Veterinary Assistant

Instruction Pack 5

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Lesson 28
Anesthesia For Animals

Step 1: Lesson Preview

Anesthetics are substances or procedures that result in loss of sensation to pain for patients. Work with animals often includes the performance of minor and major surgeries. As part of your duties, you may be required to assist in surgeries and specifically in the administration of anesthetics. This lesson presents the general guidelines and concepts with which you should be familiar in the study of anesthesia.

Step 2: Learning Objectives for Lesson 28

When you have completed the instruction in this lesson, you will be able to:

● Understand the general history of anesthesia.

● Define the basic terms associated with anesthetics.

● Distinguish the various types of anesthetic preparations.

● Understand the principles and methods of administration of general anesthetics.

● Know the purpose of preanesthetic preparations.

● Recognize the purpose and procedure of the intratracheal tube placement.

● Know the precautions involved with handling gaseous anesthetics.

● Review the general principles of restraining animals.

● Discern the indications of an anesthetized animal's condition.

● Recognize the equipment and apparatus utilized with anesthetic procedures.

● Distinguish the differences among local, regional, and topical anesthetics.

● Know the purpose of utilizing sedatives in the anesthetic process.

● Understand the precautions associated with the post-anesthetic condition.

● Recognize alternative anesthetic practices.
Step 3: History of Anesthesia

The discovery of anesthetics opened a new dimension to medical treatment. Before the breakthrough discovery of anesthetics, surgical procedures were performed only infrequently. When surgeries were performed, they were done quickly because of the pain and shock experienced by the patients who were not anesthetized. Patients were sometimes administered substances that partially deadened the sensations. These included alcohol, opium, hashish, and cocaine.

Credit for the discovery of ether as a general anesthetic is given to William Morton, a Boston dentist. Morton was not considered a reliable source because of his experimentation with various methods of relieving pain. He engaged in hypnotism with his patients and prescribed pain-relieving drugs.

Morton gained credibility when, in 1846, he demonstrated the use of ether as an anesthetic administered to a surgery patient. The surgery involved the removal of a tumor in the patient’s jaw. Dr. John C. Warren, the patient’s surgeon, was doubtful of Morton’s claims regarding ether. However, after the administration of the ether, Warren was able to remove the tumor without the patient experiencing any sensations of pain. Following the surgery, Dr. Warren turned to the amphitheater filled with observers and stated, “Gentlemen, this is no humbug!”

This dramatic presentation proved to be the beginning of the practice of anesthesia as a widely accepted medical procedure. Within two years of Dr. Morton’s demonstration, general anesthesia was being used throughout the United States and Europe.

In the early 1900s, ether was used as the primary anesthetic for small animals. Nitrous oxide was also used as an alternative to ether. Large animals generally received chloroform as an anesthetic. Nembutal was introduced in the 1920s as an oral anesthetic.

Step 4: Anesthetic Terminology

There are a number of terms that are used frequently in the administration of anesthetics with which you should be familiar. However, before learning the terms related to anesthetics, you must first be able to define “anesthesia” and its related terms. Anesthesia comes from the ancient Greek word “anaesthesia,” meaning “absence of feeling.” The word is built from the prefix “an,” meaning “absence of,” and “esthesia,” meaning “feeling” or “sensation.” Examine the following three related words recognizing the proper use of each term.

**Anesthesiology.** The medical study and science of administration of anesthetics.

**Anesthetic.** Any substance that when administered produces an absence of feeling. Common examples of anesthetics include ether, novocaine and sodium pentathol.

**Anesthetized.** The state of being without feeling or sensation due to the administration of an anesthetic drug.

Now review the following terms for a more complete understanding of the words related to anesthesia.

**Tranquilization.** The word “tranquil” means “quiet, calm, or unagitated.” A tranquilizing drug calms an animal without inducing sleep.

**Sedate.** Administering a drug that causes drowsiness by depressing the central nervous system (CNS) is to sedate.
**Narcosis.** A drug-induced state of sleep.

**Hypnosis.** An artificially induced state that resembles a sleep state.

**Analgesic.** Any drug that relieves or eases pain is termed an analgesic.

**Preanesthetic.** A drug that when administered produces a preliminary or light state of anesthesia.

**Basal anesthesia.** The state of narcosis that is produced from the administration of a preanesthetic. This allows a lesser amount of principal anesthetic to be used.

**Local anesthesia.** By the administration of a drug, the state in which sensation ceases in some limited area of the body.

**Infiltration anesthesia.** When a local anesthetic is administered by an injection directly into the tissues, it is termed an infiltration anesthesia.

**General anesthesia.** A state of unconsciousness in which the patient has no awareness of pain anywhere in the body.

**Surgical anesthesia.** The state of surgical anesthesia is a deeper level of unconsciousness than a general anesthetic state. In the surgical anesthetic state, the patient is completely unconscious and the muscles are relaxed to the point that innate reflexes do not occur.

**Regional anesthesia.** The main nerve trunk to a specific section of the body is anesthetized by injecting the anesthetic solution in and around the route of the nerve trunk.

**Overdose.** The state in which the body has received an excessive amount of drug.

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**Step 5: Progress Check 28-1**

Match the following terms to their descriptions.

1. _____ narcosis
   - a. A drug that relieves or eases pain.
   - b. An injection into a main nerve trunk causing insensitivity to pain within that body area.
   - c. A loss of consciousness produced by a preliminary medication.
   - d. A drug-induced state of sleep.
   - e. A drug substance that produces a loss of sensation.

2. _____ analgesic
3. _____ anesthetic
4. _____ basal anesthesia
5. _____ regional anesthesia

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**Step 6: Answers to Progress Check 28-1**

Check your answers for Progress Check 28-1 in the back of this book. Correct any errors you may have made.
Step 7: Types of Anesthetic Preparations

The type of anesthetic and the method of administration is determined by the veterinarian. The following list outlines the variables that influence the choice of anesthetic:

1. General health of the animal
2. Species
3. Age
4. Sex
5. Level of normal activity of the animal
6. Nature of the surgery to be performed

Anesthetic preparations are administered in a variety of modes. The following terms describe the most common methods of anesthetic treatments.

**Intravenous.** An anesthetic that is administered directly into the bloodstream is termed an intravenous anesthetic. Most intravenous anesthetics are injected through a vein which induces a prompt state of narcosis. The degree of anesthetization is determined by the effect of the drug on the patient.

**Inhalation.** Some anesthetics are gaseous in form and can be inhaled and absorbed into the system through the lungs. Examples of gaseous anesthetics are: chloroform, ether, halothane (fluothane), nitrous oxide, and trilene.

**Intraperitoneal** or **intrathoracic.** These terms describe anesthetic injections into the membrane lining of the abdominal cavity (peritoneum) or into some portion of the body's trunk (thorax).

**Subcutaneous.** Any injection introduced under the skin tissues is considered subcutaneous.

**Intramuscular.** Any injection administered into a muscular portion of the body is intramuscular. Both subcutaneous and intramuscular injections take effect more slowly than intravenous injections.

**Oral anesthetics.** When an anesthetic is taken by mouth it is termed an oral anesthetic.

**Rectal anesthetics.** Some anesthetics are administered rectally by use of an enema. Both oral and rectal anesthetics must be absorbed into the system. It is more difficult to calculate the exact dosage required with oral and rectal anesthetics.

**Topical anesthetics.** An example of a topical anesthetic is ethyl chloride which is applied directly to the surface of the skin. This produces an extreme cold reaction on the skin and reduces sensations to that limited area.

**Nerve-block procedures.** A nerve-block produces an anesthetic effect in an entire region of the body.
Step 8: General Anesthesia

As stated earlier in this lesson, general anesthesia is characterized by a state of drug-induced unconsciousness in which the patient has no awareness of pain. General anesthesia is achieved by administration of anesthetic gas or by intravenous injection.

With the administration of anesthetic in gaseous form, the animal inhales the gas into the respiratory tract. From the respiratory tract, the gas is diffused into the bloodstream. The bloodstream carries the gas to the body tissues. The state of general anesthesia is accomplished as the body tissues absorb the gas. An advantage of using anesthetic in its gaseous form is the speed at which an animal recovers from the effects of the anesthesia. The animal recovers consciousness quickly after the anesthetic is terminated.

The intravenous injection of anesthetic directly into the bloodstream has a more prolonged effect on the patient. The anesthetic materials are not able to be easily cleared from the animal’s body as with anesthetics in the gaseous form. Intravenous anesthetic materials must first go through the process of being broken down and excreted through the kidneys. This process takes an extended amount of time; therefore, the effects of the anesthetic are longer lasting.

Step 9: Preanesthetic Preparations

The most common procedure used among veterinarians is to first administer an intravenous preanesthetic. This induces a light level of unconsciousness. In this state, a gas anesthetic is added to the preanesthetic which produces a state of general anesthesia. This procedure enables the anesthesiologist to use a lesser amount of principal anesthetic. With a lesser amount of anesthetic administered, the procedure is safer for the patient and enables a quicker recovery.

Many inhalation-type anesthetics have a propensity to stimulate mucous secretions. The administration of a preanesthetic is advantageous because of its ability to reduce the degree of these secretions within the respiratory system linings.
Step 10: Intratracheal Tube

The *intratracheal tube* is an apparatus used to administer anesthetics in the gaseous form. The animal is first treated with a preanesthetic in order to induce a light anesthesia. A lubricant with a topical anesthetic substance may be applied to the tube allowing easier installation into the animal's respiratory tract. The lubricant helps ensure that the delicate tissues are not damaged. Intratracheal tubes are manufactured in a variety of sizes, accommodating the proportions of the patients.

The tube is gently inserted into the trachea, but not to the point where the bronchi divide. A “cuff” on the inserted portion is similar to the small bladder on the external portion. This structure allows both to be inflated in a balloon-fashion achieving a tight fit between the outer circumference of the intratracheal tube and the inner circumference of the trachea.

Gases are administered through the intratracheal tube to the animal’s lungs. The tube remains in place during the surgical procedure. Following the surgery, the tube is removed only after the animal recovers consciousness sufficiently and can easily breathe on its own. It is important that the animal be observed following surgery. The tube must be removed before the animal regains full consciousness; otherwise, the animal would panic and struggle.

![Fig. 28-2: This animal has been inserted with an intratracheal tube.](image1)

![Fig. 28-3: The injected air inflates the inner cuff and outer bladder.](image2)
Step 11: Precautions In Handling Gaseous Anesthetics

Two physical laws contribute to the proper administration of anesthetic gases. The first is called *Boyle’s Law*:

*At any given temperature the volume of a gas will vary inversely in proportion to pressure exerted upon it.*

*Charles’ Law* states:

*The volume of a gas at a constant pressure varies directly with the temperature. The volume increases as the temperature goes up or decreases as the temperature falls.*

In addition to observing the physical laws stated above, you should be aware of the characteristics of the various gases. Note the following precautions in using ether.

1. Ether is highly flammable.
2. Ether should not be used if the animal is also receiving diathermic treatment. *Diathermy* is the production of heat in body tissues by electric currents.
3. Ether should not be used adjacent to an X-ray machine.
4. If cautery apparatus are employed in the surgical procedure, ether should not be utilized as the anesthetic. *Cauterizing* is a process of burning or searing tissues in order to stop bleeding or prevent infection.

*Chloroform* is a colorless, sweet-smelling liquid that has been used in the past as an anesthetic. Because it is more toxic than most other gases, it is no longer used as a primary anesthetic. It is widely used as a solvent because of its nonflammable quality.

*Halothane*, also known as *fluothane*, was first introduced as an anesthetic in 1956. It is very potent and can be utilized alone without mixing oxygen. As is chloroform, halothane is nonflammable. There is a tendency for the patient’s blood pressure to decrease when using halothane.

Sir Humphry Davy, a British chemist, discovered *nitrous oxide* in 1799. This inhaled anesthetic, also known as “laughing gas,” is still used today. It is not highly potent; therefore, it is used to supplement other anesthetics.
**Step 12: Progress Check 28-2**

Answer true or false to the following statements.

1. Chloroform is currently one of the most widely used primary anesthetics. True or False.

2. The effects of an intravenous anesthetic injection are longer lasting than an inhaled anesthetic. True or False.

3. A lesser amount of principal anesthetic may be used with the additional administration of a preanesthetic. True or False.

4. There is a tendency for a patient’s blood pressure to increase when administering halothane. True or False.

5. Ether is widely used because of its nonflammable quality. True or False.

**Step 13: Answers to Progress Check 28-2**

Check your answers for Progress Check 28-2 in the back of this book. Correct any errors you may have made.

**Step 14: Restraining Animals**

If you are assisting the veterinarian in administrating anesthetics to an animal, follow these guidelines:

1. Approach the animal calmly but with confidence. The animal is likely to be fearful and may react to the unfamiliar surroundings by exhibiting nervous behavior.

2. Hold the animal securely. An insecure grasp on the animal only encourages the animal's fearful behavior. Firmly holding the animal inhibits it from struggling. If the animal is allowed to struggle, it only becomes more frantic and frightened.

3. Determine how best to secure the animal according to where the anesthetic is administered. The doctor will require you to restrain the animal without obstructing the anesthetic procedure. You may want to review *Lesson 2: Proper Handling and Restraint of Animals*.

4. Following the anesthetic administration, be prepared for the animal to struggle. The animal will at first seem to be anesthetized. However, it is common for the animal to suddenly struggle after it has appeared to be relaxed. This is a semi-involuntary reaction for which you must be prepared. Do not relax your hold on the animal too soon.
Step 15: Indications of an Anesthetized Animal’s Condition

There are numerous ways in which to assess an animal’s condition while in the early stages of anesthesia. Observe the animal for these signs:

1. Limbs move and quiver.
2. Eyelid blinks when objects are brought close to it. As the animal reaches a deeper level of anesthesia, the eyelid reflex is absent.
3. Squeezing the animal’s toe produces no response.
4. When manually flexing the animal’s hind leg, there is a progressive lessening of resistance as the anesthesia deepens.
5. Respiration is shallow but regular.

If you observe any of the following signs, notify the doctor without delay. These signs indicate a state of excessive anesthesia, and the animal requires immediate attention.

1. Breathing stops.
3. Eyes are glassy.
4. Pulse is absent.
5. Gum color appears bluish-gray.

Step 16: Anesthetic Apparatus

The equipment and apparatus used during anesthetic procedures is similar regardless of the manufacturer. The tanks for various gases are equipped with pressure gauges indicating the quantity of gas available. The valves present are used to regulate the gas leaving the cylinder. A bottle or similar device facilitates vaporization. A face mask and/or an intratracheal tube is attached to the hose leading to the tank.

A closed system refers to the attachment of a breathing bag to the apparatus so that there is no outside air being blown in or out as the animal breathes. There are also partially closed systems and open systems.

Open systems allow a considerable portion of the exhaled air to escape out through a valve. The valve opens and closes when the animal breathes. In this way, the anesthetic gases are inhaled from the anesthetic machine or from the breathing bag. The breathing bag reflects the breathing patterns of the anesthetized animal. The depth, rate, and regularity of breathing can be determined by observing the motion of the breathing bag.
Step 17: Local Anesthesia

A local anesthetic is employed when a medical procedure requires only that a specific area of the animal be anesthetized. The anesthetic drugs are injected at several points surrounding the site. The drug action temporarily deadens the sensory nerve awareness. The patient feels no sensation of pain in that specific area.

It is common to combine a local anesthetic with a smaller amount of a second drug. This slows down the absorption and rate at which the sensation returns to the area.

Though the local anesthetic paralyzes the sensation of pain in a specific area, the veterinarian may decide to tranquilize the patient. The animal must be restrained during the procedure; the tranquilizer helps to calm the animal so it will not struggle.

Step 18: Regional Anesthesia

A regional anesthetic affects only a certain portion of the body. When anesthetics are injected along the main nerve trunk, all parts of the body related to that nerve trunk are anesthetized. The patient is conscious but does not feel the sensation of pain.

There are numerous drugs used to produce regional anesthesia. These drugs are referred to as local anesthetics. Procaine (Novocaine), lidocaine, mepivacaine, and bupivacaine are the most common names of local anesthetics.

An epidural is a form of regional anesthesia in which the anesthetic is injected into the vertebral canal. An advantage to this technique is the ability to control the dosage. The effect of the anesthetic can range from pain relief to a level intensive enough to perform surgery. Epidurals are commonly employed for labor and delivery in human patients.

Step 19: Topical Anesthesia

A topical anesthetic is applied directly to the surface of the body. This type of anesthetic is used only for minimally invasive procedures.

Ethyl chloride is a topical anesthetic applied by spraying it onto the skin’s surface. After its rapid evaporation, ethyl chloride produces a cold feeling experienced as a freezing sensation. Topical anesthetics are of short duration and limited effect.

Step 20: Sedation

Sedating an animal for procedures such as teeth cleaning and ear or eye treatments is a common practice. These procedures can be very difficult to accomplish if the animal is struggling and resisting the treatment. It is normal for the veterinarian to prescribe a sedative in order to calm the animal before the medical procedure. When an animal is suffering from some painful condition, the veterinarian will also sometimes treat the animal with a sedative in order to quiet it.
Step 21: Post-Anesthetic Condition

Following surgery, the animal’s condition must be monitored carefully. If an intratracheal tube is present, the tube is not removed immediately following surgery. The animal must have recovered consciousness to the degree that it can control its mouth and throat functions. As stated earlier, the tube should be removed before the animal is aware of the tube and struggles against its presence.

As the effects of the anesthesia wear off, the animal will likely experience pain. The veterinarian will prescribe an analgesic or sedative depending on the animal’s condition. Watch the animal closely for signs of discomfort or distress that might indicate a need for medication.

Following most surgeries, animals are not allowed to eat or drink for a certain amount of time. The veterinarian will determine this period and inform you of when the animal will be permitted to eat or drink. If you are unsure of these directions, ask specific questions of the veterinarian. Do not make any assumptions.

Step 22: Alternative Anesthetic Practices

The effects of anesthetics can also be produced without using chemical substances. These methods are limited in their effectiveness, however. For instance, hypnosis is sometimes used as a means of creating a state of anesthesia. Very few patients are able to achieve a deep enough trance state to allow more than minor operations.

The Chinese medical art of acupuncture is another alternative to traditional anesthetic procedures. The success rate of acupuncture in Western culture is considered unpredictable to date. When working with animal patients, hypnosis and acupuncture are not considered as options to chemical anesthetics.
When handling horses, a twitch or twist is sometimes employed as an alternative to chemical anesthetics. A twitch is a handle about 18 inches long with a hole drilled into one end of it. A loop of cord is inserted through the hole. This loop is slipped over the upper lip of the horse and tightly twisted. The theory of the twitch is that if the horse experiences discomfort in one area, it will be distracted from the possible pain of another area where some treatment is performed. The assistant holds the twitch securely without damaging the horse's lip. This is an accepted method for treating horses without using an anesthetic.

**Step 23: Field Practice**

Go to your local public library. Locate a copy of the latest edition of the *Physicians’ Desk Reference*. If you have any difficulty finding a copy, ask the reference librarian for help. If this reference manual is not available, use an encyclopedia to complete this exercise.

**Look up the following pharmaceutical products:**

- Bupivacaine
- Ethyl chloride
- Lidocaine
- Mepivacaine
- Novocaine

For the above listed products, answer these questions:

1. **What is the description of the product?**
2. **When is the product administered?**
3. **Are there any warnings involved with the product?**
4. **Are any precautions listed?**
5. **Are there any adverse reactions listed?**
6. **What are the directions for its use?**

**Congratulations!**

You have completed Lesson 28. When you feel confident that you have mastered the instruction in this lesson, please go on to the next lesson.
Lesson 29
Giving Medicine to Animals

Step 1: Lesson Preview

Probably one of the most miraculous aspects of bodily operations is the body’s ability to heal itself. In prescribing medications, the key is to work with this natural ability to heal rather than against it. This is a basic rule of administering medication to people and animals.

In this lesson you will study some fundamental standards and techniques for medicating animals. Follow these guidelines throughout your career working with animals; your knowledge of these methods will be a valued asset to the veterinarians you assist.

Step 2: Learning Objectives for Lesson 29

When you have completed the instruction in this lesson, you will be able to:

- Know the basic rules for administering medicine.
- Differentiate among curative, preventive, and palliative medications.
- Distinguish “per orum” medications from “parenteral” medications.
- Recognize the variables involved in determining dosage of a medication.
- Understand the purposes for disposing of leftover medications.
- Know the techniques of administering pills and liquids.
- Understand the restraining techniques used in intravenous, rectal, and topical applications.

Step 3: Basic Rules For Administering Medicine

When dealing with medications of any type, it is essential to recognize and follow these basic guidelines:

1. **Directions for prescribed medicine must be specifically followed.** The doctor’s instruction for administration of medicine must be followed exactly. This includes when the medicine is to be given, the proper dosage, and the method of administration. The owner must also follow the exact prescription when the pet returns home following treatment. It is helpful to explain these same guidelines to the owner, answering questions if needed. The owner is sometimes unaware of how important it is to make sure the animal receives the medication properly.
Administration of medicine must benefit sufficiently to outweigh the animal’s discomfort in receiving the medication. Because animals cannot reason as can humans, animals do not understand the purpose for medication. The animal does not understand the future benefit of an uncomfortable treatment or medicinal injection. Most animals, and particularly exotic pets, struggle during any type of unpleasant experience. If you are determining whether or not an animal should receive a medicine, make sure the benefit to the animal’s health is substantial.

The three general purposes of medication are curative, preventive, and palliative.

- **Curative** medications are prescribed when an illness is present in the patient's body. Curative medications are not used to guard against an illness from occurring.

- **Preventive** medications are administered to provide immunity against specific diseases. Rabies vaccinations and distemper inoculations are examples of preventive medications. If an animal is exposed to a disease after receiving a vaccination for a specific illness, the animal is protected from that specific disease.

- **Palliative** medications are used neither to cure or to prevent. The term “palliative” is derived from a Latin word meaning “covered.” The definition of “palliative” is to “relieve without curing.” Analgesic drugs and sedatives are examples of palliative medications. Palliative medications treat and relieve the symptoms of a disease, but do not act to cure the disease. In an indirect way, palliative drugs may assist in curing a patient. When the patient is relieved of pain, the body is able to focus its energy on healing itself.

Medications are prescribed to assist the body in its healing processes. Medications do not heal the body without the performance of the body’s own physiological processes. The body’s own abilities to heal itself are simply enhanced by the administration of medications. For instance, without suturing, the body would still produce cells to mend the wounded area. The sutures enable these healing cells to work more effectively.

Step 4: Per Orum Administrations

Any medication which is administered by mouth is described as *per orum*. The medication may be in liquid or solid form.

If the medication is in solid form, it is further differentiated as a pill, tablet, or capsule. The word *tablet* is often employed to describe a pellet without a coating of any type. The term *pill* is sometimes distinguished as having a coating. The sugar coating on a pill improves its taste, enabling easier administration of it.

The pill coating is not for taste benefit solely. The coating also works as a shell preserving the medicinal ingredients. Some medications are most beneficial if dissolved in the small intestine. The acidic environment of the stomach would dissolve these pills. Therefore, the pills are covered with an acid-resisting coating. A pill covered with an alkaline substance ensures that it will dissolve in the stomach.

Pill coatings are also utilized to indicate the strength of the ingredients. Color coding the pills is a simple way to differentiate the potency of each pill. For example, a pink coating would indicate a pill with 10 grains of a drug; a blue coating might indicate 15 grains of the same drug ingredient.
The word “capsule” describes a small, gelatin container used to hold a powdered or liquid drug. One half of the capsule fits over the other half preventing the drug contents from escaping. The drug within the capsule is sometimes coated with substances which extend the absorption rate. This is referred to as “timed release.” Using this method, the effectiveness of the drug is extended over a longer period of time. Drugs manufactured in tablet and pill form do not have this ability.

Liquid forms of medication are also manufactured in a variety of forms. The simplest form of liquid medication is prepared in a water-based solution. Liquid medications are also mixed in alcohol, alkaline, and acid-based solutions. Sugar-based syrups are easier to administer, especially when flavors are added to make the syrup more palatable. Varying the degree of the syrup's thickness allows for specific administration needs.

**Step 5: Progress Check 29-1**

Match the following terms to their descriptions.

1. _____ palliative medication
   a. A pellet of medication without a coating.
2. _____ capsule
   b. A liquid or solid medication administered by mouth.
3. _____ tablet
   c. A vaccination.
4. _____ preventive medication
   d. A gelatin container.
5. _____ per orum
   e. An analgesic.

**Step 6: Answers to Progress Check 29-1**

Check your answers for Progress Check 29-1 in the back of this book. Correct any errors you may have made.
Step 7: Parenteral Administrations

When a drug is dispensed into the body through any method other than the digestive system, it is termed a parenteral medication.

1. An intravenous injection distributes the medication directly into the bloodstream. The prefix “intra” means “within.” So, “intravenous” describes administering a substance within the vein. This method is either given as an injection or by the “drip method.” The drip method is used when there is a large quantity of a solution that must be infused into the bloodstream over a period of time. The rate of speed at which the liquid enters the body is regulated by a valve and gravity.

2. Injecting a drug directly into a muscular area is termed an intramuscular injection. The medicine is absorbed through the muscle tissues of the body. The drug is suffused throughout the body at a much slower rate than with an intravenous injection. Depending on the type of drug, this may be advantageous.

3. When a drug is administered below the surface of the skin by use of an injection, it is called a subcutaneous injection. Subcutaneous means “under the skin.” These injections are less commonly used than intravenous or intramuscular injections. This type of injection is utilized for applications directly into specific areas of the body.

4. Rectal applications are also commonly used to administer medications. The medication is added to a small amount of fluid and administered by means of an enema. Very often a cleansing enema is prescribed previous to the medicating enema. In this way, the medication is introduced further into the colon and is retained and absorbed more effectively.

5. When a medication works most effectively in a gaseous form, it is often administered by means of inhalation. By adding the medication to steamers and/or vaporizers, the animal inhales the vapors, receiving the benefit of the medication and of the humidifying effect. When oxygen is prescribed, an oxygen therapy cabinet is sometimes utilized. If an oxygen therapy cabinet is not available, a sheet of transparent plastic hung over a cage creates the same effect.
6. Any medication that is applied directly to the surface of the skin is called a **topical application**. These applications are manufactured in the form of creams, ointments, lotions, liniments, sprays, and powders. To identify these medications as topical, the packaging includes the label “for external use only.” In most cases these medications are toxic if ingested. Muscular discomfort, eye infections, and skin rashes are examples of medical problems that would most often be treated with a topical application.

**Step 8: Determining Dosage**

The recommended dosage indicated for a drug product is based on an average figure. There are certain variables which must be considered when determining the correct dosage for a specific animal:

1. Weight
2. Size
3. Sex
4. Age
5. Species
6. Breed
7. Physical condition
8. Background of ailment

The term “to effect” is used to describe attaining the correct dosage of a drug. When the desired result of the drug administration has been attained, the drug has been administered “to effect.” Again, as stated previously, reaching this level will be affected by the above variables.

An antibiotic must be prescribed for a period of time beyond the point when the animal begins to improve. Antibiotics essentially “stun” the bacterial agent that is causing the animal to be sick. If the animal does not receive the drug for enough time, the bacteria can reappear. The bacteria tend to get stronger after the administration of an antibiotic, so a second attack is usually more severe than the first. Therefore, it is essential to the animal's health that the complete prescription of an antibiotic be administered.

When prescribing two drugs at the same time, care must be taken not to prescribe drugs that counteract each other. The term used to describe this action is **counteractors**. Stimulants are sometimes prescribed to improve digestion. If an animal was administered a sedative at the same time as receiving a stimulant preparation, the two drugs would respond as counteractors. The animal would not receive the benefit of either drug.
Step 9: Progress Check 29-2

Fill in the blanks with the correct answer from the following word list. Not all of the words are used.

intraspinal    intramuscular    sedatives    inhalators

topical        counteractors  intracardiac  intravenous

intrathoracic  stimulants    rectal        anesthetizers

1. A subcutaneous injection into the chest cavity is called a(n) _____ injection.

2. A liniment is an example of a(n) _____ application.

3. A(n) _____ injection is slower acting than an intravenous injection.

4. A(n) _____ injection distributes the medication directly into the bloodstream.

5. Medications that, when administered together, cancel the effectiveness of each other are called _____.

Step 10: Answers to Progress Check 29-2

Check your answers for Progress Check 29-2 in the back of this book. Correct any errors you may have made.

Step 11: Leftover Medicine

Your duties as an assistant may include packaging prescriptions for owners to administer at home. Follow the instructions the doctor gives you regarding the prescription amount. It is a generally accepted practice to add one or two additional tablets or doses. This is helpful to the owner in the case that a pill is lost or dropped. However, do not add so much that there would be a large quantity of medicine leftover.

Following a certain period of time, most medications lose their effectiveness. Leftover medication should be discarded so that the possibility of treating an animal with a drug that has lost its potency cannot exist.

Step 12: Techniques of Drug Administration

To efficiently administer a drug, it is most helpful to have at least two people available. One person is solely responsible for restraining the animal; the second person administers the drug. This practice helps to ensure that there is the least amount of struggle and trauma to the animal.

Even with the most capable assistant, there are times when the animal will struggle and a portion of the medication may be spilled or lost. If this is the case, do your best to determine how much medication was spilled. Then, that amount must be administered in order for the animal to receive the full benefit of the drug.
The following descriptions of techniques will aid you in capably administering medications.

**Pills, Tablets, and Capsules**

1. Immediately before administering, dip the pill or tablet in water. The pill will slide down the throat more easily. Make sure not to dampen the medication until you are ready to place it in the animal’s mouth.

2. Hold the animal’s upper jaw with one hand.

3. Tip the head back.

4. Apply pressure to the upper jaw; the animal will reflexively open its mouth.
5. Place the pill far back at the base of the tongue where the pharynx starts.
6. Close the animal’s mouth quickly and hold it shut for a moment.
7. The animal will reflexively swallow the tablet.

**Liquid Medicine**

**Dogs**

1. Measure the dose into a small bottle, spoon, or syringe. Do not use any type of glass container.
2. As you measure the liquid, make sure not to contaminate the container holding the medication.
3. Tilt the dog’s head up and slightly away from you.
4. Holding the animal’s head and opening its mouth at the upper jaw, pour the medication into the cheek portion. The liquid will also touch the dog’s tongue which induces a swallowing response.
5. Introduce small amounts of the liquid, giving the animal the opportunity to swallow frequently so that it does not choke.

**Cats**

Liquid medication is not often prescribed for cats because of the difficulty in administering it. However, if you are treating a cat with a liquid medication, follow all of the above steps except Number 3. Apply the liquid to the cat’s tongue rather than to its cheek. This encourages a swallowing response so that the cat will not expel the medication.

**Balling Guns**

Balling guns are most often used with larger animals. One end of the balling gun is placed in the animal's mouth. The end of the gun is pointed down into the pharynx. Experience is needed to ensure the pill does not go into the trachea. A plunger is used to propel a pill down the hollow tube and into the animal's esophagus.
**Tubes**

There are occasions when it may be necessary to administer a liquid medication using a tube passed through the animal's nostril or mouth. This method is used only in particular cases when it is not possible to administer the drug in other less invasive ways.

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**Step 13: Field Practice**

Using your own pet or a friend’s, practice opening the animal's mouth using the techniques described in the above sections. If the animal is receiving medication currently, follow all of the steps to administer the prescription. If you are not able to actually administer the medication, just practice opening the animal's mouth. Of course, you will want to give the animal a lot of time in between your practice sessions. Allow yourself many opportunities to practice these techniques. Each time you repeat the procedure, note what improvements to incorporate in the next practice.

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**Step 14: Restraining Techniques**

**Intravenous Applications**

When restraining an animal for an intravenous injection, it is essential that the animal remains immobile. If the animal moves about, the needle could be displaced. For intravenous drip therapy, a piece of stiff material like a tongue blade is taped to the animal's limb. This helps to ensure the needle does not move about or become loose.

**Rectal Applications**

With rectal applications, it is imperative that the medication be retained long enough for complete absorption. Immediately following a rectal application, the animal has a tendency to reflexively expel the dosage. Hold a pack over the anal area ensuring the medication remains within the animal for the prescribed amount of time.

**Topical Applications**

Most ointments and salves are not intended for internal use. If an animal has the opportunity to lick the medication, it could become sick. Also, if the medication is licked or rubbed off, the animal does not receive the benefit of the topical application. The three most common methods of eliminating this problem are the Queen Anne collar, a muzzle, or application of a dressing.
Step 15: Lesson Summary

Your first responsibility in giving medications to animals is to be absolutely sure that you are carrying out the specific directions of the veterinarian. This involves checking to see that it is the precise medication ordered, and that you are administering the prescribed dosage at the time specified.

Giving medicine to animals requires learning a variety of special techniques. Depending on the method of administration, these techniques also involve certain precise restraint measures. The process is often made difficult because the animals do not understand what is being done to them and will often vigorously resist taking their medicine.

You have learned some methods of administering medications that are widely used very successfully in veterinary practice. There will be times, however, when veterinarians will adapt or slightly change some of these methods, and when you work with a veterinarian, you should always carry out the procedure in accordance with the directions of the veterinarian.

Congratulations!

You have completed Lesson 29. When you feel confident that you have mastered the instruction in this lesson, please go on to the next lesson.
Lesson 30
Parasites That Infest Animals

Step 1: Lesson Preview

The word parasite comes from Greek origins meaning “one who eats at another’s table.” This well describes the manner in which a parasite derives nourishment from a host body. Damage from parasites to the host body ranges from simple diarrhea to death of the host.

This lesson discusses some specific ailments caused from both external and internal parasites. In addition, the lesson presents the characteristics of the parasites to assist you in detecting infestations.

Step 2: Learning Objectives for Lesson 30

When you have completed the instruction in this lesson, you will be able to:

- Identify the characteristics, detection, and life cycle of the following external parasites:
  - fleas
  - ticks
  - mites
  - flies
  - lice

- Identify the characteristics, detection, and life cycle of the following internal parasites:
  - roundworms
  - coccidia
  - tapeworms
  - heartworms
  - hookworms
  - flukes
  - pinworms
Step 3: External Parasites

External parasites cause the most extensive damage to the skin and haircoat of the host body. However, external parasites can also cause serious illness by infecting the host body with various diseases. Fleas, mites, lice, ticks, and flies are the most common external parasites that may attack the animals in your care.

Fleas

Fleas belong to the grouping of parasites called *Siphonaptera*. The Greek prefix “siphono” means “siphon” or “tube.” This describes well the flea’s parasitic method of sucking on warm-blooded animals. Fleas range in size from .04 inches to .16 inches. Their enlarged, muscular hind legs are well proportioned for leaping from one location to another. This ability is one of the major reasons why it is difficult to control fleas.

Detection

Over 11,000 species of fleas afflict not only domestic animals like dogs and cats, but also wild animals and humans. Most pet owners are very familiar with detecting the presence of fleas.

An animal scratching constantly is exhibiting the most obvious symptom of fleas. Also, if the animal is heavily infested with fleas, the hair and skin may be damaged from the intense scratching.

Part the hairs around the neck and tail areas of the animal; fleas are easily visible in the hairiest parts of the body. It is even possible to detect flea eggs which are small, white, grain-like specks.

Life Cycle of Fleas

The metamorphosis of fleas from the larval form to adulthood contributes to the difficulty of control. Pet owners discover that destroying the flea itself does little to completely rid their pet of fleas. If the eggs are not dealt with, destroying the adult fleas only temporarily rids the home of fleas.

An adult flea usually deposits its eggs on the host animal on which it is living. Some of the eggs will remain on the animal, but many will drop to the floor or into bedding. The larval stage of a flea lasts 15 to 200 days, depending on the temperature of the environment. When the larva hatches, it is maggot-like without wings. The larva spins a cocoon around itself; the adult flea emerges from the cocoon from one week to three months later. The normal life duration of an adult flea is about one year.

Control

Both preventive and repellent measures must be utilized in order to control flea infestation. Controlling fleas not only includes killing the adult flea, but also eliminating the flea eggs. Treatments for flea infestation are manufactured in a variety of forms including sprays, powders, and internal medications.

When there is more than one animal involved, it can be extremely difficult to eliminate fleas entirely from an environment. The key word is “control.” Controlling fleas is possible only with diligence and repetition of treatments. You must remember that the flea egg can live on long after the adult flea is exterminated. Therefore, repeated treatments of an area to kill the flea eggs is required.

Follow the instructions that accompany the treatment. Not all products are safe for all animals. Some products may be safe for outdoor, domestic animals but are not safe for indoor animals.
Mites

Mites are members of the class *Arachnida*, to which spiders and scorpions also belong. There are approximately 20,000 species of mites worldwide living in most every type of habitat. Not all mites are parasitic in nature; some plant-eating species are the most destructive of agricultural and horticultural insects. The three types discussed in this lesson, *sarcotic, demodectic*, and *otodectic mange mites*, are external parasites causing extreme discomfort to their host bodies.

Adult mites are usually less than .04 inches in length, having eight legs and two body sections. The forward body section is known by any of three names: prosoma, gnathosoma, or cephalothorax. The first two pair of legs and the mouth parts make up the first body section. There are also three names to describe the second section: opithosoma, hysterosoma, or idiosoma. The abdomen and the last two pairs of legs constitute this second section.

Detection

Mites are not as easy to visibly detect as are fleas. The manifestation of mites is the presence of mange ailments. An animal infested with mites exhibits a ragged hair coat and skin irritations. The only method of confirming mite infestation is by examining a skin scraping.

Dip a blunt-bladed scraping instrument into mineral or olive oil. The scraped skin specimen adheres more easily to the oil-covered blade. Using an area where the skin appears irritated, scrape the skin until it turns pink. It is necessary to scrape deep enough into the lower layers of skin containing blood vessels; however, be careful not to cut into the skin. This is why it is necessary to use a blunt instrument rather than a sharp one. Smear the sampling onto a microscope slide for examination.

Life Cycle of Mites

Some species of mites bear living young; however, most species of mites lay eggs. The larva, a newly-hatched mite, has only three pairs of legs. The mite acquires a fourth pair of legs after its first molt; at this stage the mite is termed a “nymph.” After several additional molts, the mite becomes an adult.

Sarcoptic Mange Mites

The life cycle of the sarcoptic mange mite is approximately two to three weeks. The female mite deposits from 20 to 40 eggs by burrowing into the upper layers of the skin. The eggs hatch within a week, freeing the larvae. The developing larvae live under the scabs on the animal's skin.

When the female burrows under the skin, she discharges a serum which later forms a scab. Animals experience intense itching which causes damage to the skin and hair loss. If the mite infestation is not treated, other bodily functions may become impaired, leading to the death of the animal within months.

Demodectic Mange Mites

In its advanced stages, demodectic mange, also called *red mange* or *follicular mange*, can be fatal to dogs. Many healthy dogs develop an immunity to demodectic mange; demodectic mites are common inhabitants in the hair follicles of healthy animals. Animals that develop some form of immunodeficiency — usually weak or debilitated ones — exhibit bald spots without signs of scratching.
There are varying opinions as to the life cycle duration of the worm-like mite, *Demodex canis*. The development of the mite to maturity is similar to the growth of other types: the female lays her eggs which hatch and mature through a process of molting.

The term **follicular mange** comes from the mite's burrowing behavior into the hair follicles and sebaceous glands of the skin. The loss of hair in the affected areas is usually severe and is followed by reddened skin. The term **red mange** is in reference to the eventual copper color of the affected skin. Though the itching becomes more involved as the disease progresses, it is not as severe as sarcoptic mange.

If demodectic mange is not treated, the afflicted animal may suffer from its effects for as long as two years and eventually die. Affected animals experience a debilitating drain on their systems, as their bodies are not able to fight against the absorption of toxins from the mange pustules.

The only way to positively diagnose this disease is by microscopically identifying the causative organism. Otherwise the symptoms, similar to other types of mange, can be easily misdiagnosed.

**Otodectic Mange Mites**

More commonly known as **ear mange mites**, these parasites affect the external auditory canal of the animal. Ear mange is a condition most often observed in felines, but is also present in other animals. Cats afflicted with this parasite exhibit symptoms of shaking their heads, twitching, and/or scratching the ear area. These symptoms could also indicate possible ear afflictions; therefore, it is essential that otodectic mites be located to confirm the diagnosis.

It is not difficult to diagnosis this condition, as the mites can be observed without the use of a microscope. The mites appear as grains of sugar in the ear canal. Using a cotton swab, pick up some of the “grains.” With the aid of a magnifying glass the mites are easily discernible on the swab.

The life cycle is similar to sarcoptic mites differing in that the ear mite does not exhibit the burrowing characteristic. Ear mites disturb normal secretions of the ear by puncturing the delicate membranes and feeding on the tissue juices.

**Lice**

The two groups of common lice are **Mallophaga**, or chewing lice, and **Anoplura**, or sucking lice. The incubation period of the chewing louse is approximately two weeks. Chewing lice mostly inhabit birds and poultry, though they are present on cattle and horses as well. Mallophaga chew the feathers, hair, and skin, sometimes drawing blood of birds and poultry. As are many parasites, chewing lice are limited to a single host species.

The sucking louse feeds only on blood mammals and are most commonly found on rodents. Sucking lice also afflict humans in the form of crab and body lice. The incubation period of the anoplura is slightly longer than chewing lice. Sucking lice attach themselves to one spot on the body while chewing lice move around the host body.

As with controlling flea infestation, it is necessary to kill not only the adult lice, but also those eggs, or **nits**, that may be present. In addition to the host animal, the animal's bedding and other frequented areas must be treated to prevent reinfestation.
Ticks

Ticks are eight-legged parasites belonging to the class *Arachnida* which also includes spiders, scorpions, and mites. Found worldwide, ticks are most plentiful in tropical and subtropical areas. There are two kinds of ticks, differentiated by the position of the mouth parts and the body covering:

1. **Hard ticks** are covered with scutes, which are similar to the plates of an armadillo or turtle. The mouthparts are visible on the top of the tick.

2. **Soft ticks** have leathery bodies with the mouth parts hidden by the back.

Detection

Most ticks are visible without magnification though they can be difficult to locate; ticks tend to “hide” themselves in the ears or on the neck or underside of animals. Ticks may appear brownish in color though many are brightly colored and easier to see. After the female is engorged with blood, she appears like a small grape attached to the animal’s body.

Life Cycle of Ticks

The female lays several thousand eggs at one time. The eggs hatch into active six-legged larvae which feed on a host body and after molting, develop into eight-legged *nymphs*. After feeding on host bodies, the nymphs drop to the ground and molt again. After this molting process, the nymphs emerge as adult ticks.

Control

There are a number of methods for removing ticks from the host body. Internal medications work to repel ticks from attaching to the host body. Typically, chemical dips are used to externally treat affected domestic animals.

Simply pulling a tick off the host body is not always effective. Often the head of the tick remains embedded in the host body, leaving the blood-engorged portion.

Flies

Flies, mosquitoes, and gnats belong to the order termed *Diptera*. The *cattle grub*, of the family of *botflies*, is particularly difficult to deal with and causes greater losses to the cattle industry than any other pest. The entire life cycle of the cattle grub takes about a year. Adult cattle grubs, called *heel flies*, lay their eggs on the cattle’s heels and legs.

In three or four days the eggs hatch into larvae or grubs. The larvae migrate through the skin, working their way to the animal’s gullet or spinal canal. The larvae remain in the gullet or spinal canal for several months, eventually starting another migration to the muscles in the animal’s back. In the back area, they form large swellings called *warbles* or *wolves*. The warbles are actually breathing holes which the larvae gradually enlarge.

When the *spiny grubs* are fully grown, they work their way out of the breathing holes and drop to the ground changing to *pupae*. In three to ten weeks, the adult heel flies emerge from their pupal cases ready for mating, at which time the life cycle begins again.
Step 4: Progress Check 30-1

Match the following terms with their descriptions.

1. _____ Scutes  
   - The infestation of mites in the hair follicles.
2. _____ Warbles  
   - A class of eight-legged parasites of which spiders and ticks are members.
3. _____ Otodectic mange  
   - A grouping of parasites to which fleas belong.
4. _____ Siphonaptera  
   - A plating similar to a turtle shell covering a hard tick.
5. _____ Arachnida  
   - Breathing holes through which spiny grubs emerge.
6. _____ Demodectic mange  
   - The infestation of mites in the external auditory canal.

Step 5: Answers to Progress Check 30-1

Check your answers for Progress Check 30-1 in the back of this book. Correct any errors you may have made.

Step 6: Field Practice

Compare the life cycles of fleas, ticks, and cattle grubs. What similarities are there among these three groups? Are there any differences? Record your findings for future reference.

Step 7: Internal Parasites

Though there are many different types of internal parasites, they are often referred to simply as “worms.” In the sections that follow, these internal parasites are identified: roundworms, tapeworms, hookworms, pinworms, coccidia, heartworms, and flukes.

**Roundworms**

_Nematodes_, or roundworms, are slender, cylindrical, and unsegmented, shaped much like an earthworm. They are usually white in color and range in length from 1 to 2 inches to 6 to 7 inches. Researchers have identified about 12,000 species of nematodes, though some believe there may be as many as 500,000 different types. Most roundworms are host specific, meaning a specific type of worm is found in a particular host animal.

Roundworms live in the stomach and small intestines of cats. If a cat vomits, the worms are easily visible in the vomitus as curled, spring-like, white objects. Roundworms in dogs are generally larger in size than in cats.

Sanitation is the key to controlling and eliminating infestation of roundworms. It is most important to remove feces from an animal's living area to avoid recontamination. **Vermifuges** are preparations that expel and/or destroy roundworms.
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**Tapeworms**

The term “tapeworm” describes a ribbon-like colony of flatworms. The head of the tapeworm, called the *scolex*, consists of hooks or suckers that attach to the host’s intestinal lining. Combined segments known as *proglottids* compose the body of the tapeworm. Each proglottid segment is a sexually functional individual though the colony is attached to one another.

**Detection**

It is difficult to discern the presence of tapeworm eggs by customary fecal examination. Dried tapeworm segments in fecal matter and in the anal region appear as small, dried bran particles. However, to confirm tapeworm infestation it is necessary to microscopically examine these particles. These pieces are a small portion of the tapeworm, and if diagnosed as tapeworm, the veterinarian prescribes an involved treatment with medication.

**Hookworms**

Hookworms are round and long with a head composed of “hooks” which enable it to attach itself. Usually less than an inch in length, hookworms generally affix themselves to the mucous membrane lining of the small intestine. The hookworm obtains nourishment directly from the host body’s mucous, blood, and tissue.

**Life Cycle of Hookworms**

The hookworm eggs are laid in soil and emerge as larvae. After molting, the larvae generally burrow into the feet or legs of the host body. The larvae are carried to the lungs through the bloodstream. From the lungs they migrate to the mouth and are swallowed. In the intestine the larvae become adult hookworms about five weeks after having entered the host body.

**Detection**

The following symptoms are indications of hookworm infestation:

1. Rash at the site of skin penetration
2. Inflammation and hemorrhaging of lungs
3. Iron-deficiency anemia
4. Fever
5. Abdominal pains
6. Diarrhea or constipation

Drug therapy using *thiabendazole* as the primary agent is successful in treating hookworm infestation. Proper sanitation and hygiene is instrumental in controlling this parasite.
Pinworms

Pinworms, also known as threadworms, affect domestic animals and are especially troublesome to horses. Short, maggot-like pinworms also infect children, especially in temperate climates. Female worms creep into the anus and deposit thousands of eggs and then die. An uncomfortable itching condition results from a mucous which oozes from the anus.

In addition to the itching condition, infected hosts may experience diarrhea. Generally, infestation of pinworms is not considered a serious ailment and can be treated with medication. Again, as with many parasitic infestations, sanitation is essential to control.

Coccidia

Coccidia are intestinal protozoa whose principal effect on animals is lowering resistance to disease. Symptoms of coccidiosis are very similar to the effects of distemper, including dehydration and diarrhea. The symptoms last about three weeks during which the animal experiences nausea and abdominal discomfort.

Host bodies contract coccidiosis by swallowing food or water that has been exposed to feces contaminated with the parasite. Ordinarily, coccidia are host specific affecting cattle, sheep, goats, swine, poultry, and domestic pets. The presence of coccidia is detected by microscopic identification.

Heartworms

Some varieties of worms invade specific body organs, as is the case with heartworms. These long worms enter the animal’s heart causing such damage that they must often be surgically removed. Heartworms are common in the United States and particularly in humid and tropical areas. Animals contract heartworms after having been bitten by infected mosquitoes.

Flukes

A fluke is a parasitic flatworm shaped like a simple leaf. The body consists of a mouth with one or more suckers which enable the fluke to hold onto its host. Some flukes that attack certain fish, amphibians, reptiles, and some mammals live externally on the animal or in its mouth cavity. However, the majority of flukes are internal parasites living in the lungs, digestive system, or blood vessels.

Adult flukes may produce up to 500,000 eggs. Each of the young that hatch out may produce up to 300 individual flukes. Invertebrate animals such as snails and crustaceans act as a secondary host body for developing flukes. The most common manner in which flukes are contracted is through eating raw contaminated fish that has been invaded by immature flukes or by eating a contaminated invertebrate.

Step 8: Field Practice

Compare the characteristics of tapeworms, hookworms, and flukes. What similarities are there among these three groups? Are there any differences? Record your findings for future reference.
Step 9: Progress Check 30-2

Answer true or false to the following statements.

1. Roundworms attack the digestive tracts of animals and do not travel to other parts of the body. True or False.

2. Each proglottid segment of the tapeworm is a sexually functional individual. True or False.

3. Pinworm infestation is not considered a serious ailment and is easily treated with medication. True or False.

4. It would be difficult to confuse coccidiosis with distemper since the symptoms are so different. True or False.

5. A fluke is a parasitic flatworm similar in shape to a pinworm. True or False.

Step 10: Answers to Progress Check 30-2

Check your answers for Progress Check 30-2 in the back of this book. Correct any errors you may have made.

Step 11: Mail-In Quiz #10

- Be sure you have mastered the instruction in Lessons 28, 29, and 30.
- Mark your answers on these examination pages.
- When you have finished, TRANSFER YOUR ANSWERS TO THE ANSWER SHEET PROVIDED. Use blue or black ink on your Answer Sheet. Do not use red ink.
- Mail the Answer Sheet to the school in one of the envelopes provided. Your quiz results will be mailed to you.

MULTIPLE CHOICE: Choose the BEST single answer for each of the following items:

1. In 1846, a Boston dentist named _____ demonstrated the use of ether as a general anesthetic.
   a. John C. Warren
   b. Louis Pasteur
   c. William Morton
   d. William Nembutal

2. The study and science of the administration of anesthetics is called _____.
   a. anesthetological
   b. anesthesiology
   c. analgesiology
   d. basal anesthesia
3. A(n) _____ drug produces a calm effect without inducing sleep.
   a. anesthetic
   b. tranquilizing
   c. banal
   d. placebo

4. A _____ anesthetic suppresses sensation in a limited area of the body.
   a. general
   b. topical
   c. local
   d. specific

5. When using general anesthetic, it is important to remember that animals recover quickest from general anesthetic administered _____, rather than _____.
   a. in gaseous form / intravenously
   b. intravenously / in gaseous form
   c. subcutaneously / intravenously
   d. orally / topically

6. The _____ is an apparatus used to administer anesthetics in gaseous form.
   a. syringe
   b. styptic pencil
   c. capsule
   d. intratracheal tube

7. _____ discovered nitrous oxide in 1799.
   a. King Louis XIV
   b. Dr. Edmond Hillary
   c. William Morton
   d. Sir Humphry Davy

8. Which of these signs indicate a state of excessive anesthesia?
   a. glassy eyes
   b. pulse and breathing stopped
   c. hyperactivity
   d. both a and b
9. It is common to combine a local anesthetic with another drug, one that _____.
   a. slows down absorption and rate at which sensation returns
   b. increases blood flow to the brain
   c. maintains an animal's state of awareness
   d. both b and c

10. A _____ anesthetic affects a certain portion of the body — the patient is conscious, but feels no sensation of pain.
   a. topical
   b. regional
   c. basal
   d. general

11. A _____ anesthetic is applied directly to the surface of the body, such as the skin.
   a. topical
   b. regional
   c. basal
   d. general

12. When handling horses, a _____ is sometimes used as an alternative to chemical anesthetics.
   a. hammerlock
   b. thwart
   c. twitch
   d. switch

13. The three general purposes of medication are _____, preventative, and _____.
   a. curative / anesthetic
   b. ephisial / creative
   c. curative / palliative
   d. palliative / general

14. Any medication that is administered _____ is described as “per orum.”
   a. rectally
   b. subcutaneously
   c. in gaseous form
   d. orally
15. A(n) _____ distributes medication directly into the bloodstream.
   a. per orum administration
   b. intravenous injection
   c. subcutaneous injection
   d. rectal suppository

16. “Subcutaneous” means _____.
   a. in the eye
   b. in the bloodstream
   c. under the foot
   d. under the skin

17. Which of the following are variables that must be considered when determining the correct dosage of a drug?
   a. weight, size, and sex
   b. physical condition, medical history, breed
   c. species, breed
   d. all of the above

18. The three main ways of preventing an animal from licking off a topical medicine are the Queen Anne collar, _____, and the application of a dressing.
   a. a muzzle
   b. a leash
   c. a tranquilizer
   d. general anesthetic

19. The word “parasite” comes from Greek origins meaning _____.
   a. to destroy
   b. one who eats another’s food
   c. one who eats at another’s table
   d. one who dines and runs

20. The most obvious symptom of an animal with fleas is _____.
   a. vomiting
   b. constant scratching
   c. diarrhea
   d. unconsciousness
21. Treatments for flea infestation come in _____, _____, or internal medications.
   a. powders / elixirs
   b. syringes / capsules
   c. sprays / powders
   d. sprays / elixirs

22. An animal infested with mites exhibits _____.
   a. skin irritations
   b. a ragged haircoat
   c. dehydration
   d. both a and b

23. The two groups of common lice are _____, or chewing lice, and anoplura, or sucking lice.
   a. mallophaga
   b. maxilla
   c. mallolixa
   d. phagocytotic

24. Ticks are in the same family as _____.
   a. flies
   b. bumblebees
   c. spiders
   d. ants

25. The _____ causes more damage to the cattle industry than any other pest.
   a. tse tse fly
   b. cattle larvae
   c. cattle grub
   d. horse fly

26. _____, or roundworms, are slender, cylindrical worms that infest animals.
   a. Cytoworms
   b. Nematodes
   c. Macrocytes
   d. Cattle grubs
27. The term _____ describes a ribbon-like colony of flatworms.
   a. tapeworm
   b. metroflat
   c. flatatia
   d. roundworm

28. _____ are round, long worms with a head that allows them to attach itself to an animal's small intestine and obtain nourishment directly from a host's mucous, blood, and tissue.
   a. Scarlax
   b. Tapeworms
   c. Flatworms
   d. Hookworms

29. _____ is/are transmitted by infected mosquitoes.
   a. Heartworms
   b. Hookworms
   c. Tapeworms
   d. Sleeping sickness

30. _____ are parasitic flatworms shaped like a simple leaf.
   a. Flukes
   b. Flaps
   c. Flippers
   d. Faceworms

Congratulations!

You have completed Lesson 30. When you feel confident that you have mastered the instruction in this lesson, please go on to your next lesson.
Lesson 31
Laboratory Examinations

Step 1: Lesson Preview

In the past, medical doctors and veterinarians had to rely solely on a patient’s symptoms and medical history in diagnosing ailments and illnesses. The sophisticated laboratory examinations that we have today were not available for helping to detect causes of diseases or discomfort.

Today, all that has changed, and laboratory examinations are a regular part of human and veterinary medicine. In fact, scientific advancements and refinement of instruments and examining procedures continue to advance so that new methods of detection are being devised on a regular basis. In this lesson, however, we will concentrate on the basic and standard laboratory examinations that veterinary assistants will likely have some role in helping to carry out, even if it might be securing samples and specimens and sending them to the laboratory. Whatever function you will have in assisting in these laboratory examinations, you should be armed with general knowledge about the procedures, how they are carried out, and what the purposes of these examinations are.

Most of the routine laboratory procedures involve examinations of blood, urine, fecal matter, skin scrapings or other tissue samples, etc. Most of the one-doctor or two-doctor veterinary clinics do not have their own complete laboratory facilities, but rather send the specimens out to private laboratories for examination. It is likely, however, that some of the more basic tests will be completed in the clinic when the procedures are not too complex and can be done with basic equipment, or when a medical supplier’s kit can be used to complete the examination. In either case, the veterinary assistant may have a role in collecting, preparing, and storing the specimens; and in many cases, identifying and packaging them for delivery to medical laboratories.

Since some of the basic laboratory procedures may be carried out in the veterinary clinic, you should become familiar with basic equipment and supplies used in this work. These will likely include a microscope, pipettes, mortar and pestle, centrifuge, and other paraphernalia.

The most important things to keep in mind during laboratory examinations is that these tests are very precise and that all procedures that you are involved in should be carried out with great accuracy and care. Also, since many of the samples may contain infectious materials, strict handling procedures must be followed to assure that disease-causing organisms are not transferred and that appropriate disinfection measures are taken to maintain the worksite in a sanitary condition.
Step 2: Learning Objectives for Lesson 31

When you have completed the instruction in this lesson, you will be able to:

- Identify and understand the purposes of basic equipment and supplies used for laboratory examinations in the veterinary clinic, including the microscope and a number of other pieces of equipment.

- Identify a number of laboratory examinations that are completed in the veterinary clinic, and other routine examinations that are completed in a private laboratory with specimens taken in the clinic.

- Understand the purposes of many of the routine laboratory examinations.

- Understand the basic procedures in examining blood, urine, feces, skin scrapings, and other tissues and body fluids in different kinds of laboratory examinations.

- Understand the need for accuracy and safety precautions in all aspects of laboratory examinations.

Step 3: Medical Examinations

As noted above, laboratory examinations are very commonplace today, such that there are many more medical examinations that call for laboratory tests than those which do not. In this regard, there are four basic kinds of medical examinations that veterinarians perform. These include:

**Physical or screening examinations.** Just as medical doctors recommend that you have a physical examination annually, so, too, do veterinarians recommend that animals have periodic check-ups. This occurs more or less regularly with dogs and cats, when the animals are brought in for required and/or recommended vaccinations and immunizations. Veterinarians—and veterinary assistants—observe the animals in these situations and recommend laboratory examinations when certain deviations from normal are observed. Then, too, in regular physical or other screening examinations, laboratory tests have become a regular part of the procedure with many practitioners.

**Diagnostic examinations.** When animals are brought to the veterinary clinic with symptoms suggesting an abnormal condition, such as loss of appetite, head-shaking, difficult urination, etc., a diagnostic examination is performed to determine the cause. Very often, laboratory examinations are ordered as a regular part of these procedures.

**Prognostic examinations.** A prognosis is a determination that predicts what the final outcome of an ailment or illness will be. These will vary from prognoses of complete recovery to terminal illness (in the case of certain cancers, for example). Laboratory examinations are usually very much involved in these procedures.

**Monitoring examinations.** There are a number of conditions that humans and animals have that require monitoring on a regular basis. Examples of these are diabetes and hypothyroid conditions. These and many other abnormalities require regular laboratory examinations as a part of the monitoring effort.
Step 4: Laboratory Equipment

Although a veterinary clinic may send much of the laboratory work out to a private laboratory, there are a number of procedures that are normally done in the clinic. The two basic items of equipment needed to complete a number of these examinations include a microscope and two types of centrifuges. A refrigerator is also necessary for storing certain specimens and reagents or other materials used in the examinations. A refractometer, hemocytometer, and an urinometer may also form a part of the equipment, along with cardiograph paraphernalia. Veterinary clinics may also use a number of strip tests. These are chemically treated paper strips that are dipped into liquefied specimens. A chemical reaction with the substance causes the strip to turn different colors when certain reacting substances are present, indicating specified abnormal conditions. These are sometimes referred to as “dip stick” tests. Also included are slides and cover slips, dyes and stains, test tubes and racks, pipettes and unopettes, syringes and miscellaneous glassware, and a number of additional items.

Microscope

As you know, microscopes are used in laboratory work to view organisms and specimens which are too small to be seen with the naked eye. Enlargements of hundreds and even thousands of times can be achieved so that very small organisms can be examined with a microscope.

A microscope is basically a tube with an eyepiece lens in one end and an objective lens in the other. This tube with the lenses is suspended above a stage with a hole in it to allow light to pass through the specimen when it is placed on the stage over the hole and the microscope is focused. The eyepiece lens will have magnification power of from 5X diameters to 15X diameters. The objective lenses will have magnification powers of from 10X diameters to 100X or more diameters. To find the total magnification, you multiply the eyepiece magnification by the objective lens magnification. Thus, if you were using a 5X eyepiece and a 40X objective lens, you would get a total magnification of 200 diameters. That is, the enlargement that you view would be 200 times as large as the specimen viewed.

If you are in a facility which has a microscope, it is to your advantage to learn how to use it. There will likely be some prepared slides available that you can practice viewing. Before doing so, however, you should become familiar with the microscope and its controls. Then, you should also study the user’s manual and/or the directions and precautions published by the manufacturer. Do not attempt to operate the microscope by yourself until you become familiar with it and know how to operate it. Do not operate it unless the veterinarian or a co-worker who uses the microscope regularly gives you lessons on it. You should first gain practice viewing slides that have been set up and in focus just to see how various specimens look under magnification. This will give you the opportunity to “train” your eyes with a monocular microscope so that you can keep both eyes open while viewing the specimen with one eye. It will take a little practice before you will be comfortable doing it.
Parts of the Microscope

The main parts of the microscope include the following.

- **Eyepiece**: The lens in the top part of the body tube that you look into. As noted, this lens will have low magnification power of 5X to 15X diameters.

- **Coarse Adjustment Knob**: Located on either side of the tube, this knob adjusts the tube vertically (up and down) and is used to bring the specimen into view.

- **Fine Adjustment Knob**: Located on either side of the tube, this knob adjusts the tube vertically and is used to bring the specimen into final focus.

- **Body Tube**: The tube that serves as the viewing channel.

- **Revolving Disk**: A disk at the bottom of the tube with threaded holes. Objective lenses of various powers can be fastened into the holes. The disk is turned (revolved) to get the desired lens over the hole. Normally there are three holes in the disk used to accommodate a low power lens, a high power lens, and a high power oil immersion lens. For example, a microscope may be set up with a 5X eyepiece lens, and objective lenses of 10X (low power), 40X (high power), and 100X (oil immersion high power).

- **Objective Lenses**: These are the lenses described above which are fitted into the revolving disk. All lenses (including the eyepiece) can be easily removed and replaced with lenses of different powers. The objective lens is immediately above the specimen being viewed.

- **Arm**: A sturdy curved handle-like shaft which is used to grasp the microscope and move or carry it.

- **Stage**: A rectangular platform with a hole in it onto which slides are placed for viewing.

- **Stage Clips**: Clips that are used to keep the slide secure and in place when it is placed on the stage. More sophisticated microscopes will have a mechanical stage to secure the slide with button controls to move the slide horizontally when desired.

- **Mirror**: A two-sided mirror, with one side flat and the other concave to concentrate light rays, is the bottom part of the microscope assembly. The mirror can be adjusted to reflect light up through the specimen so that it can be seen. The mirror is most often replaced with a sub-stage electric light assembly to provide a constant source of light under any conditions.

- **Condenser**: Just below the hole in the stage, the condenser is used to adjust the amount of light that passes up through the specimen.

- **Base**: A heavy horseshoe-shaped base forms the bottom part of the assembly. A knob control joins the top and bottom halves of the microscope and allows adjustment so that the lenses, stage, mirror, and condenser can be tilted back up to 45 degrees for comfortable viewing.
Although you are probably accustomed to seeing monocular (single eyepiece) microscopes, a binocular (two eyepieces) microscope is recommended for laboratory work. This is because it improves the microscope image and enables easy viewing with less likelihood of causing eyestrain. As noted previously, a microscope will normally have three objective lenses; a low power (10X) lens, a high power (40X) lens, and a high power (100X) oil immersion lens. The oil immersion lens requires a drop of special oil for viewing. After use the lens is wiped dry. Lenses should be cleaned with lens paper.

Important rules to remember when using a microscope are to start with the slide clamped to the viewing platform so that it is securely in place. Then, turn the low power lens into place over the slide. Before you view through the lens, adjust it to the lowest position you can without having it touch the slide. Then you can adjust the lens upward to get the field in focus. Once you have the field in focus, you can move the slide laterally while it is still under the clamps to try to get a better field in view. When you have focused on a field, you can change to high power to examine what is on the slide. When you do so, remember to start with the lens low (close to the slide) and focus upward. This procedure is followed so that you do not break the slide or damage the lens. When you try to focus by moving the lens downward, you run the risk of forcing the lens into the slide.

**Care of the Microscope**

Always grasp the arm of the microscope when removing it from its case, moving it, or picking it up. Never use the control knobs to move it since they are much too delicate to bear weight. Also, since dust is the enemy of the microscope, always keep it covered when not in use with its plastic cover, or if not used for prolonged periods, it should be kept in its case.

Keep any foreign material from getting on the objective lenses, including parts of the specimen. If it does happen, the foreign material should be cleansed off the lens by gentle wiping, with lens paper as the final step. Also, the microscope should not be near open chemicals. Vapors from various acids or alkaline solutions can damage the lenses and the metal.

**Centrifuge**

The centrifuge has a chamber into which specially designed test tubes with liquid specimens are placed and rotated at regulated rates of speed. Centrifugal force causes the different components of the specimens to gather in different levels of the tube in accordance with their specific gravity, thus forming layers of different substances. The most dense components will be layered at the bottom of the tube and the least dense components will be at the top. This procedure is used to separate serum or plasma from red blood cells, isolating sediment in urine samples, performing fecal flotation or sedimentation procedures, and for a number of other tests. Attention to balancing samples rotated, with tubes opposite each other, will decrease wear and enable the centrifuge to operate efficiently. The centrifuge is operated at lower rates of rotation to preserve cellular detail for evaluation. Higher rates of rotation are employed to segregate sediment in urine or to prepare fecal samples.
A standard centrifuge that will accommodate tubes holding 15 milliliters of blood is necessary for many of the tests. Veterinary clinics may also have a second smaller microhemocrit centrifuge. This is a special device which accommodates small, (about two inches long) very narrow gauged capillary tubes into which blood is drawn to a prescribed level, and centrifuged. Before being centrifuged, the ends of the capillary tubes are sealed by dipping them into a special wax. After centrifuging, the layers of blood components are then read by using a special comparison chart to get an interpretation of results. These microhemocrit evaluations enable fast and accurate determinations of packed cell volume which is important in a number of examinations.

**Hemocytometer**

A hemocytometer is a special counting chamber used under the microscope to enable manual counts of red blood cells (erythrocytes) and white blood cells (leukocytes). An etched grid is visible through the microscope which shows nine squares, and the blood cells within certain squares are actually counted. Private laboratories have automatic cell counting machines to take the manual counting out of it. The hemocytometer is primarily used with white blood cells and rarely used to count red cells anymore because of more efficient and accurate methods that have been developed.

**Urinometer**

A urinometer is a special kind of hydrometer (like mechanics use to check specific gravity of antifreeze/water mixes in an automobile radiator) which measures the specific gravity of the substance. The urinometer is placed into a cylinder containing urine and allowed to float free. When removed, a reading of specific gravity is made from the scale on the urinometer. Normal specific gravity varies among different animals. Abnormality is indicated when specific gravity is higher or lower than normal for the species being tested. Higher than normal readings may indicate foreign bodies in the urine. Lower than normal readings may indicate a lack of necessary components which make up normal urine.

**Refractometer**

A refractometer is also used to determine the specific gravity of urine. In addition, it is used to measure properties of other liquids or translucent bodies, notably in eye examinations. The refractometer passes light rays through the object or substance being measured. The bending or other characteristics of the rays passed through are measured and compared to a standard scale. Density of the substance and other determinations are noted which are valuable in making many diagnoses.

**Step 5: Laboratory Analyses**

The most common laboratory examinations involve analyses of blood, urine, and fecal specimens. There are about 100 different tests that can be conducted on urine, and about 50 different determinations that can be made on blood. Most of these are sent to private laboratories by local veterinary clinics, but some of them are conducted in the clinic by the personnel employed there.
Laboratory Examinations in the Veterinary Clinic

One of the important urine examinations that can be completed in the clinic involves the use of a kit with chemically treated paper strips, charts with colors to indicate reaction results, and limited use of a microscope. Color is always an important determination to make on urine, with different colors indicating presence or absence of certain components. For example:

- Normal urine is yellow due to a certain pigment; pale yellow if there has been high fluid intake, and dark yellow with very low fluid intake.
- Hemoglobin (from blood) will cause the urine to appear dark reddish, like wine.
- Bile (from the gall bladder) will cause colors from yellowish-brown to greenish-yellow.
- Uroerythrin will cause a pink coloring when uric acid or uric crystals are present.
- Drugs will cause urine to turn blue, green, or orange.

Other observations of urine that prove helpful are:

- **Clarity** - Fresh urine is normally clear, with the exception of horse urine which is cloudy when voided. In dogs, cats, and other animals, when cloudiness is observed it can indicate a concentration of cells, bacteria, fungi, casts, and/or crystals. Fat droplets may also cause urine to turn cloudy or milky.
- **Odor** - Normal urine has a faint aromatic aroma. If the odor is strong, it indicates presence of bacteria. And, a sweet, fruity odor may indicate diabetes or an acetone disorder.
- **Foam** - Excessive foaminess when urine is shaken can indicate proteinuria. Green or yellowish-brown foam may reflect presence of bile, and hemoglobin will cause the foam to appear reddish-brown.

Kits from medical supply companies are available to veterinarians which will test urine for several different components. Chemically treated paper strips, or dip sticks, and a color chart showing the meanings of resultant colors can be used to test for the presence in urine of acidity/alkalinity, proteins, glucose, ketones, bilirubin (containing bile), blood, nitrites, and urobilinogen. For example, in testing for acidity/alkalinity (the pH test), the chemically treated strip is dipped into urine. If the strip turns orange, it indicates acidity; if it turns blue, it indicates alkalinity. Since a dog’s urine is normally acid, you would expect the strip to turn orange. If it turned blue, indicating alkaline, it would suggest an abnormality that the veterinarian would investigate further.

Specific gravity can also be determined, and a small sample of urine can be centrifuged and examined under the microscope for the presence of bacteria and blood cells. Although there may be a presence of a few red blood cells in normal urine, if increased amounts of the erythrocytes are observed, the urine is abnormal. Also, if bacteria are detected under the microscope, a disease condition exists.

A number of blood examinations are carried out completely in veterinary clinics, including examinations to detect heartworm, leukemia, blood glucose level, and packed cell volume (of red cells).

Paper strip tests are also used in eye examinations. One of these is called the tear test to determine if the eye ducts are functioning normally. A second eye test involves use of a special eye stain which causes a colored film to coat the eye. Then, a visual examination is made under ultraviolet light to discover a light spot which would be caused by an ulcer.
Step 6: Progress Check 31-1

Answer the following questions and write your answers on scratch paper.

1. What is the difference between a diagnosis and a prognosis?

2. What important rule should you always remember when focusing a microscope lens?

3. What does a centrifuge do?

4. What is a hemocytometer?

5. What is a urinometer?

6. What is a refractometer?

7. In doing a pH dip stick test on a dog’s urine, what color would you expect the paper strip to turn if the urine was normal?

8. What colors would you expect a cat’s urine to be if it contained more than normal amounts of blood, or bile, or drugs?

9. Why would you be concerned if an animal’s urine had a strong odor?

10. What is the tear test?

Step 7: Answers to Progress Check 31-1

Check your answers with the answer key at the back of this book. Correct any errors you may have made.

Step 8: Laboratory Examinations

We have noted that many of the tests requested by veterinarians involve samples of blood, urine, or feces. Before we get into these, let’s consider some basic facts about blood and common acronyms used in the veterinary clinic when referring to blood and blood samples.

Precautions For Laboratory Procedures

Because blood and other body fluids from all patients should be considered infective, the following precautions are recommended for all health care workers in assisting or carrying out laboratory procedures, by the Centers for Disease Control in Atlanta, Georgia.

1. All specimens of blood and body fluids should be put in a well-constructed container with a secure lid to prevent leaking during handling and transport. Care should be taken when collecting each specimen to avoid contaminating the outside of the container and the laboratory form accompanying each specimen.
2. All persons processing blood and body fluid specimens (e.g., removing tops from vacuum tubes) should wear gloves. Masks and protective eyewear should be worn if mucous membrane contact with blood or body fluids is anticipated. Gloves should be changed and hands washed after specimen processing.

3. For routine procedures, such as histologic and pathologic studies or microbiologic culturing, a biologic safety cabinet is not necessary. However, biologic safety cabinets (Class I or II) should be used whenever procedures are conducted that have a high potential for generating droplets. These include procedures such as blending, sonicating (processing samples with sound wave energy), and vigorous mixing.

4. Mechanical pipetting devices should be used for manipulating all liquids in the laboratory. Mouth pipetting must not be done.

5. Use of needles and syringes should be limited to situations in which there is no alternative, and when handled, needles should not be recapped, bent or broken by hand, removed from disposable syringes, or otherwise manipulated by hand. After they are used, disposable syringes and needles, scalpel blades, and other sharp items should be placed in puncture-resistant containers for disposal; the puncture-resistant containers should be located as close as practical for disposal. Large-bore reusable needles should be placed in a puncture-resistant container for transport to the reprocessing area.

6. Laboratory work surfaces should be decontaminated with an appropriate chemical germicide after a spill of blood or other body fluids and when work activities are completed.

7. Contaminated materials used in laboratory tests should be decontaminated before reprocessing or placed in bags and disposed of in accordance with institutional policies for disposal of infectious waste.

8. Scientific equipment that has been contaminated with blood or other body fluids should be decontaminated and cleaned before being repaired in the laboratory or transported to the manufacturer.

9. All persons should wash their hands after completing laboratory activities and should remove protective clothing before leaving the laboratory.

Implementation of universal blood and body fluid precautions for all patients eliminates the need for warning labels on specimens since blood and other body fluids from all patients should be considered infective.

**Blood Tests**

While you will not be drawing blood from animals for laboratory examinations in an animal clinic, you will likely be involved in certain phases of these examinations such as storing the samples, sending the samples to a laboratory, getting together any equipment and supplies the veterinarian needs to complete the procedures, etc. It becomes important, therefore, that you understand the terminology the veterinarian uses, which includes a number of acronyms.
Blood-Related Acronyms

The following acronyms are in common use in animal health facilities:

- **CBC** - Complete blood count, which would include a red blood cell count, a white blood cell count (along with a differential white blood cell count), and packed cell volume (of the red cells). The examination may also include rate of erythrocyte (red cell) sedimentation, and the number of blood platelets (thrombocytes). The size and shape (morphology) of the red blood cells may also be noted, as well as the presence of blood parasites and icterus (signs of jaundice).

- **PCV** - Packed cell volume (of the red blood cells), which is an important determination for a number of diagnoses.

- **RBC** - Red blood cell; and therefore, a red blood cell count could be referred to as a RBC count.

- **WBC** - White blood cell; and therefore, a white blood cell count could be referred to as a WBC count. The WBC is different from the differential WBC in that the differential count will show how many of each kind of white blood cells are present, while the WBC gives the total count of all white blood cells.

Basics About Blood

We have made reference to red blood cells (erythrocytes) and white blood cells (leukocytes). The functions of these two types of blood cells are very important to the body. The red cells, via the hemoglobin they contain, pick up oxygen in the lungs and carry it and disperse it to tissues throughout the body. When something goes wrong with this function, a condition called anemia can result, which means that the tissues are not getting enough oxygen from the red blood cells. Laboratory examinations of the red cells can detect anemia and various other conditions. In these examinations, a red blood cell count can be made to determine how many red cells are contained within a certain volume. If the count is below normal, anemia and/or other conditions can be diagnosed and treated. The structure (morphology) of the red blood cells can also be observed under a microscope. Various abnormalities in the structure of these cells can also indicate certain diseases. For example, variations in the size and shape of red blood cells can indicate certain types of anemia, chronic blood loss, iron deficiency, and severe parasitism.

The white blood cells have a primary function of fighting diseases. When bacteria or viruses attack the body, the white cells respond by multiplying and becoming more abundant. Thus, a white blood cell count will indicate if there is a normal number of white cells in a given volume, or if the count is high due to the more rapid multiplication of cells produced to fight disease-causing organisms. There are also diseases that cause the white cells to have different structures and components. Additionally, there are several different kinds of white blood cells, and abnormal amounts of the various cells can be linked to certain diseases. The various white blood cells in the body include:

- **Neutrophils** - These are the most numerous of the white blood cells in most species, including the dog and cat. These cells are produced in the bone marrow and released into the blood stream when they are mature. The nuclei of these cells are horseshoe-shaped, and when the need increases, more cells are released.
• **Lymphocytes** - Second-most numerous in most species, these cells have round nuclei that may have a slight cleft. The cytoplasm stains blue and the cells may contain small pink-purple granules.

• **Monocytes** - Normally, these make up from two to ten percent of the white blood cells. Their nuclei have various shapes, and the cytoplasm is blue-gray and may have small vacuoles or small pink granules.

• **Eosinophils** - Making up from two to eleven percent of the white blood cells in most species, these cells have segmented nuclei. Granules within the cells take on different shapes in the various species. In dogs, the granules often vary in size within a cell; in cats they are small and rod shaped; in horses they are large and round; and in cattle, sheep, and pigs, they are small, round, and uniform.

• **Basophils** - These are the least numerous of the white blood cells. Dogs have few, cattle and horses have more of them. The granules contained stain purple to black except for cats where they may stain a light lavender and are less numerous.

A WBC count plus a *differential* WBC count will give a good indication of the body's responses to disease. In addition, the percentages of the various leukocytes in the *differential* WBC count will suggest specific diseases to the veterinarian.

Then, you should also be aware that blood contains platelets and plasma. Platelets are irregularly shaped disks which do not have nuclei. Abnormal platelet counts also suggest certain diseases. Higher than normal counts are associated with stress and lower than normal counts are associated with bleeding disorders. Platelets are the most fragile of the blood components and the counts should be made within two hours of the sample collection to assure that deterioration has not occurred.

Collection of blood samples is done by withdrawing blood from veins as described in previous lessons. The function of the veterinary assistant in these procedures will be to help restrain the animals for the veterinarian, and to store or send out the samples as directed. Although needle and syringe is still used to collect samples, prepared vacuum tubes are now used extensively in which blood is automatically drawn into the vacuum container once the needle is properly in the vein. These tubes may also contain EDTA, an anticoagulant to prevent clotting, so that nothing has to be added to the sample before it is sent to the laboratory.

A blood smear is often prepared on a slide so that it can be viewed under the microscope. A blood smear is prepared by dipping a sterile end of an applicator stick into the sample to secure a small drop of blood which is transferred to the end of a slide. A second slide is then drawn across the sample against the first slide at a 30 degree angle, spreading a thin film of the sample across the slide to create what is called a blood smear. The smear is then allowed to air dry and then can be viewed under the microscope. Slides are also prepared by using a coverslip with the slide. A coverslip is a very thin flat plate of glass, usually square and less than an inch wide, which is placed over the specimen on the slide. First, the specimen is placed on the slide, then the coverslip is pressed over it securely so that any air bubbles are pressed out. The specimen is then secure on the slide and is not exposed to the air.

Although blood may be observed untreated, different kinds of examinations require that samples be stained. This means that a stain (a special kind of dye) is applied to the sample so that various structures being observed will absorb the color from the stain and be more easily observed.
Urine Examinations

As you've seen earlier in this lesson, examination of urine can help in diagnosing many diseases and conditions. Analyses include visual observation (gross examination) and microscopic examination. These tests can result in diagnoses of diseases of the bladder, genitourinary tract, kidney, liver, and other organs. Common tests include the dip stick tests discussed earlier, specific gravity tests with the urinometer or refractometer, and microscopic examination of centrifuged sediment.

The veterinary assistant normally participates in these procedures in a number of ways, and may be the one who collects the sample, secures it, and stores it until it can be analyzed or sent out for analysis.

There are three methods of collecting urine samples. The first is the “clean catch” while the animal is urinating. To accomplish this, a stick about the size and length of a yardstick is attached to a sanitary cup and when the animal urinates, part of it is caught. When collecting urine in this manner, it is best to catch it in “middle stream;” that is, wait until after the animal has started urinating before the cup is positioned for the clean catch. The amount of urine collected should be enough to fill a test tube. If you start too early, the sample may include debris from the urinary tract that was not a part of the urine. In fact, this is a concern that is important in collecting and preserving all laboratory samples—that no extraneous materials have been introduced to the sample to contaminate it and influence the test results.

The other two methods of urine collection involve catheterization, where a catheter is introduced into the urinary tract, and on into the bladder to allow the urine to flow out. Then finally, there are occasions when the veterinarian injects a needle into the lumen of the bladder and withdraws the sample into a syringe. This collection method may become necessary when stones have formed and are blocking the urinary tract.

When a urine sample cannot be analyzed soon after collection, the secured container should normally be refrigerated to prevent bacterial growth or other chemical changes which may occur. Preservatives to reduce bacterial growth are often added to the sample when there is an extensive waiting period for analysis.

Fecal Examinations

Fecal examinations are often called for when an animal is suspected of having internal parasites (worms). In the past, it was a common practice to administer an anthelmintic when an animal showed outward symptoms of having worms. This consisted of a “shotgun” medication designed to expel a number of different species of intestinal parasites in the hopes that it would take care of the particular parasite that had infested the animal. Today, the veterinarian more often attempts to identify the particular parasite and prescribe treatment that is effective in eliminating that organism.

On occasion, the owner is asked to collect the laboratory sample by using a wooden tongue depressor and a paper cup with a tight-fitting lid. The sample is taken soon after the animal defecates, and an amount described as tablespoon size, or the size of a walnut, is transferred to the paper cup and sealed with the lid. Care must be taken not to include any extraneous material and the sample should not be more than three hours old when examined. When it is necessary to store the sample for a longer period of time, it should be securely sealed, labeled, and refrigerated to inhibit bacterial growth. The sample should not be frozen or kept in a warm room.
This same sample collection method can be used in the veterinary clinic by the veterinary assistant. At times, however, when the veterinarian wants a sample immediately, he may introduce a regular sponge forceps with smooth metal loops at the end into the rectum and secure the sample. The forceps’ loops are lightly lubricated for this procedure, and the animal must be restrained.

There are two common methods of doing microscopic examinations of the fecal sample which are performed to find and identify parasite eggs. The first of these is the preparation of a smear. Distilled water is used to liquefy a small portion of the sample so that an observable smear can be prepared. The flotation method can also be used to prepare the slide. In this, a sugar solution is added to a small amount of the sample in a test tube. The test tube is filled to the top and allowed to stand upright for a short period of time. Since the parasite eggs are lighter (have less specific gravity) than the sugar solution, they will rise to the top of the tube. A slide is then laid across the top of the tube (brought into contact with the liquid) so that a portion of the sample will adhere to the slide. Then, after a coverslip has been placed over the specimen on the slide, it is examined for parasite eggs under the microscope. As an alternative to the flotation method, a centrifuge is also used to propel the eggs in the solution described above to the top of the test tube.

**Skin Scrapings**

There are also external parasites and organisms which attack an animal’s coat and skin. The most common of these are fleas, ticks, and lice. These can be identified and treated without magnification. Mange mites and other organisms, on the other hand, do require magnification, and the samples are normally collected with skin scrapings.

The most common of these parasites are:

- **Sarcopotes** - Skin burrowing mites, also referred to as mange mites, itch mites, or scabies. (Mites are microscopic free-living organisms which cause dermatitis or tissue damage by creating blood or tissue fluid loss).

- **Demodex** - Minute parasitic mites that attack the sebaceous (skin) glands and hair follicles.

- **Dermatophyte** - A fungus which causes infection of the skin, hair, or nails.

To obtain specimens, skin scrapings are made with a scalpel blade or with a dull knife, depending on the veterinarian’s preference. A lesion is located that is undisturbed and with no extraneous material adhering to it. A drop of mineral oil is added to the blade to make the transfer of the specimen onto a slide easier, and the lesion is scraped so that a specimen of it is on the blade of the knife. After the specimen is transferred to the slide, a coverslip is placed over it and it can be examined under the microscope. Procedures will vary slightly from the above depending on what organism the veterinarian suspects to be present.

**Cultures**

A culture is a technique in which a laboratory will place a specimen in a medium and attempt to grow the offending pathogen so that it can be identified microscopically. Many different media can be used, depending on what disease is suspected. Cultures may be allowed to stand for a period of several days or more to allow the infectious organisms to grow. Media in common use include MacConkey’s Agar, Selenite Broth, and Triple Sugar Iron Agar (TSI). Samples taken for culturing should be handled with utmost precaution since it is very likely that they contain highly infectious pathogens.
Veterinary Assistant

Step 9: Progress Check 31-2

Answer the following questions by writing your answers on scratch paper.

1. When disposable needles and syringes are used, how should they be disposed of?

2. What precautions should be taken when handling specimens for laboratory examinations?

3. Identify the following acronyms:
   - CBC _____
   - PCV _____
   - RBC _____
   - WBC _____

4. When disease is present, what would you expect a WBC count to show?

5. What are neutrophils and lymphocytes?

6. What is EDTA?

7. What are two methods of preparing blood samples for microscopic examination on slides?

8. When blood, urine, or fecal samples cannot be analyzed soon after collection, they should be

9. What are the normal reasons for collecting skin specimens and fecal samples?

10. Describe the flotation method of examining a fecal sample.

Step 10: Answers to Progress Check 31-2

Check your answers with the answer key at the back of this book. Correct any errors you may have made.

Step 11: Lesson Summary

Laboratory examinations are carried out extensively in animal health care facilities in physical or screening examinations, diagnostic examinations, examinations to make a prognosis of a disease or condition, and to monitor and treat a number of disease conditions. Veterinary assistants participate regularly in different phases of these laboratory procedures, including collection of samples; storing, preserving, and sending out samples to laboratories; record keeping; preparing paraphernalia for laboratory exams; and helping to assure sanitary conditions before, during, and after these examinations.

It is of primary importance, therefore, that veterinary assistants have a full understanding of the precautions necessary during the various phases of these examinations and when handling laboratory specimens. These include personal cleanliness and handwashing, wearing rubber gloves when handling samples or decontaminating the worksite, wearing other protective gear when necessary, accuracy when labeling specimens or recording information, and proper disposal of used supplies or other items.
It is also important to understand the basic purposes of the many laboratory examinations as they relate to the various samples collected, including blood, urine, fecal matter, skin scrapings, tissue specimens, and the other samples collected. A veterinary assistant with this necessary knowledge will be of great assistance to the veterinarian in the animal health care facility.

Congratulations!

You have completed Lesson 31. When you feel confident that you have mastered the instruction in this lesson, please go on to your next lesson.
Contagious diseases that infect animals are as varied and as numerous as those that infect humans. And although these afflictions can have a very serious impact on animal populations and oftentimes on humans as well, they are generally less well understood than are the diseases of human medicine. Veterinarians and animal health facilities have served very important roles in controlling many of these diseases, and in several cases, they have practically eradicated a number of them. Among the quarantine and other methods used to combat communicable diseases, animal health agencies and animal hospitals administer ongoing efforts to educate the public in disease prevention.

The quarantine is a successful method of control that has been exercised throughout history and was used even before our ancient forebears had developed other medical procedures or substances to counteract disease. Quarantine is the detention or isolation of animals (or persons) suspected of having a communicable disease so that other animals (or persons) cannot be contacted and infected. This may also include animals who do not have the disease, but are suspected of having been exposed to it.

This isolation and protective control takes a number of different forms. When a dog that is suspected of having rabies bites a person, for example, the dog is placed in isolation until it can be determined that the dog does not have the disease. In certain diseases of cattle, entire herds are isolated and sometimes the diseased members are destroyed. Another form of quarantine is the “border check,” wherein animals are not permitted to enter a state or country unless they have appropriate health certificates and evidence of certain vaccinations. And, in animal health facilities, animals with communicable diseases are placed in an isolation ward and contact with other animals and people is severely restricted.

An example of the devastation that communicable diseases can cause is the hoof and mouth (foot and mouth) disease contracted by cattle. In 1914, cattle in 22 states and the District of Columbia were affected and thousands of livestock had to be destroyed. The latest outbreak in California in 1929 was quickly controlled. Although this disease, rabies, and several others are not the constant threat that they were in earlier times, public health organizations and animal health personnel are still ever vigilant and on the lookout for conditions or evidence of diseases that may require courses of action. Even in our modern world, rabies and other communicable diseases are responsible for the death of thousands of animals and people annually.

Another topic that we will look into in this lesson is euthanasia, which is the practice of putting animals to death by painless methods. We will look at the conditions which influence animal owners or medical personnel to use this “pleasant death” option when they consider it necessary or advisable to apply this tactic.
Step 2: Learning Objectives for Lesson 32

When you have completed the instruction in this lesson, you will be able to:

- Explain what quarantine is and what it accomplishes.
- Determine who is protected by quarantine regulations.
- Relate the measures taken to prevent communicable disease epidemics.
- Understand the role that veterinary clinics and public health authorities play in applying quarantine regulations and controlling communicable diseases.
- Understand how euthanasia is practiced and the purposes of using it.
- Understand the role that animal health personnel play in guiding the public concerning quarantine regulations and control of communicable diseases.

Step 3: Public Health and Zoonoses

Early Development

In 1796, Edward Jenner, an English doctor, discovered that dairy maids had contracted cowpox from cows. Cowpox produces a localized skin infection in cows and humans, and is similar to smallpox. This was evidence that disease could be transmitted from animals to humans. Although many animal diseases cannot be transmitted to humans, over 150 infectious conditions have been identified that humans can catch from contact with animals. These kinds of diseases are referred to as zoonoses.

Dr. Jenner also observed that the dairy maids who had been infected with cowpox never contracted smallpox when they were exposed to it—they had become immune to the disease. This led him to the development of a vaccine for smallpox which has been responsible for eliminating it from many populations of the world, to the extent that smallpox does not today represent the scourge that it once was to so many people in the world.

The discovery that a vaccine could be developed which would prevent those inoculated from getting the disease, led to research on many other diseases for the development of vaccines that would be effective against them. As you know now, there are many different diseases that animals and humans can be vaccinated for which will prevent these individuals from contracting these diseases. This is one of the main reasons that epidemics are not prevalent in the world today as they once were.
Public Health Agencies

Federal Agencies

There are many public health agencies throughout the United States—and throughout the world—that work diligently to control and prevent the spread of diseases. In the United States there are public health agencies at virtually every level of government. At the federal level the Agricultural Research Service of the U.S. Department of Agriculture leads the way in fighting animal diseases. Also, the U.S Department of Health and Human Services is concerned with diseases that affect humans, and includes an active role in helping to regulate zoonoses. Wildlife problems in general are within the province of the U.S. Department of Interior, which is concerned with animal populations and environmental conditions as they affect animals. Through the efforts of all of these agencies, regulations are in place aimed at the control of disease within all borders. This means that they have regulations in place to control the entrance of animals into this country from all nations. Since they are also responsible for health concerns in interstate commerce, they have regulations regarding transport of animals within the United States. They also have many activities occurring with regard to the control of disease. Their major activities consist of research, inspection and evaluation of vaccines and other pharmaceutical products, and record keeping. The research is concerned with the efforts to control disease, and the record keeping involves keeping track of the numbers of animals that become infected with various diseases.

Through the efforts of these agencies, over the years many diseases have been brought under control which have devastated populations of animals in the past. One of the primary reasons for the transfer of infectious disease has been the importation of diseased animals from other countries. Today, animals cannot be freely imported into the United States without undergoing quarantine and/or testing. Some of the most stringent regulations probably apply to cattle. In the past, tuberculosis and foot and mouth disease were brought into the United States by the importation of diseased cattle. These diseases have been brought under control today because any cattle brought in must undergo quarantine and testing. Other diseases that have been eradicated or brought under control are glanders and dourine of horses, (pleuro)pneumonia of cattle, brucellosis, and hog cholera. Federal agencies have not done all of this alone. State, county, and local animal health agencies have all participated in these disease eradication programs and continue to do so today.

State Agencies

The federal concerns and regulations apply to interstate traffic and activities. If there is an outbreak of a disease in a state, the federal authorities will sometimes become active to assure that the disease is contained within the state. It is up to the state animal health authorities to carry the burden of controlling the disease within the state. State authorities also have the responsibility of carrying out federal statutes within the state, and often work in cooperation with federal agencies. Beyond that, however, each state has its own agenda for the prevention and control of animal diseases. Each state has its own set of quarantine regulations, and the regulations of different states may differ widely from each other. The regulations are closely related to the kinds of animal populations within the states and the various problems they have faced over the years. Thus, states that have large wild animal populations and large populations of cattle, etc., will have different regulations than states that are less concerned with these animal populations.
Although most states no longer have check-points to inspect vehicles coming into a state, they do have regulations on domestic animals. Most often a state will require that dogs have current rabies vaccinations at least 30 days prior to entrance, and sometimes distemper vaccinations, also. To play it safe, pet owners who plan to travel with a dog should be advised to have a health certificate for the animal from a qualified veterinarian, and certificates indicating that the animal has had a rabies vaccination and a distemper vaccination. Another restriction is that puppies are not normally allowed in a state until they are four months old. This is the age when most states require that the animals be licensed.

Hawaii has the most stringent requirements for bringing in domestic pets. Any dog entering the state is held in quarantine for 120 days, and must have the required health certificate and rabies and distemper vaccinations. There are other considerations and requirements for airline travel with pets. Each airline has its own requirements, which include recommended safe practices and also take into consideration the laws of the states of destinations. United Airlines and Delta Airlines have brochures that are free upon request for interested travelers. In addition to vaccinations and health certificates required, the brochures have information on portable cage specifications that meet their minimum transport requirements, and information regarding food and water provisions. Travelers may want to take along food and water dishes, a water carrier, a first aid kit, flea powder and medication, leashes, bedding, toys, and grooming aids. The fee for transporting an animal on an airplane when the owner is aboard is usually $50 with most airlines, but each airline has its own fee schedule.

Local (County and City) Governments

County and city animal health agencies usually have the job of enforcing all the laws. They maintain animal shelters, monitor and enforce the licensing laws, and respond to queries and complaints by citizens about animal care and damage or harm caused by animals. There are many situations that demand their attention on a daily basis.

Some of the jobs they have to do include:

- Issuing licenses to pets that meet the requirements, which most always include a rabies vaccination.
- Picking up and holding strays and other animals that are not properly licensed.
- Placing a quarantine on any area prevalent with infectious disease.
- Investigating reports of diseased animals.
- Capturing any animal (wild or domestic) suspected of having rabies or an infectious disease.
- Examining animals for tuberculosis when there is a cause to do so.
- Seeing to it that livestock diseases are reported to the county veterinarian.
- Taking proper action in the case of animal bites, such as taking the offender in and holding the animal in quarantine to be examined for rabies or other diseases.
- Educating the public and issuing bulletins to animal care facilities and pet stores with regard to lawful requirements and unusual disease conditions in the state and local area.
There are a great many laws that local authorities must enforce that the public may never hear about or be aware of. Some examples of these include:

- Pet owners may not bury a deceased animal on their property without first notifying local authorities and arranging for proper disposal or burial.

- Garbage must be sealed by the refuse companies when transporting it to the disposal site. (Garbage with infected organisms has been the cause of the spread of disease in numerous instances.)

- Swine watering troughs must be constructed to allow hogs to get only their heads, and no other part of their body, into the trough. (Hog cholera has often been transmitted via infected water when hogs have the opportunity of putting their feet into the troughs and leaving infectious organisms that they have picked up.)

- Animal carcasses cannot be fed to swine, chickens, etc. (Diseases are often transmitted from dead animals to live animals.)

**International Regulations**

Most countries of the world have quarantine and sometimes total restrictions for certain animals entering their countries. The laws of the United States, for example, have kept many foreign animals under quarantine control or totally out and have helped immensely in controlling the spread of animal and human diseases. Tuberculosis, psittacosis, and undulant fever (brucellosis) are prime examples. Specific information about these regulations is available from the Agricultural Research Service of the U.S. Department of Agriculture. State departments of agriculture and county veterinarian offices also have this kind of information.

**Zoonoses**

Diseases that can be transmitted from animals to man, or zoonoses, are always of great concern in animal health care. Although these diseases are most often rare in occurrence, they still infect a number of animals—and humans—in the United States. The table on the following pages has a list of the most important diseases that currently exist in North America.

Although each disease is of concern to health authorities, many of them are rare and none of them are widely prevalent in America. Although each disease is of concern to health authorities, many of them are rare and none of them are widely prevalent in America. However, people are infected with them every year.

Zoonoses are much better controlled in the United States than in most parts of the world, and are not normally a large concern in our daily lives. The rest of the world is not as fortunate, and it is estimated that about 75% of the human rural population of the world suffers from animal diseases. Now, let’s look at some additional facts relating to the more important zoonoses.
### Zoonoses in America

<table>
<thead>
<tr>
<th>Disease Name (infectious organism)</th>
<th>Animals Likely to Carry Disease and Transmit to Humans</th>
<th>Means of Transmission to Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthrax (Bacillus anthracis)</td>
<td>Warm blooded animals</td>
<td>Inhaled, ingested, or through the skin. Possible from spores in soil or animal products.</td>
</tr>
<tr>
<td>Brucellosis or Undulant Fever (Brucella abortus, etc.)</td>
<td>Cattle, goats, sheep, pigs, caribou, dogs.</td>
<td>Contact with excretions and secretions, infected milk.</td>
</tr>
<tr>
<td>Campylobacteriosis (Campylobacter spp)</td>
<td>Many animals.</td>
<td>Fecal contamination or food.</td>
</tr>
<tr>
<td>Cat scratch fever (bacillus)</td>
<td>Cats, dogs, and others.</td>
<td>Scratches, licks, and bites.</td>
</tr>
<tr>
<td>DF2 infection (Dysgonic fermenter)</td>
<td>Dogs, other mammals.</td>
<td>Unknown; dog bites suspected.</td>
</tr>
<tr>
<td>Erysipelas (Erysipelothrix rhusiopathiae)</td>
<td>Pigs, turkeys, pigeons, sea mammals, fish.</td>
<td>Wound infection.</td>
</tr>
<tr>
<td>Leptospirosis (Leptospira spp)</td>
<td>Domestic and wild animals, mostly rodents.</td>
<td>Contact with animals’ urine or feces; contaminated soil or water.</td>
</tr>
<tr>
<td>Listeriosis (Listeria monocytogenes)</td>
<td>Numerous animals and birds.</td>
<td>From food; not well known.</td>
</tr>
<tr>
<td>Lyme disease (Borrelia burgdorferi)</td>
<td>Deer, dogs, horses, rodents, raccoons, and opossums.</td>
<td>Tick bite; possible urine and tissues.</td>
</tr>
<tr>
<td>Plague (Yersinia pestis)</td>
<td>Rodents, cats, dogs, others.</td>
<td>Fleas contact with infected animals, inhalation.</td>
</tr>
<tr>
<td>Psittacosis (Chlamydia psittaci)</td>
<td>Parakeets, pigeons, parrots, turkeys, ducks, geese, and other birds.</td>
<td>Inhalation from dust, feces, or feathers.</td>
</tr>
<tr>
<td>Rat bite fever (Streptobacillus)</td>
<td>Rodents.</td>
<td>Bites, ingestion, wounds.</td>
</tr>
<tr>
<td>Salmonellosis (Salmonella spp)</td>
<td>Poultry, pigs, cattle, horses, dogs, cats, and wildlife.</td>
<td>Ingestion of uncooked food contaminated with feces, handling diseased animals.</td>
</tr>
<tr>
<td>Tetanus (Glostridium tetani)</td>
<td>Herbivores.</td>
<td>Wound infection from soil, primarily feces.</td>
</tr>
<tr>
<td>Tularemia (Francisella tularensis)</td>
<td>Rabbits, dogs, cats, rodents, sheep.</td>
<td>Ingestion, exposure to infected animals, arthropod bites.</td>
</tr>
<tr>
<td>Yersiniosis (Yersinia tuberculosis)</td>
<td>Animals and birds.</td>
<td>Contaminated food or water.</td>
</tr>
<tr>
<td>Ringworm (Microsporum spp)</td>
<td>Many mammals and birds</td>
<td>Direct contact with animals.</td>
</tr>
</tbody>
</table>

* *ssp* indicates several species
### Zoonoses in America, (continued)

<table>
<thead>
<tr>
<th>Disease Name (infectious organism)</th>
<th>Animals Likely to Carry Disease and Transmit to Humans</th>
<th>Means of Transmission to Humans</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chagas’ disease (Trypanosoma)</td>
<td>Dogs, cats, armadillos, pigs, and other mammals.</td>
<td>Wound bites, blood transfusion.</td>
</tr>
<tr>
<td>Sarcosporidiosis (Sarcocystis spp)</td>
<td>Pigs, cattle, sheep, ducks.</td>
<td>Ingestion of meat.</td>
</tr>
<tr>
<td>Toxoplasmosis (Toxoplasma gondii)</td>
<td>Mammals, mostly cats and birds.</td>
<td>Ingestion of meat or other food that contains cysts.</td>
</tr>
<tr>
<td>Beef tapeworm, Cysticercosis (Taenia saginata)</td>
<td>Cattle, buffalo, giraffe, llama.</td>
<td>Ingestion of beef.</td>
</tr>
<tr>
<td>Echinococcosis, Hydatid disease (Echinococcus granulosis)</td>
<td>Dogs, wild carnivores, sheep, cattle, cats, small rodents.</td>
<td>Ingestion of eggs in feces of carnivores.</td>
</tr>
<tr>
<td>Fish tapeworm (Diphyllobothrium)</td>
<td>Dogs, fish-eating mammals.</td>
<td>Ingestion of partially cooked or raw fish.</td>
</tr>
<tr>
<td>Pork tapeworm, cysticercosis (Taenia solium)</td>
<td>Pigs and other animals.</td>
<td>Ingestion of measly (infected with organisms) pork.</td>
</tr>
<tr>
<td>Sparganosis (Spirometra spp)</td>
<td>Dogs, cats raccoons, amphibians.</td>
<td>Direct contact or ingestion or raw crustaceans and undercooked pork.</td>
</tr>
<tr>
<td>Cutaneous larva migrans (Anclyostoma brasiliense)</td>
<td>Dogs, cats</td>
<td>Skin penetration.</td>
</tr>
<tr>
<td>Trichinosis (Trichinella spiralis)</td>
<td>Pigs, bears, and other carnivores, rodents.</td>
<td>Ingestion of undercooked infected meat.</td>
</tr>
<tr>
<td>Visceral larva migrans (toxocara canis)</td>
<td>Dogs, cats.</td>
<td>Ingestion of eggs shed in feces.</td>
</tr>
<tr>
<td>Lymphocytic choriomeningitis (Arenavirus)</td>
<td>Monkeys, dogs, mice, hamsters, guinea pigs.</td>
<td>Excretions and secretions.</td>
</tr>
<tr>
<td>Newcastle disease (Paramyxovirus)</td>
<td>Fowl.</td>
<td>Occupational exposure.</td>
</tr>
<tr>
<td>Pseudocowpox (Paxivirus)</td>
<td>Cattle.</td>
<td>Contact.</td>
</tr>
<tr>
<td>Rabies (Lyssavirus)</td>
<td>Skunks, bats, raccoons, foxes, coyotes, mongooses, dogs, cats and other carnivores.</td>
<td>Bites of diseased animals; inhalation has been suspected.</td>
</tr>
<tr>
<td>St. Louis Encephalitis (Flavivirus)</td>
<td>Wild birds and domestic fowl.</td>
<td>Mosquito bites.</td>
</tr>
<tr>
<td>Rocky Mountain Spotted Fever (Rickettsia rickettsii)</td>
<td>Dogs.</td>
<td>Ticks.</td>
</tr>
</tbody>
</table>

* ssp indicates several species
Tuberculosis

Tuberculosis that is transmitted to humans (mainly from cattle) is not listed in the above table because it is under strict control in America. It is still a problem in many parts of the world, infects large numbers of cattle, and is passed on to humans. Although quarantine and testing measures have eliminated this threat in America, it could become a threat once again if the animal importation controls are relaxed in the future. Tuberculosis is caused by mycobacterium tuberculosis of the human, bovine, or avian type. It is transmitted by ingestion, inhalation, or wound infection and is very easily transferred from infected animals to others. The disease invades tissues and causes loss of flesh and frequently death to infected animals. In birds, the infection attacks the liver and spleen. In other animals the lesions occur in the lungs and lymph nodes.

Rabies

Rabies still causes the death of thousands of people a year worldwide, and is still a factor in the United States, although the occurrences are rare. Tight controls are exercised, such as mandatory vaccinations of dogs in all states and immediate response by county veterinarians and health agencies to capture any carnivore suspected of being rabid that has bitten a human. Rabies is carried in the salivary glands of carnivores (skunks, bats, foxes, raccoons, dogs, cats, etc.) and when a rabid animal bites a human or other animal, rabies is transferred from the animal's saliva to the blood stream of the victim. Rabies is a disease of the central nervous system caused by a virus. It will normally result in death of the victim (and the carrier) unless treatment is started very soon after the bite.

Treatment consists of an immediate and thorough cleansing of the wound followed by daily injections of an antirabies serum for 14 to 30 days followed by two booster doses at 10 day intervals. Treatment must start immediately after the biting episode to be effective and is sometimes administered before the animal is identified with rabies because of the life-threatening nature of the disease.

Rabies takes two forms in animals: furious (irritable) rabies and dumb (paralytic) rabies. An animal with furious rabies will run amuck, snapping and biting at everything in its path. When the carrier has dumb rabies, which is less common, a paralytic condition sets in early. The animal is usually quiet and still, with occasional erratic movements due to lost control of its nervous system. Dumb rabies is often more dangerous than furious rabies because the infected animal does not show the more common indications of the disease.

Psittacosis

This disease, which infects and is transmitted by birds, is also known as parrot fever. It primarily affects the respiratory system and is transmissible to humans via dust particles, handling infected birds or dead bird carcasses, or bite wounds. No instances of humans eating infected poultry and catching the disease are known. The infectious organism appears to be destroyed during cooking. It is considered an occupational disease that has infected many pigeon breeders, farmers, poultry processing workers, and exotic bird handlers. Infected animals may have diarrhea, respiratory infection and weakness, or may show no signs of the disease. Treatment with tetracyclines in the feed or water cures the condition. Symptoms in humans are chills, sore throat, fever, loss of appetite, nausea, and vomiting. Although the disease can infect all birds, it was thought that increased incidence in the United States was due to importation of exotic birds. As a result, strict importation laws were enacted and the resulting quarantine regulations and importation restrictions have greatly reduced the incidence of the disease in this country.
Foot and Mouth Disease

Also known as hoof and mouth disease, this affliction has infected masses of cattle in epidemic proportions nine different times in the United States. In one of these, cattle in 22 states and the District of Columbia were infected. It has not occurred as an epidemic since 1929, when it was quickly controlled in California. The disease is well under control today and it rarely infects humans. Symptoms of the disease include fever, blisters in the mouth, nostrils, and on the feet and other areas of tender skin. Infected animals show excess salivation accompanied by smacking of the lips. Eating becomes difficult and painful, and animals may shed their hooves. Infected animals lose a great deal of weight and cows give reduced quantities of milk. The disease kills young animals and causes pregnancies to abort. Although a vaccine has been developed for the disease, it is not administered widely because of the expense and the decreased incidence of the disease today. The slaughter of infected animals is considered the only effective measure to reduce the impact of epidemics. In the course of an outbreak of the disease in the late 60s, more than 400,000 animals were slaughtered. In the United States, the disease is well controlled on all borders by the U.S. Department of Agriculture, which inspects all livestock, feed, and bedding and enforces strict quarantine regulations at all points of entry into this country.

Anthrax

This serious bacterial disease infects sheep, goats, cattle, horses, and humans throughout the world. Animals may die without showing any symptoms of the disease before death. The disease is transmitted via infected food or water, or it may be transferred through inhalation. Biting insects may transfer the spores which develop whenever they are exposed to air. Grazing animals often pick up the infection in pastures. Symptoms in animals include high fever and bleeding from body openings. When the disease enters the respiratory tract, the infectious organisms cause edema of the head and neck and often results in death.

Brucellosis

This disease, also known as undulant fever and Bang's disease, has been one of the most common diseases transmitted from animals to man in the past. The disease has been transmitted to man through milk, and it can also be transmitted to people who eat raw meat. The disease in humans shows the same symptoms as a case of influenza. The disease has also been transmitted from dogs to humans, but cases are rare today because a vaccine developed was widely used and has proved effective in reducing incidence of disease.

Leptospirosis

This disease is found worldwide in many animals. It is picked up in contaminated food or water. The disease causes anemia, degeneration of the liver and kidney, jaundice, and abortion. In humans, the chief symptoms are fever, muscle pain, and conjunctivitis.

Ringworm

This disease is a form of dermatomycosis that infects the skin, hair, and nails. It is caused by a fungi and is widespread among animals, and easily transmitted to man. Most often the disease has been transmitted to humans by dogs and cats, and may well occur in epidemic proportions. Control of the disease is made difficult when transmitted by cats, because they often show no signs of the infection. The disease is passed on in infective spores that can remain viable for several months. Veterinarians often suspect the disease when pet owners report that family members also have skin lesions. Though bothersome, the disease is not a threat to life or general well-being and proper treatment can bring about relief and a cure.
Salmonellosis

This disease is caused by many different species, some of which cause typhoid fever, dysentery, and various forms of food poisoning. It can result in septicemia (blood poisoning) and enteritis (intestinal infection). Beginning symptoms are fever and diarrhea, and the disease is likely to become very serious. These diseases infect all animals, but are most prevalent in turkeys, chickens, cattle, and swine. Causative bacteria are often found in dogs and cats, which show no ill effects from the bacteria. The disease has become more common as the livestock production has increased over the years. Groups of patrons in restaurants and fast food purveyors have become infected from time to time, which has led to revisions in food inspection procedures by federal and state authorities. In certain cases, toxins in the blood of a victim can be very disabling, cause shock, and result in death.

Leptospirosis

Though the causative organism for this disease is carried by cats, pigs, and horses, the chief agent responsible for infecting humans is the rat. Occupational workers who work in rat-infested environments are the people most likely to contract the disease. Handlers of infected dogs are also exposed to the causative organism. The disease is transmitted from the urine of infected animals, and the organisms enter the body through the eyes, nose, mouth, or a break in the skin. Vaccines are available for the control of leptospirosis, but are not used widely.

Cat Scratch Fever

Although cats are known to transmit this disease, the method of passing the disease to humans is unknown. Cat scratches are the suspected cause. The infection causes localized painful swelling of the lymph nodes in humans, although cats do not appear to suffer ill effects from the disease. Cat scratch fever is a relatively mild and uncommon disease.

Lyme Disease

This disease has appeared most often in the north, east, and midwestern United States. Lyme disease is transmitted by the deer tick. White-tailed deer and white-footed mice are the main carriers. The ticks are picked up in grassy or wooded areas by attaching to anything that brushes against them. Animals can be covered with ticks and not be bothered by them since the tick bite creates very little sensation. Symptoms of the disease are fever, pain, and swelling in the joints, causing lameness, listlessness, and inflammation around the bite. Antitick serum is used in treatment of the disease and a vaccine is available for prevention. Vaccination of dogs and puppies is sometimes recommended by veterinarians in the spring and fall in areas where these ticks are prevalent. Since Lyme disease attacks the muscles, it can cause paralysis in the advanced stages, and possibly death when it attacks the respiratory muscles and causes cessation in breathing.
Toxoplasmosis

This disease can be acquired by humans who come in contact with cat feces containing infective cysts. These oocysts can remain viable for as long as six months under certain conditions. Thus, cat owners are advised to use strict sanitary procedures when cleaning and disposing of cat litter, including the use of rubber gloves as a standard procedure. Children’s sand boxes can serve as a source of the infection when they are not covered when not in use, or not properly cleaned. The disease is also transmitted by dogs, rats, pigs, cows, and wild animals, and to humans who have eaten meat that was not properly cooked, failed to wash their hands after handling raw meat, or been exposed to flies and cockroaches. Symptoms of the disease include loss of appetite, coughing, diarrhea, fever, and disabling central nervous system involvement. It is an important cause of stillbirths and abortions in pigs, sheep, and goats. Diagnosis of the disease is made possible by identifying characteristic lesions and serological testing of the isolated organisms.

Step 4: Other Infectious Animal Diseases

Now we will consider other contagious diseases that are not transmittable to man, but are highly contagious and warrant isolation and quarantine conditions when animals are infected. These are generally of great concern in animal hospitals because when appropriate handling and isolation techniques are not employed, many animals in the health care facility are likely to become infected.

Canine Distemper

This is a highly contagious disease in dogs that attacks the skin, respiratory tract, intestinal tract, and brain. It is a viral disease characterized by fever, loss of appetite, dehydration, vomiting, and diarrhea. There may be a pus discharge from the nose and eyes, and abscesses on the dog’s skin. In advanced stages, there is likely to be brain damage, blindness, and paralysis. There is a vaccination against this disease that is generally recommended by veterinarians. Annual booster shots are required for continued immunity against the disease. The infectious organisms are carried in minute droplets in the respiratory system and therefore can be transmitted by inhalation. The disease is prevalent with puppies and is usually fatal for them; immediate treatment with distemper antiserum and antibiotics may prevent fatality, but there are often after-effects which will plague the animal throughout its life. When distemper goes untreated, it is nearly always fatal.

Feline Panleukopenia

This disease is also called feline distemper or infectious enteritis. It can infect all members of the cat family and the raccoon. The virus is in all secretions and excretions of the infected animals. The disease spreads by direct contact or contact with any materials that have absorbed the organism. Animals contracting the disease experience loss of appetite, depression, and weakness. Diarrhea and vomiting may occur after the first day. Kittens with the acute disease die within twelve hours of the onset of symptoms and the rate of mortality is high in all cats with the disease. Vaccinations are available to prevent infection and are recommended for kittens within the first ten weeks of life. In older cats, the prognosis for survival is good if the cat survives the first seven days of the disease.
**Canine Parvovirus**

This disease attacks the cells in the gastrointestinal tract and the heart and affects most of the vital functions of dogs. It is highly contagious and is transmitted by direct contact with an infected dog’s saliva, feces, vomit, hair, or feet. It can also be transmitted via contaminated clothing, cages, or animal bedding. The symptoms include high fever, diarrhea and bowel distress, and vomiting followed by dehydration. Infected dogs also experience loss of balance and labored breathing which leads to eventual collapse. Treatment includes antibiotics to stop secondary infections and administration of fluids. Parvovirus can be prevented with vaccinations and annual boosters.

**Kennel Cough**

This is generally a mild disease of the throat and bronchial tubes, but can develop into a severe pneumonia, usually in younger dogs. The disease is similar to the common cold. It is highly contagious and of great concern and is likely to spread in animal hospitals, especially in overcrowded conditions. A harsh dry cough that leads to gagging and sometimes vomiting are symptoms of the disease. Fever may be present but is not common. Treatments for infectious tracheobronchitis are often helpful, but the cough is very persistent. The goal of veterinarians treating kennel cough is to prevent it from advancing to bronchitis or pneumonia.

**Infectious Canine Hepatitis**

This viral infection can range from a mild affliction to a systemic disease that results in fatality in the victim. The disease is most common in younger animals. It is transmitted to dogs who come in contact with the urine of infected animals. Symptoms include listlessness, fever, vomiting, loss of appetite, discharges from the eyes and nose, and excessive thirst. The corneas of the eyes may become cloudy after two weeks, when other symptoms have disappeared. Infectious canine hepatitis can be prevented with a vaccine.

**Step 5: Euthanasia**

Euthanasia has been defined by the American Veterinary Medical Association as “the act of inducing painless death.” It is not a pleasant subject. There is considerable disagreement among animal health professionals, many animal organizations, and the general public at large, as to when and under what circumstances euthanasia should be applied. There are three general circumstances under which euthanasia is used. The first is when animals become old and diseased, the prognosis is that no more can be done for them, and that they will only experience continued pain and suffering and be subject to a miserable existence while they continue to live. The second circumstance arises in the case of communicable diseases, when infected animals are put to sleep to avoid an epizootic (an animal epidemic) which would spread to a large number of animals. The third situation in which euthanasia is applied is when it is reasoned that there are just too many animals to be fed and cared for, and that the numbers of these creatures must be reduced in order to maintain healthy living conditions for them.
Deciding When to Say Good-Bye to a Pet

When a pet owner has an old, infirm dog, crippled by dysplasia, blind, and frequently disabled by a cough and appearing to be in discomfort much of the time, the animal will likely be taken to a veterinarian. The owner will be given alternative courses of action that may be taken. When there is no prognosis for improvement with continued treatments or medications, euthanasia is one of the alternatives that may be mentioned. The owner must make the decision on what course of action to take, and may choose euthanasia when there is no apparent way to provide relief for the animal. The owner is under no legal obligation to keep the animal alive in the distressed condition. This is often a highly emotional and stressful situation. The veterinarian and the clinic staff will usually be very considerate of the pet owner’s feelings, and will try to provide advice and comfort to deal with an unhappy situation. If the owner decides on euthanasia, he or she is asked to sign a release, and the veterinarian performs that unhappy service. This is a situation that occurs on occasion in veterinary clinics. The release form is necessary because if the owner has a change of heart and mind in this very emotional setting, the veterinarian must be able to document the treatments, the deliberations, and the decision.

Euthanasia for Disease Control

The second circumstance where euthanasia is applied is usually done by public health authorities to control and limit disease. The best example is the spread of foot and mouth disease with cattle. There have been several occasions—worldwide—when hundreds or thousands of animals were destroyed to prevent further spread of the disease. These are what are called epizootic conditions. It also occurs when an animal is considered to be a menace to the community in certain cases of biting dogs or rabid animals. Many communities have drafted laws that detail situations where euthanasia is called for.

Euthanasia for Protecting the General Health and Welfare

The third situation in which euthanasia is applied is also carried out by public health authorities. This is the most controversial area of euthanasia. Most communities in our country have public animal shelters or “animal pounds,” as they are sometimes called. Local laws regulate their operation. They have limited space and limited budgets to carry out their assigned activities. They operate in conjunction with the animal wardens who have the job of enforcing the animal laws of the community. It is their task to enforce the licensing laws and take animals into custody that are strays or abandoned, or in violation of the animal laws of the community. These animals are housed in the public animal shelter. With their limited space and resources, they can only hold and care for a limited number of animals. Although they usually recruit many volunteers—including veterinarians—who help to tend to the animals, they usually have more animals than can be properly housed. Many of these animal shelters conduct extensive campaigns to urge citizens to adopt the pets for very minimal fees. They also actively promote the neutering of animals to hold down the population. Yet they will still have more lost and abandoned animals than they can provide for. Under local laws, usually, the animals that are not adopted or can be taken care of are subject to euthanasia.
This situation has been relieved to an extent by many animal volunteer organizations such as the various animal rescue leagues and others that work actively to find homes for the animals. In some cases, they take the pets into their homes, and in others they act like brokers and try to find homes for the pets. But even with all of the volunteers, the animal shelters will still wind up with more animals than they can care for. In accordance with their local laws, therefore, the animals that cannot be accommodated are subject to euthanasia. The local law will often read—“any animal taken into custody which has not been claimed or adopted after a period of six weeks (the time period varies among communities) will be subject to euthanasia.” This condition exists because there are too many people who abandon animals or do not take proper care of them. As a result, there are many excellent and lovable pets that are adopted from animal shelters, and many more that will not be given the right to continue living because of uncaring and inconsiderate owners.

**Methods of Euthanasia**

There are several different methods of euthanasia that have been used over the years. They all result in a painless death and are selected by the various agencies and veterinarians based on their preferences, facilities, and what they feel is the most painless and least objectionable. These methods include electrocution, lethal gases, oral overdose of barbiturates, and lethal injection. The method most often applied today is lethal injection. Once again, we need to emphasize, euthanasia is not a pleasant topic. It is definitely unpleasant for an animal health care worker to assist in the process of taking in an animal that will become a euthanasia victim. There is no solace in trying to rationalize the process by asking the moral question, “How will the animal suffer least, by staying alive or through euthanasia?”

**Step 6: Progress Check 32-1**

Answer the following questions by writing your answers on scratch paper.

1. **What epizootic has occurred several times throughout history, spreading through wide areas, and requiring the destruction of thousands of diseased animals?**

2. **What doctor discovered evidence that a disease could be transmitted from animals to man, and developed the first vaccine?**

3. **What federal agency is at the forefront in fighting animal diseases?**

4. **One of the primary reasons for the transfer of diseases to animals in the United States has been _____.**

5. **Which levels of government enforce quarantine regulations?**

6. **What are four of the main tasks that county and city animal health agencies perform**

7. **What are zoonoses?**

8. **What respiratory disease has been common to people who work with and handle birds?**
9. What disease has been a scourge throughout history, at several different times infecting thousands of cattle over wide areas?

10. What zoonoses can be transmitted to people who ingest infected milk, food, or water?

11. What four infectious diseases common to dogs, which are not zoonoses, are treated by veterinarians on a regular basis?

12. What cat disease is the feline equivalent to canine distemper?

13. What highly infectious disease is carried by the deer tick?

14. What dog disease attacks the gastrointestinal tract and heart, and affects the animal's most vital functions?

15. What canine disease is similar to the common cold?

16. What are three reasons given for the use of euthanasia?

**Step 7: Answers to Progress Check 32-1**

Check your answers with the answer key at the back of this book. Correct any errors you may have made.

**Step 8: Lesson Summary**

The quarantine of animals with infectious diseases has been a very effective method of controlling diseases throughout history. By use of this technique—coupled with vaccinations in more recent times—several animal diseases have been all but eliminated in the United States. Three of these are glanders, tuberculosis, and psittacosis.

Some diseases that cause the greatest concern are the zoonoses, or the diseases that can be transmitted from animal to man. Although there are over 150 zoonoses, many of them do not exist in at this time in the United States, and many that do are quite rare. The ones that do exist in this country pose a great threat to the people infected but because they are closely monitored, they are rare.

The chief method of infection of animals has been the importation of diseased animals into this country. Today’s quarantine and vaccination laws are strictly enforced at all ports of entry by appropriate government authorities, which has created a very healthy environment for animals in this country. Health authorities at all levels of government participate in enforcing the laws which have allowed America to keep animal diseases under control.

Many zoonoses and several other infectious diseases were discussed in this lesson. These are not to be committed to memory; rather this lesson should be used as a reference source when needed.
The final topic in the lesson was euthanasia. This is a very controversial issue, and there are various people and animal organizations that oppose some or many of the current practices. Authorities who manage animal facilities with often more animals than they can care for have not managed to find any alternative methods of dealing with their problems.

Congratulations!

You have completed Lesson 32. When you feel confident that you have mastered the instruction in this lesson, please go on to the next lesson.
Dental care for animals has advanced greatly in recent years. It used to be that the most common dental procedure for ailing teeth in most animals was extraction, or the removal of an ailing tooth. Today, more attempts are made to save teeth, and many of the procedures used in human dentistry are now used more often on animals.

Dental care for animals and humans begins with prophylaxis. This is preventative care which includes scaling and polishing (cleaning the teeth), and recommended home procedures for animal owners which include certain diets for animals and brushing the teeth.

In addition to prophylaxis, dental care for animals today includes treating diseased gum tissues, correcting tooth alignment problems, making and fitting artificial teeth or dentures, performing surgical operations on the mouth or jaw, filling teeth or inserting crowns, and extracting teeth when necessary.

Although most pet owners do not seek out regular dental care for their animals, veterinarians do become involved in dental care when an animal is brought in with a dental problem, or when a regular examination of an animal reveals the need for dental care.

When you have completed the instruction in this lesson, you will be able to:

- Recognize signs of dental distress that animals display when they have dental problems.
- Identify the most common problems that animals have with their teeth.
- Recognize the most common dental treatments given in animal care.
- Determine the steps taken in dental prophylaxis.
- Identify the structure and the types of animal teeth.
- Identify the methods of treating diseased gums.
- Recognize the specialties in animal dentistry.
Step 3: Frequently Used Terms in Animal Dentistry

The following terms relating to dental care are frequently used in animal health care facilities:

**Alveolus**: The little socket in which the tooth is embedded in the jaw.

**Caries**: A destructive disease of teeth that starts with the enamel and dissolves inorganic components. Commonly referred to as tooth decay. Usually treated by removing diseased portions and filling the tooth or making and fitting a crown over it.

**Cementum**: A layer of modified bone which covers the dentin of the root and neck of a tooth and blends with the fibers of the periodontal membrane.

**Crown**: The upper mostly visible part of a tooth which is covered with enamel. Crown also refers to the artificial cap that is placed over a tooth to restore it as a working tooth when it has become diseased.

**Deciduous Teeth**: The “baby teeth,” or the first set of teeth to develop in humans and animals. At various points in time, they dissolve or fall out and are replaced by the permanent teeth.

**Dentin**: The ivory substance forming the mass of the tooth below the enamel.

**Floating the teeth**: A treatment designed to correct occlusion problems, primarily in horses and cows. A rasp-like instrument is used to file or “float” tooth surfaces.

**Enamel**: The hard, glistening substance covering the exposed portion of the tooth composed mostly of an inorganic substance with small amounts of carbon, magnesium, and fluoride.

**Endodontics**: A specialty field of animal dental care that deals with the inside of the tooth. A root canal procedure is one example of this field.

**Fistula**: An infectious discharge originating at an infected tooth which finds a pathway to the surface of a dog’s or cat’s face just below the eye for release of the bacteria-laden pus.

**Gingiva**: The gum; dense fibrous tissue that envelops the inner jaws and surrounds the necks of the teeth.

**Gingival Sulcus**: The little “V” shaped crevice where the top of the gum meets the tooth. Usually this crevice measures from one to three millimeters. If it becomes deeper, it is a sign of a disease condition.

**Gingivitis**: Inflammation of the borders of the gums (gingiva). The affected portions change from pink to red or purple, and the gums bleed easily. This is the first stage of periodontal disease.

**Malocclusion**: Deviations from effective contact of opposing teeth; the top teeth do not properly meet the bottom teeth in the chewing action, which causes eating disorders that prevent normal, healthy development.

**Mastication**: The act of chewing and mixing food in the mouth with saliva, which is the first step in the digestive process.

**Oclusion**: Contact between the chewing surfaces of the upper and lower teeth.
Orthodontics: A specialty field of animal dental care that deals with malocclusion and irregularities of teeth. When the teeth of the upper and lower jaws do not meet properly, animals can have feeding problems which threaten their general health and welfare.

Periodontal Disease: Inflammation of the structures around the tooth which causes bleeding of the gums, loosened teeth, and eventually loss of teeth. Periodontal disease is caused by plaque.

Periodontics: A specialty field of animal dental care that treats the structures supporting the teeth and is most often concerned with diseased gums.

Periodontitis: Inflammation of the structures around the tooth; also referred to as periodontal disease.

Permanent Teeth: The second set of teeth which the animal will have throughout its life.

Plaque: The white, slippery film that collects on the tooth at just above and below the gumline. It is made up of bacteria, food debris, white cells, and other substances. When allowed to collect on the teeth, it will form into calculus (tartar).

Prophylaxis: Preventative dental care which includes teeth cleaning (scaling and polishing), and often includes recommended diets and home care such as brushing.

Pulp: Occupies the inner part of the tooth below the gumline in the root, and contains the nerves and blood vessels.

Pyorrhea: Infected gum tissues with a discharge of virulent materials. Used to a greater extent in past years to describe gum disease; today it is more often referred to as periodontal disease.

Restorative Dentistry: A specialty field of animal dental care that rebuilds teeth with artificial substances including fillings, crowns, dentures, and artificial teeth.

Root: The bottom portion of the tooth (below the gumline) which contains the nerves, blood vessels, and other structures necessary to support the tooth.

Root Canal: A dental treatment which involves removal of diseased portions of the root and replacement with an artificial substance.

Scaling: Scaling is the process of scraping teeth with dental instruments to remove tartar and other debris. The process of cleaning teeth is made up of scaling and polishing.

Tartar: The common term for calculus: a white, yellow, or brownish deposit at and below the gumline.
The Three Types of Animal Teeth

Animals have three types of teeth, and the design of each of the types is suited to fulfill a different purpose. The three types are:

1. **Incisors** - These are the cutting teeth with flat sharp edges. They are positioned in the front of the mouth and do the job of grasping and cutting food. Different species of animals will have varying numbers of incisors.

2. **Canines** - These are pointed fang-like structures that are prominent in carnivores. They are used to rip and tear food, and are also important in defense (or offense) and capable of inflicting deep puncture wounds. Normally meat-eaters have four canine teeth, one on the left and one on the right, in both the upper and lower jaws.

3. **Molars and Premolars** - These are the chewing or grinding teeth. They are flat-bodied structures with outer ridges that are suited to chewing and mashing food when the top jaws clamp down and force the top molars against the bottom ones to exert broad force in a chewing action. The premolars are smaller than the molars, but have the same basic shape and structure as the molars.

Each of the types of teeth take on slightly different forms in the various species, suited to the function that best provides for nutrition and survival. Carnivores, the meat eaters, have long and sharp teeth which are advantageous in catching prey, tearing it into pieces, and then digesting it. Herbivores (horses and cows) live on hay, grasses, and grains that require extensive chewing (grinding) before the food can be properly digested. Their large, flat molars and premolars accomplish the grinding task. Omnivores, the animals that survive with a mixture of meat and food from plants, have teeth of both types that are not as well developed for the “cutting and tearing” and the “grinding” functions as the teeth of the other animals. It is interesting to note that the chewing and grinding action is very important to cows and horses, and when dental problems prevent them from doing so, they can’t digest their food properly. Dogs, on the other hand, will swallow portions of their food whole, without extensive mastication, with no ill effect to their digestion.

The following table shows the number of each of the types of teeth that various animals have, and at what age the teeth erupt. Included are the deciduous teeth which are somewhat smaller than the permanent teeth and erupt first, of course, before they are later replaced. In the table, C stands for canine tooth, I stands for incisor, P stands for premolar, and M stands for molar.

The letter “d” following the above designations indicates “deciduous.” The last number in the first column shows the tooth to be the first, second, or third of that type. Keep in mind also that the chart represents developing teeth on one side of the upper or lower jaw; therefore, four teeth would develop for every one shown in the table unless otherwise noted.
## Development of Teeth in Animals

<table>
<thead>
<tr>
<th></th>
<th>Dog</th>
<th>Cat</th>
<th>Horse</th>
<th>Cow</th>
<th>Sheep/Goat</th>
<th>Pig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Id 1</td>
<td>4-5 wk</td>
<td>2-3 wk</td>
<td>0-1 wk</td>
<td>pre birth</td>
<td>1-2 wk</td>
<td>2-4 wk</td>
</tr>
<tr>
<td>Id 2</td>
<td>4-5 wk</td>
<td>3-4 wk</td>
<td>4-6 wk</td>
<td>pre birth</td>
<td>1-2 wk</td>
<td>6-12 wk</td>
</tr>
<tr>
<td>Id 3</td>
<td>5-6 wk</td>
<td>3-4 wk</td>
<td>6-9 mo</td>
<td>0-1 wk</td>
<td>2-3 wk</td>
<td>pre birth</td>
</tr>
<tr>
<td>I 1</td>
<td>2-5 mo</td>
<td>3-4 mo</td>
<td>2½ yr</td>
<td>1½-2 yr</td>
<td>1-1½ yr</td>
<td>1 yr</td>
</tr>
<tr>
<td>I 2</td>
<td>2-5 mo</td>
<td>3½-4 mo</td>
<td>3½ yr</td>
<td>2-2½ yr</td>
<td>1½ yr</td>
<td>16-20 mo</td>
</tr>
<tr>
<td>I 3</td>
<td>4-5 mo</td>
<td>4-4½ mo</td>
<td>4½ yr</td>
<td>3 yr</td>
<td>2½-3 yr</td>
<td>8-10 mo</td>
</tr>
<tr>
<td>Cd</td>
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<td>3-4 wk</td>
<td>none</td>
<td>*0-2 wk</td>
<td>*3-4 wk</td>
<td>pre birth</td>
</tr>
<tr>
<td>C</td>
<td>5-6 mo</td>
<td>5 mo</td>
<td>4-5 yr</td>
<td>*3½-4 yr</td>
<td>*3-4 yr</td>
<td>6-10 mo</td>
</tr>
<tr>
<td>Pd 2</td>
<td>4-6 wk</td>
<td>Upr-2 mo Lwr-none</td>
<td>0-2 wk</td>
<td>0-3 wk</td>
<td>0-4 wk</td>
<td>5-7 wk</td>
</tr>
<tr>
<td>Pd 3</td>
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<td>0-3 wk</td>
<td>0-4 wk</td>
<td>1-4 wk</td>
</tr>
<tr>
<td>P 1</td>
<td>4-5 mo</td>
<td>none</td>
<td>5-6 mo</td>
<td>none</td>
<td>none</td>
<td>5 mo</td>
</tr>
<tr>
<td>P 2</td>
<td>5-6 mo</td>
<td>Upr-4-5 mo Lwr-none</td>
<td>2½ yr</td>
<td>2-2½ yr</td>
<td>1½ yr</td>
<td>12-15 mo</td>
</tr>
<tr>
<td>P 3</td>
<td>5-6 mo</td>
<td>5-6 mo</td>
<td>3 yr</td>
<td>18-30 mo</td>
<td>1½-2 yr</td>
<td>12-15 mo</td>
</tr>
<tr>
<td>P 4</td>
<td>4-5 mo</td>
<td>5-6 mo</td>
<td>3 yr</td>
<td>18-30 mo</td>
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<td>12-15 mo</td>
</tr>
<tr>
<td>M 1</td>
<td>5-6 mo</td>
<td>4-5 mo</td>
<td>9-12 mo</td>
<td>5-6 mo</td>
<td>3-5 mo</td>
<td>4-6 mo</td>
</tr>
<tr>
<td>M 2</td>
<td>6-7 mo</td>
<td>none</td>
<td>2 yr</td>
<td>1-1½ yr</td>
<td>9-12 mo</td>
<td>8-12 mo</td>
</tr>
<tr>
<td>M 3</td>
<td>6-7 mo</td>
<td>none</td>
<td>3½-4 yr</td>
<td>2-2½ yr</td>
<td>1½-2 yr</td>
<td>18-20 mo</td>
</tr>
</tbody>
</table>

*The canine tooth of ruminants is commonly counted as a fourth incisor.*

The total number of the various types of permanent teeth in the animals shown above is as follows:

## Total Number of Permanent Teeth

<table>
<thead>
<tr>
<th>Animal</th>
<th>Teeth Details</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog</td>
<td>12 incisors, 4 canine, 16 premolars, 10 molars</td>
<td>= 42 teeth</td>
</tr>
<tr>
<td>Cat</td>
<td>12 incisors, 4 canine, 10 premolars, 4 molars</td>
<td>= 30 teeth</td>
</tr>
<tr>
<td>Horse</td>
<td>12 incisors, 4 canine, 12-14 premolars, 12 molars</td>
<td>= 40-42 teeth</td>
</tr>
<tr>
<td>Cow, Sheep, and Goat</td>
<td>6 incisors, 2 canine, 12 premolars, 12 molars</td>
<td>= 32 teeth</td>
</tr>
<tr>
<td>Pig</td>
<td>12 incisors, 4 canine, 16 premolars, 12 molars</td>
<td>= 44 teeth</td>
</tr>
</tbody>
</table>
Estimating The Age Of Animals By Examining Their Teeth

It is possible to estimate the age of some animals by examining their teeth. There are three basic factors that are usually considered:

1. **The eruption of the various teeth.** In the previous tables you have seen that various teeth erupt at various ages in animals. Veterinarians can recognize the difference between deciduous and permanent teeth. The deciduous teeth are smaller and have a slightly different shape than the permanent teeth, and most animals do not develop deciduous molars. Thus, the number of deciduous and permanent teeth are an indication of age in young animals.

2. **The wear on the “cusps” of the incisors.** As an animal ages, the cusps on the incisors wear down, and in older animals they are no longer detectable.

3. **The shape of the occlusal surfaces changes with age.** As an animal ages, the chewing surface of the teeth wears down. This is especially true with large animals like horses and cows. The molars and premolars of old cows have sometimes worn down to the point that they lose efficient chewing action.

While there are other clues that help in determining age by dental examination, it is often difficult to accurately determine the age of older animals. Best guesses of an animal’s age by dental examination is made on horses. On other animals, best guesses are made when they are young, but may not be very accurate when the animals are older.

The Structure of Teeth

The composition of all teeth is basically the same, regardless of the shape of the teeth or the types of teeth. As you can see in Figure 33-1, the outer layer of the crown is made up of the very hard, glistening enamel. As you go down the tooth to the gumline and into the root area, the outer covering is cementum, a modified bone substance. Throughout the tooth, the second layer which makes up the greatest mass is composed of dentin, a hard ivory substance that is not as hard as the outer enamel or cementum. These outer layers protect the pulp cavity which houses the nerves and blood supply. Note also the periodontal membrane which is the outside layer of the gum (gingiviva) which hugs the tooth and forms the “V” shaped gingival sulcus when it reaches the gumline. This is a very critical area that veterinarians examine closely when considering dental care.

![Fig. 33-1: The structure of a tooth, showing the various layers and their components.](image-url)
Step 5: Progress Check 33-1

Answer the following questions by writing your answers on scratch paper.

1. What is caries?

2. What is the first sign of gum disease?

3. What offensive substances are removed from teeth when they are scaled and polished (cleaned)?

4. Why is proper occlusion important for animals?

5. What is the outside layer of a tooth, and what substance lies underneath it?

6. Which specialty field of dental care deals with each of the following areas?
   - Malocclusion _____
   - Gum Disease _____
   - Root Canal Repair _____
   - Dentures _____

Step 6: Answers to Progress Check 33-1

Check your answers with the answer key at the back of this book. Correct any errors you may have made.

Step 7: Signs of Dental Problems

Changes In Eating Habits and Behavior

Most of our pets are not taken to the veterinarian for regular dental checkups. Most often we discover their dental problems when they show unusual or abnormal behavior, or when they are taken to a veterinary clinic for other reasons. Then, the veterinarian may discover a dental problem or recommend dental care. With large animals, more care is taken by owners to assure that there are no dental problems. This is done not only because of concern for an animal’s health, but also because of economics. Loss of income may well result when milk cows or race horses or other animals that provide income for their owners suffer from poor health due to dental problems.

There are also a number of signs that animals may give when they are suffering from dental problems that animal owners are likely to report to their veterinarians. These include:

1. When animals experience pain from masticating.

2. When animals are extremely slow in eating, favor one side of the mouth in chewing, or are reluctant to drink cold water.
3. Intermittent chewing—starting, stopping, then starting again—or when food is dropped from the mouth after a partial chew.

4. When horses suffer pain in chewing, they may bolt their food and suffer indigestion or colic (characterized by painful abdominal spasms), or they may be reluctant to take the bit. The mastication process is very important to ruminants in the digestion process. This is not true to the same extent in dogs. Dogs tend to gulp and swallow their food without much chewing and can still manage to digest satisfactorily.

5. Unmasticated (and undigested) grain in feces.

6. Excessive salivation and blood tinged with mucus in the mouth.

7. Large animals may show a lack of desire to eat hard grain.

8. Loss of general health evidenced by loss of weight and sluggishness can also be a sign of dental problems.

9. Unusual appearance due to facial swelling about the jaws may also be a signs of dental disease.

**Dental Disease Symptoms Discovered by Examination**

When a veterinarian sees an animal for any reason, general observations are made that may reveal conditions needing attention that are different from the condition that prompted the visit. This is when a number of dental-disease conditions may be discovered. Here are some examples of symptoms that point to dental disorders:

1. Plaque on the teeth near the gumline indicating the need for prophylaxis and recommended “at-home” measures.

2. Tartar (calculus) at and below the gumline that definitely shows the need of a thorough teeth cleaning procedure.

3. Fetid (foul) breath is a sign of tooth decay and will often reveal a tooth infection.

4. Broken teeth, loose teeth, missing teeth, and irregular occlusal surfaces. The first three of these conditions are often accompanied by periodontal disease, and “poor bite” due to irregular, worn, or eroded occlusal surfaces almost certainly will lead to periodontal disease.

5. An open sore just beneath the eye may be from a mandibular fistula caused by discharge from an infected tooth root which has channeled its way to the surface of the skin.

6. Nasal discharge that may originate in an infected tooth.

7. Bleeding or receded gums. Inflamed (reddened) gums which have pulled away from the teeth create small pockets that trap bacteria and cause infections in the roots of teeth.

8. Pus from infected teeth.

9. Abnormal eruption of teeth—when deciduous teeth do not fall out before the permanent teeth erupt, which then requires extraction of the offending deciduous teeth to permit normal development.
Common Dental Disorders

The most common dental disorders among domesticated animals are periodontal disease and malocclusion. While caries (tooth decay) is not that frequent, we will mention it here because it presents a severe problem when it does occur.

Caries

This is tooth decay that results from infection in the pulp cavity of the tooth. There are a number of different ways that bacteria find openings into the pulp cavity. Tooth decay does not occur frequently in dogs because their diets are free from fermentable carbohydrates, they have an acidic pH in the mouth which is resistant to caries, and they have a very thick layer of enamel on their teeth. When they do develop caries, it may be due to a cracked tooth resulting from chewing rocks or other hard surfaces. The opening in the tooth enables bacteria to invade and cause the tooth decay. Treatment generally involves extraction, although in rare cases the veterinarian and the owner may elect to “fill the cavity” to repair the tooth. With large domesticated animals, caries is more often treated with restoration. Because the masticating process is so important in digestion for these animals, cows’ molars and premolars, which sometimes develop caries, are drilled and capped with stainless steel crowns.

Periodontal Disease

The greatest threat to the dental health of most animals is periodontal disease. It is estimated that 85 percent of dogs and cats five years of age or older have the disease. Periodontal disease is caused by plaque which is allowed to accumulate on the teeth at the gumline. The two stages of the disease are gingivitis and periodontitis.

Gingivitis

Gingivitis often becomes severe in cats and dogs at about two years of age. If it is allowed to progress unchecked it will develop into periodontitis. Gingivitis is inflammation of the marginal gum tissues induced by bacterial plaque which causes the gingiva to turn red and bleed easily. The bleeding is often noted when the animal is chewing. There is some swelling of the gums often accompanied by a discharge of pus-like material. Healthy gingiva display a tapered edge which hugs the teeth very closely. This is the point where gingivitis attacks, at the very small crevice (gingival sulcus) at the gumline. With the destruction of gum tissue, the gingival sulcus is widened and deepened, allowing pockets of bacteria to cause further havoc with the supporting tooth structures. Gingivitis can be treated and stopped with thorough teeth cleaning, above and below the gumline, and home care. Cases that do not improve with treatment should be examined further for presence of plaque and calculus.
**Periodontitis**

This is a destructive inflammatory process of the supporting structures of the teeth caused by bacterial plaque. It is an advanced stage of gingivitis driven by bacteria which destroy the gingiva, the periodontal ligament, alveolar bone, and the root cementum. It normally occurs in dogs and cats between the ages of four and six, after years of plaque and calculus accumulation. It is a devastating disease and results in permanent loss of tooth support. The second problem is that with severe periodontitis, the bacteria can find their way to other body organs and infect the lungs, liver, kidney, or heart. This disease is not reversible. Periodontitis is the primary cause for loss of teeth in dogs. In addition to thorough cleaning, periodontitis can be treated with surgical procedures that involve repositioning some gingival tissue. This is a procedure performed by specialists (periodontists) and can save teeth with as little as 25 percent of the bone tissue remaining. There are also a number of other surgical treatments by periodontists that can help to save tooth structures.

**Malocclusion**

Misalignment of the teeth or misshapen teeth do not allow an animal to cut or chew food properly. This condition occurs for three main reasons. First, it can happen when deciduous teeth are still retained after permanent teeth erupt. This causes the permanent tooth to come in alongside the deciduous tooth that should have been discarded, and occupy a different position than normal. Second, malocclusion can result from wear. The surfaces of teeth do not always wear evenly after years of chewing, sometimes leaving points or ridges that interfere with mastication. Third, malocclusion can be inherited, and when it is due to genetic reasons, the suggested remedy is to breed with different stock. This, of course, only helps future generations and does not solve the immediate problem, which will require orthodontic procedures if the condition is to be alleviated. Unless measures are taken to address malocclusion problems, injuries to the teeth may result and create openings that permit infectious bacteria to invade and cause periodontitis.

When the problem is due to retained deciduous teeth, the solution is to extract the offending baby teeth and get them out of the way. In the case of wear from years of chewing, the answer can be to float or file down points on the teeth to re-establish an even surface. A different problem is often common with old cows. The molars have worn down to the extent that they can no longer make good contact with the food during mastication. The simple answer to this problem has been to feed them moistened pellets that are more easily broken down.

Many of the measures taken to correct malocclusion involve orthodontic procedures similar to those used in human dentistry. One common procedure involves grinding a tooth down and capping it with a crown to achieve a biting surface that will enable efficient mastication. Animal orthodontists also use appliances similar to those used in human dentistry. In this case it is the animal that wears the appliance that will cause the teeth to be repositioned in the mouth to achieve a better bite.
Step 8: Prophylaxis: Professional Teeth Cleaning

Do Animals Need Dental Checkups?

Although veterinarians recommend it, most pet owners do not take their animals to the clinic for professional teeth cleaning on a regular basis—or brush their animals’ teeth at home. For animals with gingivitis, however, these are very critical procedures for the animal to retain good dental health. Animal dental authorities recommend that animals with gingivitis should have a professional cleaning every six to eight months, and that animals with severe gingivitis should have it done every three to four months—in addition to at-home brushing twice a week or so in both cases. And, for animals brought to the clinic for vaccinations, neutering, or for other reasons, many veterinarians will recommend professional teeth cleaning annually.

Professional Teeth Cleaning

One of the most valuable dental services a veterinarian can provide is professional teeth cleaning, which consists of scaling and polishing the teeth. The objective in this procedure is to rid the teeth of plaque, calculus, and any other debris.

The Pre-Examination

Before the prophylaxis is scheduled, the veterinarian often prefers to examine the oral cavity. In addition to assessing the job to be done and scheduling time for it, the veterinarian will determine if a bacterial infection is present. The veterinarian will also determine if there are missing teeth, periodontal pockets, receded gingiva, or fractured teeth. When there is evidence of bacterial infection, the animal will likely be started on antibiotic medication a few days before the appointment for scaling and polishing. When this precaution is not taken, it is possible that infectious bacteria unleashed during the process can be absorbed by the system and infect other organs.

Preparation for Scaling and Polishing

During the scaling procedure, many bacteria will become aerosolized (airborne) and be inhaled, saturate clothing, and infect other areas of the clinic if proper precautions are not taken. These precautions include protective glasses, mask, gloves, gown, and cap for the veterinarian or technician doing the cleaning procedure.

The proper sterilized instruments and supplies should also be laid out in readily available positions so they can be used immediately when needed. They include the following hand instruments, as shown in Figure 33-2:

a. Fiberglass mirror.

b. Periodontal probe - Used to gauge (measure) depth of the periodontal pocket, and also to detect irregularities under the gumline.

c. Jacquette scaler - Triangular in cross-section and sharp at the tip, designed to remove calculus with a sharp pull-stroke.
d. Curette (McCall’s) - A curved, spoon-shaped cutting surface designed to remove calculus below the gumline with a sharp pull-stroke.

e. Universal periodontal scaler - For removing calculus below the gumline.

![Image of dental tools]

Fig. 33-2: Basic prophylaxis kit.

After another inspection of the oral cavity by the veterinarian, the patient is anesthetized and a cuffed endotracheal tube is used to prevent foreign debris or liquid from entering the trachea. The patient should be positioned at a slight incline, with the nose downward to enable water to run out of the mouth while scalers are being used with irrigation.

**The Scaling and Polishing Process**

**Scaling**

When there are large amounts of calculus, chunks can be easily removed with special forceps. Electric or air-driven scalers are then generally used because they are fast and can do the job quickly. The hand scalers and curettes are used to do the scaling in areas that are difficult to reach with the mechanical scalers. When there is only a small amount of plaque and calculus, the hand scalers and curettes may be the only ones used.

Mechanical scalers require a great deal of skill and practice. The carbide burs or other tips used can be rotated at up to 25,000 rpms. They are generally used at much lower rates of speed, down to 4,000 rpms and less, for better control. One major problem is that they create a great deal of heat that can cause thermal damage to the tooth structures. Thus, continual irrigation is used for a cooling effect, the instruments are never allowed to have contact with a tooth for more than a few seconds at a time to prevent heat build-up, and they are kept moving continually. Since the mechanical scaler can only be applied in one location for a few seconds, it may have to be applied two or three times, back and forth over teeth, to remove all of the calculus and plaque.
Polishing

After the teeth have been scaled, they are polished. While polishing serves to make the teeth glisten and look better, the primary purpose is to smooth the tooth surface to eliminate any small—and even microscopic—“pits” that can collect and hold plaque. The mechanical scaling device is used with a special polishing bur. A substance called prophy paste is used to help in the polishing process, along with other polishing pastes that the veterinarian can choose from. All visible surfaces of the tooth are polished, including the top, or chewing surface.

After the polishing has been completed, a final oral cavity examination is made to assure that all plaque and calculus have been removed and there are no remaining problems. After the animal has been allowed to recover from the anesthesia it is likely that it will have soreness in the mouth for a few days, and so the pet owner is advised to feed soft foods for the better part of a week to allow the oral cavity to return to normal.

Step 9: Home Dental Care

Although the following home dental care measures are recommended for all dogs and some of them for all domesticated animals, they become necessary when animals have gingivitis or periodontitis. There are three general practices that veterinarians will recommend for dogs. The first is brushing the teeth, the second is providing chew toys, the third is controlling the diet, and the fourth is controlling the environment so that hard objects are not available to the animals.

Brushing the Teeth

Just as brushing teeth will control plaque formation in humans, it will also help animals to maintain good dental health—and often lengthen their lives as a result. For dogs with gingivitis, many veterinarians will recommend twice-a-week brushing, and sometimes more often, depending upon how severe the disease is.

For proper brushing, it is up to the veterinarian and clinic staff to explain and demonstrate how it should be done so that the pet will accept the procedure and be as comfortable as possible with it. Before starting the procedure, pet owners should handle the pet's muzzle several minutes a day to get the animal comfortable with the idea of having the muzzle manipulated. This, and the brushing, should be done at a time of day when the owner and the animal are comfortable and relaxed.

To start the brushing, the mouth should be held closed gently with one hand. The lip on one side should be lifted and the exposed teeth should be brushed on the outside surfaces with a gauze square wrapped around one finger. It is best to use a circular motion in the brushing, but a back and forth stroke is acceptable. