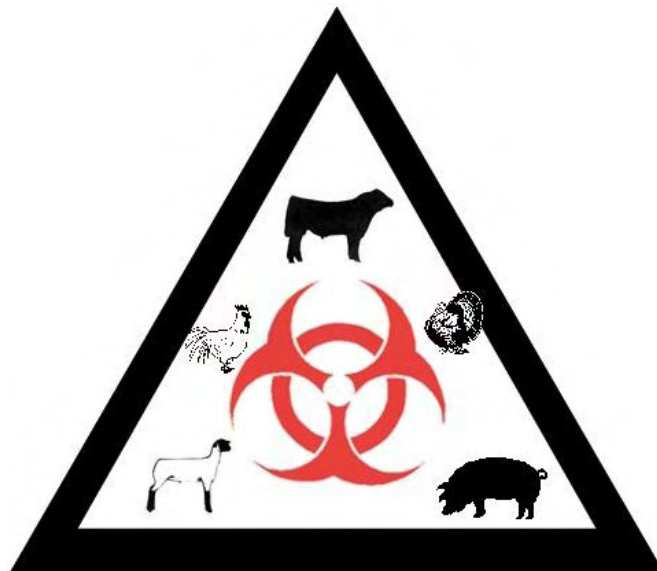


PREVENTION

**A Young Person's Guide to Keeping
Animals Safe and Healthy**



PREFACE

This booklet provides a short youth-oriented course concerning those basic medical principles essential to keeping animals safe and healthy -- farm isolation, traffic control, hygiene, and sanitation. Readers are shown how common or unusual diseases are reduced when animals are protected from direct or indirect contact with other animals (wild or domesticated), people, and equipment from other locations. Further, they are informed about the many reasons why an animal's environment and surroundings need to be hygienic and sanitary. As used here, the word "animal" refers to both mammals, such as cattle, sheep, horses, and hogs, and to birds, such as chickens, turkeys, game birds, and waterfowl.

Pathogens Defined: Pathogens are disease-producing or infectious agents. They exist "all around us and are part of the natural world" (M. Pearl, 2005). Many microscopic organisms (microbes), such as viruses, bacteria, fungi, yeasts, algae, and protozoa can be pathogens.

Importance of Pathogens and Their Control: Pathogens often cause animal suffering and sometimes death. Their activities always reduce growth efficiency. They add to the costs and labor of animal production. Young people are encouraged to learn more about animal health and pathogens because they may now be keeping or living near animals, and because these young citizens may soon be the owners and/or managers of much larger populations of animals.

A disease outbreak can be economically devastating to entire nations or regions of the world depending on the disease and

severity of the outbreak. Many animal pathogens are zoonotic, meaning that they can be transmitted from animals to people. Pathogens on the skin/hide, the feathers/hair, and in the digestive tract can contaminate the meat, milk, or eggs produced by an animal.

Biosecurity: Briefly imagining an animal's body as a donut provides a good orientation when beginning to study the basics of disease prevention, now commonly called "biosecurity." The surface of the "donut" can represent those essentially outside parts of the body (skin and breathing passages) that come into contact with pathogens carried by dust, debris, and in the air from the outside. The hole in the donut can represent the inside part (digestive passages) that comes into contact with pathogens that may have been eaten or taken in by licking or pecking at contaminated surfaces. The solid part of the donut can represent such body organs as the kidney, liver, heart, and brain that must remain totally free (sterile) from pathogens if a state of health is to be maintained. Using everyday language, biosecurity practices keep the entire "donut" or animal body away from, and at lowered risk from, pathogens. These procedures and precautions are presented in a systematic and hopefully engaging manner.

Keeping pathogens from traveling from one location to another (external biosecurity) is the subject of Chapter 1. Their reduction and possible destruction when such pathogens have become residents on a farm (internal biosecurity) are described in Chapter 2. To help the reader gain a better grasp of the nature and totality of the diverse threats that exist to animal health, Chapter 3

presents a comprehensive discussion of these threats from the visible to the invisible. Chapter 4 completes the educational message offering a time-tested vision of the position youth and adults need to take to truly succeed in the practice of animal disease prevention.

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CHAPTER 1

External Biosecurity -How to Avoid Bringing Pathogens to Your Animals

INTRODUCTION

This chapter explains how to keep from bringing pathogens to your animals from outside (off-farm) sources.



Ways Pathogens Spread

In order to prevent the introduction of pathogens, one must understand how pathogens find their way onto backyard, hobby, and large corporate poultry or livestock operations. The spread of pathogens is primarily caused by the movement of animals, people, and contaminated equipment. Therefore, you can help prevent the spread of pathogens by controlling the movement of people and animals and avoiding contact with any potentially-contaminated equipment or objects.

Controlling Animal Movement & Contact

The easiest and most frequent way to transmit a pathogen is for an infected animal to come into contact with a healthy animal. Most disease is transmitted nose-to-nose or by other direct contact with sick animals. New additions to flocks or herds are a very common way to introduce pathogens. Stray pets that wander onto your farm or land can be another source of pathogen transmission. If a sick animal is allowed into a show or fair, it may infect other nearby animals. In addition to stray pets; wild animals, free-flying birds, and insects can be responsible for the introduction of a pathogen.

People Movement

People, vehicles, equipment, and clothing that are in contact with an infected animal may be contaminated with pathogens. These contaminated articles (scientifically referred to as fomites) include equipment, machinery, and other objects used for the transportation, care, and management of livestock and poultry (i.e., halters, combs, brushes, water buckets, pitchforks, trucks, crates, boxes, etc.).

If pathogens can be spread from animal to animal at shows and fairs, does that mean that we cannot take an animal to the show? Can we even buy new animals? YES, you can purchase animals and go to the fair, but you should isolate those animals when you return. The wisest decision is to choose shows and make livestock and poultry purchases from places where disease prevention is always given high priority.



Practical Steps that Improve Isolation

Isolation (a form of quarantine) prevents contact between animals within a controlled environment. The idea behind isolation is to prevent contact between healthy animals and an animal that is or could be infected with a pathogen. Animals new to the herd or flock should be isolated away from the rest of the herd or flock for at least four weeks. Always isolate sick animals and only return them to their original group when they've fully recovered.



Livestock returning from fairs or shows should also be isolated, since they could have picked up a new pathogen at the show. After returning to the farm, you should isolate your show animals to avoid the possibility of infecting other animals on your farm. Ideally, this should be in a completely separate place to avoid close contact. At minimum it could be a separate pen in a different building or at least a separate corner of the barn. This may represent some extra work, but it can be very important. Isolate all purchased animals for four weeks. If they are incubating a serious disease, the signs (i.e., diarrhea, hard breathing, etc.) of that disease will likely be observed in that 4 week isolation period. This gives you some time to do follow-up testing or give booster vaccinations if needed. Always purchase good, healthy animals. Do not buy sickly animals, even if they are being sold for a "cheap" price. Livestock or poultry at bargain prices can be expensive!

Since people can carry pathogens on their body or clothing, it is necessary to control the visitors that may come in contact with your livestock or poultry. Always make sure visitors wear clean boots and clothing. It is best if visitors come only when you are there to escort them around your farm. Locked gates and doors will keep people out when you're not around. Signs and notices help to alert visitors of the potential risk that they may pose. Perimeter fences will

keep people from accidentally wandering onto your property. Question visitors about the farms or animals they have visited or have been near recently, and ask if they have visited a foreign country within the past 5 days.

There are ways to help keep out wild animals, free-flying birds, and insects. Although it is impossible to totally prevent all contact between wildlife and our livestock, we can make barnyards and surroundings unattractive to many of these species. Cutting the grass and weeds around the outside of buildings will help prevent rodents from entering. Keep grain spills or other potential sources of food cleaned up and unavailable to wildlife. Clean up old board piles or woodpiles and inspect buildings for possible hiding or denning areas. Inspect the haymow or other protected areas for evidence that cats, raccoons, or other animals that are likely using the hay or the straw for nesting areas. Store feed where wild animals, including rodents and birds, cannot make contact with it. Dispose of all waste feed in a way that will not attract pests. Maintain barns and buildings in good repair making it more difficult for animals or birds to gain access. Keep doors and windows shut when not needed for ventilation. Place screens or netting on the windows.



Location and Construction of Buildings

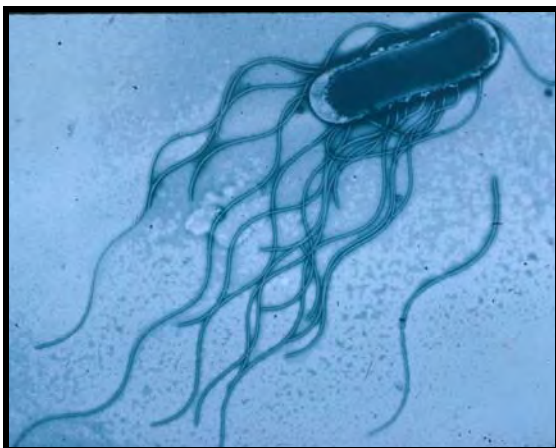
When planning the location of a barn or building used to house your livestock and/or poultry, isolation is key. The buildings or pens should be constructed to promote isolation from outside sources of disease. The facility should be a substantial distance from road traffic. It is important to consider possible exposure and the distance from other flocks, herds, or populations of domestic or wild animals. It is especially crucial that there is no nose-to-nose or beak-to-beak contact with other animals. There should not be any contact with drainage water or waste runoff from other animals.



Separation of Species and Ages

When planning the organization of either a large- or small-scale animal operation, the risk of disease can be greatly reduced whenever you keep different species and ages of the same species well separated. This is because pathogens producing little or no disease in one species can produce significant disease in another species. Mild infections in older animals can produce severe disease in young animals.

Disease susceptibility within the same species varies with age. Because they have acquired resistance, older animals may shed pathogens without getting sick themselves. These same pathogens can be serious to younger animals. *Salmonella* and *E. coli* are good examples of pathogens that can spread and produce extra trouble in young or newborn animals when they are not well separated from older stock.



***Salmonella* magnified 3000X**

Various ways may be available to achieve species/age separation. They will be different depending on many factors such as the value of the animals, the economic and labor resources available to the herd/flock owner, and such other factors as farm size and marketing opportunities. They may include separate buildings, well-separated pens, different caretakers, or, ideally separate premises for different species and ages.

Certain types of farm operations are able to ensure separation of ages by using the “all-in/all-out” management practice. All-in/all-out management allows only one age at a time on a premise. No new or younger animals are brought in until all of the older animals are removed and the barn has been cleaned. This allows for cleaning and disinfecting before a new group of animals is brought onto the premises.

Suggested Group Projects

- ✓ Design your own disease **isolation** and species/age **separation** programs for hypothetical farms of various types and sizes.

- ✓ Group discussions of attitudes and factors that deter the adoption and greater use of better herd/flock isolation and species/age separation practices.

- ✓ A new horse is brought to a stable with other horses.
 - Where should you keep the horse?
 - What could spread disease from the new horse to other horses? How could this be prevented?

CHAPTER 2

Internal Biosecurity - How to Avoid Bringing Your Animals to Pathogens



Universal “Biohazard” Symbol

INTRODUCTION

This chapter explains how to avoid or limit bringing your animals to pathogens that may already be present on your farm or operation.

The farm environment can be a very comfortable place where pathogens can survive and multiply. Animal buildings, barns and pastures, as well as litter and manure surfaces, are often damp environments favorable for a dangerous increase in pathogen populations. Depending on the number of animals, very large accumulations of manure and litter may develop and become areas where pathogens can survive and multiply for many weeks or months.

