the evaluations for levels I and II and understands the idea of quality assurance, he/she sends the self-addressed card back to the NPPC. The producer will then receive the level III booklet. The producer must follow the guidelines in the level III booklet to qualify for the Quality Assurance Program.

Ten critical control points are outlined in level III for "Quality Assured Pork Production."

Herd health management plan - A producer must establish an efficient, effective herd health management plan. A swine producer should provide a clean, healthy environment, as much as possible. A checklist helps ensure management practices are in line for a healthy swine herd. The herd health management plan also sets up a vaccination program for the herd and compares it to recent trends in the swine industry. The herd health management plan should be completed in the presence of the producer's veterinarian.

Veterinarian/client/patient relationship - A valid relationship exists when three conditions are met: (1) The client or swine producer agrees to the instructions provided by the veterinarian on judgments of animal health and medical treatments; (2) The veterinarian has sufficient knowledge of the client's livestock to make proper judgments on medical treatments; and (3) The veterinarian is readily available for follow-up evaluation on infected livestock to observe any adverse conditions that still exist.

Drug storage - Store all drugs correctly, follow label instructions, and pay close attention to expiration dates. If the label reads, "use the entire bottle," do so or discard the remainder. Store leftover medications in a cool, dry, dark place (preferably a refrigerator). A pick-up dashboard is unacceptable. Clean syringes and discard used needles. Do not store medications in syringes. Keep medications out of reach of children. Keep water or feed additives dry to prevent caking or clumping.

FDA-approved drugs - A producer must always use FDA-approved OTC (over-the-counter), extra label, or Rx (prescription) drugs with professional assistance. Remember, prescription medications can only be given by a licensed veterinarian. Over-the-counter medications can be administered by anyone after carefully reading label directions. Extra label medications require extra instructions from the vet The producer must follow the guidelines on dosage, withholding times, mixing, safety, and efficacy. Producers are discouraged from buying unapproved FDA medications and buying drugs from uninformed suppliers.

Drug administration - A producer must administer all injectable drugs and oral medications properly. Injectable drug administration guidelines follow. Use the smallest recommended needle to reduce stress, minimize tissue and skin damage, and reduce leakage. There are four types of delivery systems for injectable medications. Intramuscular (IM) medication is given in the muscle, subcutaneous (SQ) is given under the skin, intraperitoneal (IP) is given in the abdominal cavity, and intravenous (IV) is given in the vein.

If a producer cannot answer the following questions correctly, he/she must seek assistance from his/her veterinarian to inject medication. Should drugs ever be injected in the muscle of the ham? Are the syringes adjusted correctly to give proper dosages? Do you follow label directions for quantity of medication and site selection? Do you

restrain animals to prevent needle breakage and inappropriate dosages?

The producer also needs know how to give water medications. When are water medications used? How do you calibrate medicators? How often do you calibrate medicators? Where do you store medications? How do you flush the lines if medications are used? Are medications mixed fresh daily, and do you monitor consumptions? What is the recording system for water medications?

Following label instructions - Always follow label instructions when using feed additives. A producer must be able to answer the following questions about feed additives (or seek veterinarian assistance). When is the last time the mixer or scale was calibrated, and what time period does the owner's manual recommend? Do you keep written records on calibration dates? When is the last time you did a feed analysis to check mixer accuracy? How often do you check the mixer for wear? How often do you clean your mixer or mill? How do you handle spills of medicated feeds? Do you flush your mixer after mixing medicated feeds? How do you store feed additives? Do you follow label directions and withdrawal times carefully?

Records of treated animals - A producer must maintain proper treatment records and adequate identification of all treated animals. A swine producer is responsible for keeping accurate records on all health-related events associated with livestock. These records must include the identification of animals, what medications were administered, times treated, and withdrawal times.

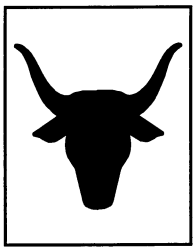
Drug residue tests - A producer must use residue tests when appropriate. Consider residue testing when sows are culled directly from the farrowing house for selling or marketing. Animals that receive extra label medications should be tested. Consider residue testing swine shown at fairs or livestock shows. Consider residue testing pigs sold to individuals for roasting or for slaughter at private slaughter houses. Newly purchased animals entering the herd should be residue tested since it is rare to receive treatment records for these animals.

Staff medication awareness - A producer must implement employee/family awareness of proper drug use. Swine producers, employees, and family members involved with administering medications should be educated on proper administration techniques and product labeling. Remember, the swine producer is ultimately responsible for those hogs!

Annual checklist - A producer must complete the "Quality Assurance Checklist" annually with the residing veterinarian. Consider this checklist a minimum for swine health programs. This checklist will point out a producer's attitude, knowledge, and commitment to the pork industry.

