

# Classifying Animal Medications

**I**T IS IMPORTANT to understand the role of vaccines and medications in disease prevention. Vaccines and medications can be very powerful tools in combating things like bacterial growth and influenza in animals and humans. Without the proper use of vaccines and medications, a rampant disease could spread throughout a herd or infect all of the pets in the neighborhood. Knowing which preventative medicines to use and how to use them properly is essential for animal owners.



## Objective:



Examine the types and forms of drugs and vaccines used in animal disease control and their appropriate storage methods.

## Key Terms:



adjuvants	drench	pharmaceuticals
antibiotics	feed additive	steroids
antigen	hormone	sulfa compound
biologics	killed vaccine	vaccine
bolus	modified live vaccine	

## Use of Animal Medications in Disease Control

People have been known to use vaccines and medications to prevent diseases since 200 B.C. and likely before. The first known use of a vaccine was against smallpox in China and India. Of course, since those times, our public health and safety institutions have come extremely far with technological advances in preventative medicine. The first virus to be virtually eliminated was smallpox in 1977, and now scientists are working to eliminate polio and measles across the

globe. Vaccines and medications play a crucial role in protecting humans and animals against viral and bacterial infections that can be extremely harmful or potentially deadly.

## MAJOR CLASSIFICATIONS OF DRUGS

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Generally, there are two classifications of drugs used in disease prevention and control—biologics and pharmaceuticals. **Biologics** are medicinal products derived from living sources, such as humans, animals, or microorganisms, as opposed to chemical sources. This includes a wide array of medical products, such as vaccines, blood and blood components, somatic cells, gene therapy, tissues, and recombinant therapeutic proteins.

**Pharmaceuticals** are synthetically created drugs or medicines used to treat disease and disorders. There are many classes of drugs used in veterinary medicine. Eleven broad areas of medications include: central nervous system drugs, cardiovascular drugs, respiratory drugs, kidney and urinary tract drugs, gastrointestinal agents, hormones, anti-infective drugs, blood modifying agents, fluid and electrolyte modifiers, anticancer/immunosuppressives, and some miscellaneous agents.

Both pharmaceuticals and biologics are important in prohibiting the spread of diseases and illness.

## CLASSIFICATIONS OF VACCINES

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A **vaccine** is a biologic that uses a killed or debilitated organism that is capable of inducing protection against the specific disease caused by that organism. Vaccines help prevent disease by triggering the body's immune system to make antibodies that will protect the animal against the disease-causing organism if exposed to it in the future. The immune system will then be prepared to eliminate any intrusion of a disease-causing organism when it enters the body. Vaccines consist of a substance called an **antigen**, which the body's immune system recognizes as a threat and then develops antibodies to protect the body against the disease. An antigen is any agent or substance that stimulates an immune response to foreign microorganisms, including bacteria, viruses, and the toxins they produce. After a vaccine is administered and the body develops antibodies to protect itself, it will be more prepared in the future to eliminate any disease-causing organism that enters the body.

Of the many forms of vaccines used today, the two major types are killed vaccines and modified live vaccines. A **killed vaccine** is a vaccine that uses bacteria or viruses that are killed in a laboratory by a non-disease causing agent and then administered to elicit an immune response. Killed vaccines must have the correct amount of antigen during their administration to elicit the body's response. Generally, killed vaccines need more antigen than a modified live vaccine, making it more expensive. **Adjuvants** are foreign materials that are mixed with a vaccine antigen that enhance the body's response to the antigen.

A **modified live vaccine** is a vaccine that uses bacteria or viruses attenuated (weakened) in a laboratory by a non-disease causing agent and then administered to elicit an immune response. Modified live vaccines reproduce within the animal and require a much smaller

amount of antigen, compared to that of killed vaccines. The benefits of modified live vaccines are that they offer quicker protection against disease and their effects tend to last longer because they mimic the “real disease,” but in a safer way than the animal contracting the actual disease.

However, the virus in an injected vaccine is still living, and there are added risks in its use. Modified live vaccines require the active infection of host cells in order to work properly. There is a consequential, although small, risk that a modified live vaccine could revert back to an infectious state and actually cause the disease it is trying to prevent.

Use of modified live vaccine in pregnant animals could potentially result in pregnancy loss unless very strict adherence to label directions is followed. Generally, it is best to consult and have guidance from a veterinarian in this process.

## CLASSIFICATIONS AND FORMS OF PHARMACEUTICALS

Various types of animals, locations, illnesses, and situations make it necessary to use different types of treatments in different forms. Often, it is much easier to vaccinate an entire herd by giving them medicine through their feed rather than individually administering the drug. In other situations, feed additives may not work and individual vaccinations must be given.

### Classifications

Various types and forms of medications are used for the treatment and prevention of diseases.

**Antibiotics** are drugs that kill or prevent the growth of bacteria. However, most anti-bacterial antibiotics do not have an affect

on viruses, fungi, or other microbes. An estimated 70 percent of antibiotics used in the United States are given to food animals without any diseases or illnesses. The misuse of antibiotics in food animal production has been associated with the emergence of antibiotic-resistant strains of bacteria. These resistant strains could be of concern for humans, because the resistant bacteria may infect humans and there may not be an effective antibiotic to treat the disease. However, this risk is only a speculation and has not been proven, but producers are taking precautions now.

**Steroids** are drugs composed of organic hormones used in the treatment of disease. Common steroids use hormones, such as estrogen, testosterone, cortisone, Vitamin D, and cholesterol. A **hormone** is a chemical or protein that acts as a messenger or stimulatory signal that relays instructions to stop or start certain physiological processes. Many hormones, body com-



**FIGURE 1.** Under certain circumstances, animals must be given vaccinations individually.

ponents, and drugs are considered steroids, thus the term steroid carries many different meanings. Steroids may refer to the corticosteroid drugs used to reduce swelling, pain, and other symptoms of inflammation. Overall, steroids perform many different physiological stimulating functions and can be used to treat many disorders.

A **sulfa compound**, also called a sulfonamide, is a synthetic antibacterial compound capable of inhibiting the growth of bacteria and is used to prevent and treat animal diseases. Sulfa compounds were the first antimicrobial drugs to be created, and they started an antibiotic revolution in the medical field, beginning in the 1930s. Sulfa compounds were commonly used during World War II on the open wounds of soldiers as a disinfectant. They are still used today in various forms to treat infections. Because of common sulfonamide use in food animals and extensive use in humans before the discovery of other antibiotics, resistance has developed in many organisms, thereby limiting the clinical usefulness of these drugs.

## Forms

Often it is necessary to use different forms of medications when administering a drug, depending on the type or application of the drug. In some cases, drugs must be stored as a powder or liquid in order to retain their effectiveness. In other cases, it may be easier or more efficient to administer a drug to large numbers of animals through their food or water supply. Overall, it is important to understand when it is appropriate to use different forms of medications.

Liquids are a form of medicine that, depending on their classification, may be given to an animal orally or via injection. Liquid medications are usually stable at room temperature to retain their effectiveness.

Powder used in medication is a solid that has been pulverized into particles and is used for treatment via inhalation or injection. Often medications found in powder form are unable to be stored in liquid form without becoming ineffective. Glucagon is often injected in diabetic animals when their blood-sugar level becomes too low (hypoglycemic). Glucagon comes in powder form and must first be mixed with water before it can be injected into an animal with low blood sugar.

A **bolus** is a medication given in a large dose in order to raise the blood concentration of a drug to an effective level. In veterinary medicine, a bolus is a large time-released tablet that stays in the rumen of cattle, goats, and sheep. It is generally given orally and slowly releases a medication or nutrient as it moves through the digestive tract.



FIGURE 2. A bolus is often released into an animals throat by use of a balling gun.

A **drench** is a type of medicine given to an animal by pouring it into its mouth. Often this method utilizes a drenching or feeding syringe to aid in the oral administration of liquid medications.

A **feed additive** is a substance added to animal feed to improve its nutritional value, promote growth, or control disease. USDA Scientists have just recently created a soybean meal feed additive that helps poultry and swine digest phosphorus more efficiently. This helps boost nutrition and reduces the amount of potentially harmful phosphorus from escaping into the water supply and the environment.

## STORING MEDICATIONS PROPERLY

Proper storage facilities improve medication effectiveness and reduce treatment errors. Without the right storage methods, medication can be ineffective and dangerous. Thus, medications should always be stored and used according to the directions listed on the label or with the assistance of a veterinarian.

A major problem for drugs in the forms of tablets and powders is exposure to moisture and air. These products should remain in airtight containers to avoid moisture buildup by storing them in dry places. Moisture can make drugs ineffective when exposed to water or promote the growth of bacteria and other microorganisms. Air contact can promote bacteria, mold, and fungus growth, whereas exposure to O<sub>2</sub> and CO<sub>2</sub> can decompose certain active ingredients.

Various medications may decompose or become ineffective when exposed to light. Manufacturers of these medications distribute them in light-resistant packages that help keep light from decomposing the drug over time. It is important to keep these drugs in a lightproof storage unit and avoid sun exposure.

Often liquid medicines need to be kept in certain temperature ranges in order to stay potent. Generally, liquid medicines should remain above the freezing point and below room temperature. Vaccines containing modified live organisms will have markedly reduced effectiveness if stored at room temperature or above. Most antibiotics are heat sensitive and should be stored in a refrigerator at a temperature between 2° and 8°C to maintain potency. Many other products require storage in a cool (below 15°C), but non-refrigerated, location. Check product labels for information on acceptable storage temperature.

Biological drugs and antibiotics lose their potency with time. Expired vaccines will not be effective for later use and may become contaminated. Expiration dates on labels should always be checked before the administration of vaccines.

Ideally, a storage unit for veterinary medications is a clean, dry, frost-free area, such as a farm office, refrigerator, or utility room. By utilizing a clean and organized refrigerator,

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animal health products can be protected from changes in temperature, sunlight, dust, moisture, animals, and insects. When in doubt, check the label on the medication and consult your local veterinarian regarding any questions on proper use of medications.

## Summary:



Vaccines and medications can be very powerful tools in combating illnesses like bacterial growth and influenza in animals. A vaccine is a biologic that uses a killed or debilitated organism that is capable of inducing protection against the specific disease caused by that organism.

There are two classifications of drugs—biologics and pharmaceuticals. Biologics are medicinal products derived from living sources, such as humans, animals, or microorganisms, as opposed to chemical sources. Pharmaceuticals are synthetically created drugs or medicines used to treat disease and disorders.

Two types of vaccines used in disease control are killed vaccines and modified live vaccines. A killed vaccine is a vaccine that uses killed bacteria or virus before administering, whereas modified live vaccines use weakened bacteria or virus.

Medicines come in a variety of types and forms for use in various situations, such as liquids, powders, feed additives, and boluses.

Proper storage facilities improve medication effectiveness and reduce treatment errors. Without the right storage methods, a medication can be ineffective and dangerous. Thus, medications should always be stored and used according to the directions listed on the label or with the assistance of a veterinarian.

## Checking Your Knowledge:



1. How is a vaccine used to prevent disease?
2. What is the difference between a biologic and a pharmaceutical?
3. What is the difference between a killed vaccine and a modified live vaccine?
4. What problems can the misuse and overuse of antibiotics lead to?
5. Why is a clean refrigerator an ideal location to store animal medications?

## Expanding Your Knowledge:



Call your local veterinarian office and ask if you can view a pet or large animal vaccination. Be sure to look at what type, form, and classification of vaccine is being administered and get more in-depth information about the procedure by discussing it with the veterinarian.

## Web Links:

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### **United States Food and Drug Administration Center for Veterinary Medicine**

<http://www.fda.gov/cvm/>

### **Cornell University College of Veterinary Medicine Animal Owners Resource**

<http://www.vet.cornell.edu/services/owners.htm>

### **USDA—Animal and Plant Health Inspection Service**

[http://www.aphis.usda.gov/animal\\_health/index.shtml](http://www.aphis.usda.gov/animal_health/index.shtml)

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