Sanitation

How can you avoid bringing your animals to pathogens? The best way is to maintain a clean, dry, and sanitary environment. Cleaning is very important in reducing pathogen

levels. Cleanliness means freedom from dirt, filth, and debris. Although buildings and equipment can appear clean when they are not visibly dirty, many microscopic contaminating pathogens can continue to be present. They remain and survive by clinging to surfaces, and by hiding in tiny cracks and crevices. The use of a disinfectant kills these remaining pathogens.

Proper disinfection results in reduction of pathogens. Reducing the amount of pathogens around your animals will decrease the risk of disease. Disinfectants are chemical agents that kill pathogens on contact. However, it is important to clean before disinfecting so that the pathogens become fully exposed to the disinfectant. Pre-cleaning is doubly important because a disinfectant can be used up or inactivated by dirt. Disinfection and thorough, prompt drying are the last steps in the sanitation process. Without quick, thorough drying, any pathogens surviving the effects of the disinfectant can re-multiply to high numbers.

Hygienic Manure/Litter Management

Animal body wastes (feces, urine, etc.) ordinarily accumulate right in

the environment (surroundings) where the animals spend most of their lives. In humans, of course, this does not occur because of toilets, plumbing and sewage treatment/disposal systems. Since flush toilets are not practical for animals, this ordinarily unavoidable problem for animals is partially reduced when manure or litter is managed in a way that, at least **lowers the level of exposure** to potential pathogens.

Accumulated manure must be managed to reduce its volume, its odor, and to kill pathogens and weed seeds. The essential parts of manure management include collection, transfer, and storage. Spreading manure onto fields is the most common method of disposal.

The sun will dry manure after it is spread onto fields which will kill many pathogens. A proper level of airflow over manure surfaces promotes drying and the decrease of many pathogen populations. In contrast, stagnant air contributes to the build-up of moisture, and an increase in pathogen populations.

Chemical treatments can be beneficial in manure management. Raising the pH to at least 12 for 30 minutes will kill most of the microorganisms present. Lime is usually used to raise the pH. Treatments that produce anaerobic

conditions (very low oxygen) are also used. Anaerobic lagoons take advantage of a natural process where manure is digested by beneficial anaerobic bacteria. In contrast, aerobic lagoons add oxygen to the manure. The addition of oxygen allows more common bacteria to survive and multiply and for the bacteria to break down the waste material. These bacteria convert the manure into carbon dioxide, water, and more beneficial lagoon bacteria.



In animal pens or holding areas, we want the bedding and floor dry. Management of areas where water spillage or water accumulation is highest is very important. Good drainage and proper ventilation of buildings will help reduce the dangers of dampness. The frequent removal of wet litter and/or bedding and a continuous, modest flow of air over manure/litter surfaces will help to produce the drying needed to suppress bacteria.

Suggested Group Projects

- ✓ From personal experiences or observations, make a list of places on farms where pathogens may hide and multiply. What areas of the floor of a pen or building may need extra attention to ensure good manure/litter surface airflow?
- ✓ Make lists of animal pathogens that may commonly be found in animals or their environment. Information sources include: veterinary school and extension office libraries.

CHAPTER 3

Threats to Animal Health from the Visible to the Invisible

Animals may be injured or die from the attacks by something as large and dangerous as a coyote or wolf to something just as dangerous, but only as small, as a molecule. This section takes you on a voyage into a world of animal health dangers. This fascinating voyage ranges from dangers that are visible to the naked eye (predators), to some that are more easily seen with a hand lens (internal and external parasites), to some that can only be seen with a microscope (bacteria and viruses). The voyage continues all the way on down to the sub-microscopic world of disease-producing molecules!

More about these visible and invisible hazards to animal health and a short discussion about their prevention is presented below. The discussion is very basic and introductory. Your group leader or teacher can direct you to sources of more complete information.



Predators

We know that disease-causing pathogens that we cannot see threaten our livestock. In addition, there are also other threats that can be easily seen. Predators may easily be detected; however, many often appear at night or when people are not around. There are ways to help keep out predators that could potentially physically attack and harm your animals. First, remove all easily accessible food supplies. This may be very difficult depending on the size of the farm and the amount of livestock feed on-hand. Keeping feed bins in good repair and sealed off will help prevent predators from entering areas where feed is stored. Keeping feed bins and feeding areas clean is very important. An accumulation of waste feed in and around feed bunks attracts animals.

A second suggestion is to remove water supplies. This is even more difficult on most farms. Stock tanks often provide a constant water supply and are attractive to predators such as raccoons. Preventing any unnecessary pools of water will help.

A third suggestion is to modify habitat and reduce access. Clearing brush and keeping weeds away from barns and buildings will help deter animals just like it will help deter rodents. Finally, you can trap or

control predators. There are a variety of traps available to catch animals.

Barns and buildings should be kept in good repair. Predators often enter barns through open doors, or cracks and holes that may exist. Closing doors and patching cracks and holes helps to reduce the problem. Wire mesh or screening on windows can also help.

External Parasites

Small yet visible threats to livestock include external parasites such as ticks, flies, fleas, lice, mosquitoes, mites, grubs, etc. Parasites are a threat to livestock health just as microbial (invisible) pathogens are a threat. Parasites can transmit and spread microbial pathogens in addition to the harm and damage that they naturally cause by irritating animals and sapping their energy. The most common way to control external parasites is through the use of pesticides or insecticides. Pesticides kill and help control the parasite populations. Pesticides are applied as sprays, dips, pour-ons, dusts, injectables, pastes, boluses, etc. Ear tags impregnated with insecticide are commonly used in cattle.

Pesticides are very effective; however, pesticides alone will not control a threat such as flies. Keeping the environment clean and sanitary helps eliminate fly breeding areas. Manure management will help reduce fly breeding areas. Fly

eggs and larvae in thinly spread manure are killed by drying and heat.



Lice

Internal Parasites

Livestock and poultry can be attacked by a variety of large and small worm-like parasites such as roundworms and tapeworms. These internal parasites mainly invade the digestive passages while some also infest an animal's breathing passages. Other parasites can go even deeper into the "donut" or animal body reaching various vital organs and body tissues.

Most parasites enter an animal's body when the animal eats the egg (ova) or an early life stage of the parasite. These ova or intermediate life stages come from the adult parasite reproducing and living inside an animal. They are typically passed by way of animal droppings onto the ground, or into the bedding or litter. As a result, an effective preventive strategy for many internal parasites rests on keeping animals from eating

feed or licking surfaces contaminated by animal waste. It is a wise practice to keep animal yards, pens and buildings or other concentration points as clean from urine and accumulated fecal material as is practicable.



Tapeworm

Various powerful chemicals are sometimes used to treat different types of infestation. Their improper or inappropriate use may produce more damage to your animals than would be done by the parasites alone. Consequently, it is best to seek guidance from your local veterinarian before you treat for worms. In the final analysis, prevention is often less expensive than treatment.

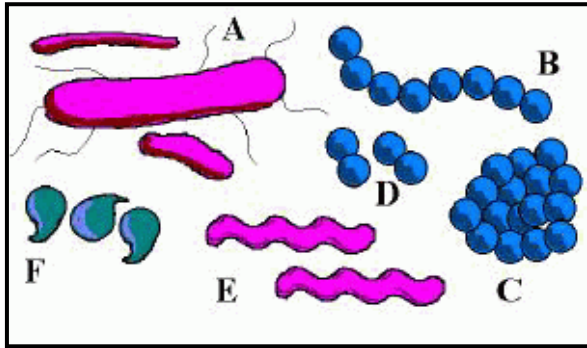


Bacteria and Viruses

Bacteria and viruses are visible only when they are magnified hundreds to many thousands of times. They are not only able to attack the skin and digestive tract or respiratory linings of an animal's body, but, are often able to devastate the entire body including such organs as the brain, heart, liver and spleen. Their extremely small size makes it possible for these pathogens to survive long periods of times outside an animal's body. They can survive in fur, hair and feathers, in nasal and other discharges from a sick animal, and in animal urine and fecal droppings. Viruses survive, and bacteria can actually multiply, in animal bedding, litter, and manure. Many survive long periods of time in the tiny particles of dust or soil present in the farm environment. With many tiny, scattered hiding places they can easily be carried to a new farm or group of animals riding on a person's clothing, on the surfaces of boxes,

crates or equipment, and on the wheels of cars and trucks.

Bacteria are single-celled microorganisms. They may live free in the environment or within a living cell. *E. coli* (*Escherichia coli*), *Streptococcus*, *Staphylococcus*, and *Salmonella* are a few examples of bacteria that can cause disease.



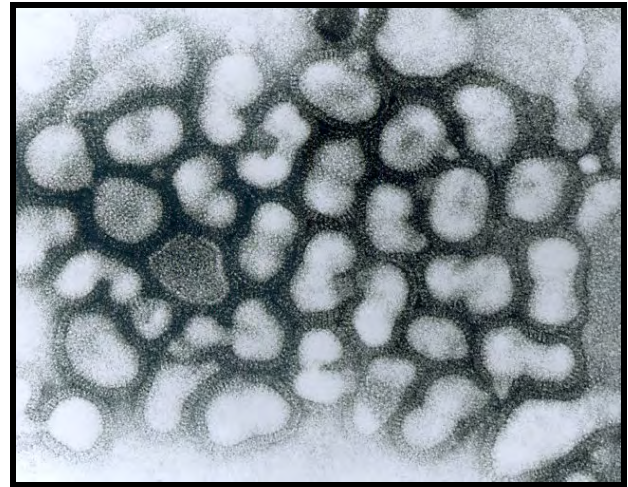
Bacteria come in a wide variety of shapes:

- A. Rods
- B. Round in chains (e.g., *Streptococci*)
- C. Round in clusters (e.g., *Staphylococci*)
- D. Round in twos (e.g., *Diplococci*)
- E. Spiral
- F. Comma

Viruses are tiny organisms that only grow inside the cells composing the animal's body. All viruses rely on a live animal host to reproduce. Examples of viruses that affect humans include the common cold (rhinovirus) or the flu (influenza) virus.

Viruses can infect animals and cause respiratory symptoms (influenza viruses), diarrhea (rotavirus and

coronaviruses), and numerous other disorders.



**Influenza A viruses
magnified 200,000X**

Although common viral or bacterial pathogens are unwelcome visitors or residents, certain ones can be especially troublesome. These special pathogens produce unusually high losses and/or unusual behavior such as extensive tenderfootedness, incoordination, or slobbering. Milk or egg production may cease or drop sharply. Your daily activities in caring for and feeding your animals put you in an excellent position where you could be among the first to spot the possible emergence of an especially unwelcome pathogen.

As previously emphasized, isolation, traffic control, hygiene, and sanitation are the main ways to keep these essentially invisible pathogens from spreading to, and from reaching levels that can infect your animals! Medications, antibiotics, and vaccines are additional measures available to minimize the effects of

bacterial or viral infections. Although powerful allies in an animal's battle with one or more pathogens, they are really the second line of defense. The first line consists of all the steps you take to keep these microbes out or their numbers down to begin with. Again, those primary steps are herd/flock isolation, traffic control, hygiene, and sanitation.



Prion

Dangerous Molecules

Prions. A prion is a very unusual infectious agent that is capable of causing an infection or disease. It is believed to be a self-reproducing protein structure that is similar to a virus. Prions cause prion diseases such as transmissible spongiform encephalopathies (TSE's). Unlike other infectious agents, prions produce no body-defending immune response.

Mold Toxins. Mold growth takes place in feeds when they are damp. Mold does not always mean that you cannot use the feed. Most molds are not toxic when fed to livestock; however, some are very toxic. The toxic by-products produced by molds (fungi) are known as mycotoxins (mold toxins). Mold toxins are very diverse because they are produced

by many different molds. Fungi that have the ability to produce mycotoxins are very common in grain and other livestock feeds and in the facilities and equipment used for transportation and storage of feed. They can be very dangerous causing reduced growth rates, lowered immunities, and increased susceptibility to various infectious diseases. Many feed companies are working on ways to sample and test feeds and grains for mold toxins before their sale.

You should store and keep your animal feeds dry. You must realize that feeding any moldy feedstuffs is a risk to the health of your animal. There is less risk in feeding moldy feeds to fattening animals than for lactating or pregnant animals. The risk is also different among different species of animals.

Dryness is the simplest way to control the growth of mold. Take the following steps when evidence of mold growth (musty odor, visible mold) is suspected.

- Stop the moisture source (fix the leak) correct condensation problems in outside storage bins.
- Thoroughly dry or discard all porous items.
- Scrub mold off hard surfaces with detergent and water, and thoroughly dry. Chlorine-containing products are of help in killing mold spores.

Bacterial Toxins. Many bacterial pathogens have the ability to produce toxins which add to the disease they produce, thus making them a double threat to your animals. Some toxin-producing bacteria form their poisons outside the body

(botulism), while others do so inside the body (tetanus, black leg, and gangrene). These toxic bacteria can present a much greater risk than many ordinary bacteria. Vaccines are used to aid in their prevention, particularly where risks of exposure or infection are high.

Suggested Group Projects

- ✓ Form “buzz” discussion groups to consider how certain human activities (visible) and some attitudes (invisible) can put animal health at risk.
- ✓ Form “buzz” discussion groups examining how other human activities and attitudes work together to protect and advance animal health.
- ✓ Request student commentary on how activities and attitudes, and their effects, are all interrelated.
- ✓ Discuss what (a) may be wrong with these scenarios; and (b) what would be safer courses of action.
 - a. A farm has mysteriously had a large number of animals die. The dead animals are loaded on a truck and taken to a rendering plant.
 - b. Alarmed about a sudden drop in feed consumption and the observation that several animals are having walking difficulties, a farm manager goes

into town to the local restaurant to visit with other farmers to see if they have had the same problem.

CHAPTER 4

Safeguarding Animal Health

The position of a flock or herd is not unlike that of a populous city of which the public health largely depends on the functions of an intelligent “**health officer.**” The owner, above all, should function as a health officer to his/her flock or herd. This element of animal management completes the picture of what it takes to keep animals safe and healthy. The health officer idea is especially important to many young people. After all, in the next few years, they may become the owners or managers of even larger populations of animals.

Now, more than ever, the job of a health officer (young or old) requires that they regularly apply the principles and strategies of animal disease prevention outlined and discussed in Chapters 1, 2 and 3. They need to be alert to threats to the health of their own animals, and to those belonging to others. They should be quick to recognize and

properly respond to unusual diseases and to oversee and manage their own operations to prevent or minimize the effects of common diseases.

The search for and application of disease prevention knowledge can be an enjoyable, enriching lifelong experience. An alert, active disease prevention “mind set” provides many dividends! By protecting your own animals from pathogens you are also helping to protect the animals of others.



Suggested Group Projects

- ✓ Obtain pamphlets and other publication on unusual as well as common animal diseases. Check with your local veterinarian, county and state agricultural

officials, trade organizations and state colleges of agriculture or veterinary medicine.

- ✓ Each student develops and shares his/her list of things they would want to do to be an excellent 'health officer" for their animals. This exercise could apply to animals currently under their care or, in the not too distant future, to a possibly much larger population of animals.

- ✓ Group discussions on: a) what it might mean; and b) what people would need to do should they ever encounter a situation where several animals quickly sicken, die or suddenly behave abnormally.

- ✓ Group discussion on what a person would need to do (and who they might notify) should they ever observe people behaving suspiciously around their farm or at an auction, fair, or show.