Beef Quality Assurance Program

The Beef Quality Assurance Program is unlike pork and dairy programs. State associations, rather than the national association, are responsible for setting up quality assurance programs. There are several other differences between quality assurance programs. The Missouri Beef Quality Assurance Program has a code of ethics for producing beef in Missouri. The Missouri association also has set up beef management practices that should be followed by beef producers. Instead of 10 critical control points, the Missouri beef association has five "beef tips" that producers should follow to ensure quality beef products. These tips follow.



Processing cattle - Handle cattle in a way that minimizes bruising when administering injections. Avoid injecting cattle during wet weather to prevent contaminants from entering the injection site. Make sure the injection site is dirt- and manure-free. Avoid using disinfectants when using any modified live virus product. Consider needle size when administering medications. Use smallest needle possible to prevent abscesses. Wet down the work area around the chute to reduce dust or other foreign materials. Secondary infections could result from these materials entering the body at injection sites and open incisions.

Select injection sites carefully. Consider injecting medications in the neck or lower thigh to prevent loss of expensive cuts of meat and market docks. Consider the volume of medication injected at one site. There are limitations on the amount given at a selected injection site. Know the differences between intravenous (IV), intramuscular (IM), and subcutaneous (SQ) injections. Inject these medications appropriately and follow label directions. Always properly place implants to avoid excess trimming of meat. Keep the working area, equipment, and employees clean to avoid any secondary infections when working with cattle.

Current Good Manufacturing Practices - Manufacturers need to follow the following practices to ensure quality beef products. Building, grounds, work and storage areas, and equipment should be routinely maintained, metered, cleaned, and properly stored to ensure purity and intended potency. Manufacturers must keep accurate records of all lab tests done on product testing.

Proper storage for different medications should be designed and maintained. Use proper clean-out procedures on equipment to prevent contamination of products. Use adequate labeling of products to prevent mix-ups and assure that correct labels are used on medicated feed. Production records must be kept on formulation, mixing dates, and shipping dates to ensure quality assurance.

Violations and inspections - If a residue is detected in an animal, the inspector will report the finding to the USDA's Food Safety and Inspection Service. They assign a case number and identification number to the owner of the cattle. The producer will then be asked questions about the incident and why the animal(s) tested positive. Every time the producer ships animals to market, he/she must notify the USDA office of shipments. This monitoring will continue until the USDA office is satisfied that this occurrence will not happen again.

The USDA office reports to the FDA. The FDA then decides whether a follow-up visit is needed. If the violation only occurs once, there will probably not be a visit. If there are several violations, there will be a visit to the facility. The FDA has the legal right to inspect any facility they desire, so producer cooperation is critical.

If you do not cooperate with the FDA during their inspection of the facility, the FDA has several options, all of them serious. The FDA can get a federal court injunction against the facility to halt all further activities. The FDA can file civil or even criminal charges against the producer for not complying with regulations. Also, the FDA can seize all cattle that remain at the facility. Producers must understand label directions about residue withdrawal times or pay the consequences.

Record keeping and inventory control - Beef producers must keep accurate records on all aspects of animal health. To maintain market share and consumer confidence, producers must prove, through effective documentation, that they have a tight control on risk factors associated with animal health. This maintains consumer confidence and strengthen the demand for beef. Inventories on animal health products are also important for beef producers to control. Knowing the amounts of medications and the amounts used are important in maintaining tight control over risk factors.

Feed ingredient quality control - A beef producer must be aware of the implications associated with residues found in feed ingredients. If a producer buys medicated feed from a supplier, which is then fed to the producer's cattle and cause a residue violation, who is responsible? If the producer does not have accurate records verifying that the load of medicated feed was received on a certain date and its contents, the producer is responsible. If the producer has accurate records of all incoming feed ingredients and withdrawal times, the producer can pass the liability to the supplier. Accurate records keep the producer free of any implications related to residue violations from purchased feedstuffs.

Dairy Quality Assurance Program

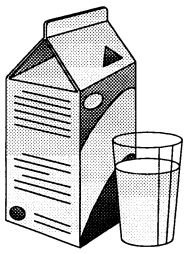
The National Milk Producers Federation and the American Veterinary Medical Association have produced 10 critical control points for "Quality Assured Dairy Production." The 10 critical control points are as follows.

Preventive health program - A producer must have a preventive herd health management program

established. A dairy producer should maintain the herd in a clean, healthy environment, as much as possible. The nutritional program should meet growth, maintenance, and lactation needs of animals. A producer should have the veterinarian implement a health program that encompasses preventive medical procedures and monitoring of reproductive status of breeding stock. Healthy livestock are more profitable and less likely to require drug therapy. Good management practices and health programs keep animals producing efficiently; therefore, they are less dependent on medical therapy.

Veterinarian/client/patient relationship - A valid veterinarian/client/patient relationship exists when the following conditions are met. The client or dairy producer agrees to the instructions provided by the veterinarian on judgments about animal health and medical treatments. The veterinarian needs sufficient knowledge of the client's livestock to make proper judgments. The veterinarian must be readily available for a follow-up evaluation on infected livestock to observe any adverse conditions that still exist.

FDA-approved drugs - Dairy producers should use FDA-approved drugs, whether they are prescription or over-the-counter drugs. The producer must follow label guidelines. Guidelines on dosage, withholding times, mixing, safety, and efficacy are also important.



Grade A requirements - All drug labels must comply with "Grade A" milk control labeling requirements. Over-the-counter drugs used by the dairy producer must have the following requirements specified on the label: (1) the manufacturer's label with indications for use on lactating cows and withholding times and (2) the manufacturer's label with indications for use on non-lactating cows. If used according to label directions, no further instructions are needed.

Prescription drugs used by the dairy producer must have the following requirements specified on the label:

1. The prescribing veterinarian's name and address, in addition to the manufacturer's label indicating milk withholding time on lactating animals
2. The prescribing veterinarian's name and address, in addition to the manufacturer's label indicating use for non-lactating cows

Prescription drugs are given by the veterinarian, and the medication should be used up totally. There shouldn't be any left over; if there is, return it to the vet. It should not be stored at the producer's facility.

Extra label drugs used by the dairy producer must have the following on the label: veterinarian's name and address, active ingredient, directions, and cautionary statements as necessary.

Drug storage - Store all drugs according to "Grade A" milk control labeling requirements. All drugs used in a dairy operation must be stored properly. Storage must not contaminate the milk supply, equipment, or utensils. Drugs used for lactating animals must be stored separately from drugs used for non-lactating animals. Drugs for lactating animals must be labeled for "lactating animals," and the name and address of veterinarian is required if the medication is Rx. Drugs for non-lactating animals must be labeled for "non-lactating animals."

Drug administration - A producer must be sure that all drugs are administered properly and treated animals are properly identified. Before administering or dispensing drugs to any animal, consider the following. What FDA medications are approved for all classes of cattle on the farm? (Use labels.) Do you follow label directions on proper dosages? Do you follow approved routes of administration? Do you follow withholding times? If a dairy producer does not understand any of these questions, he/she should seek assistance from the residing veterinarian.

Treatment records - A producer must keep treatment records and identify treated animals. A dairy producer is responsible for keeping accurate records on all health-related events associated with livestock. These records include identification of animals, what drugs were administered, times treated, and withholding times.

Drug residue testing - Proper drug residue testing capabilities are readily available to producers for on- and off-farm usage. Producers must test milk and urine by appropriate tests for best results.

A dairy producer must consider the following factors to prevent drug residue from entering the milk supply or slaughter residue testing. Consider testing milk from sick animals that have received medication to detect any drug residues. Remember, withholding times on labels are based on healthy animals, so sick animals might have longer withholding times. Consider testing milk on animals that have been given extra label drugs, because extra label drugs do not have official withholding times.

Dry animals returning to the milking herd that have been given any type of medication during dry period should be tested. Consider testing any newly purchased lactating animals, since it is rare to receive treatment records for newly purchased animals. Before sending animals to the sale barn, consider testing the urine of any culled animals and calves that were weaned from treated cows. Urine testing detects any drug residues present in the animals. Calves can be infected by milk from a treated cow. Consider urine or milk testing on animals intended for slaughter to ensure that there are no residue violations during slaughter.

A dairy producer must know and understand precautions and misuses of residue testing. *Never* use residue testing to shorten a withholding time. *Never* test the bulk tank to test milk from individual cows. Treated cows should be tested individually, not with the entire population. *Never* add milk that has tested residue-positive to the bulk tank to dilute it!

Staff medication awareness - Dairy employees must demonstrate a knowledge of proper medication usage and methods to avoid marketing adulterated products. Dairy producers and employees who administer medications should be educated on proper administration techniques and understand product labeling.

Annual checklist - A producer must complete a "Quality Assurance Checklist" annually with the residing veterinarian. Consider this checklist a minimum for dairy health programs. Each dairy operation should be customized to fit the "Quality Assurance Checklist."

Summary

Quality assurance programs help alleviate consumer apprehension about medication usage, placements of injections, drug residues, and environmental conditions. Producers need to make a conscious effort to reevaluate procedures and practices to realign them with these program guidelines. Student awareness of these programs will reenforce the importance of quality production and give them the tools required to defend the industry against opposition or misinformation.

Credits

Milk and Dairy Beef Quality Assurance Program. Stratford, IA: Agri-Education Inc., 1991.

Missouri Beef Quality Assurance Program. Ashland, MO: Missouri Beef Producers, 1990.

Pork Quality Assurance Program. Des Moines, IA: National Pork Producers, 1991.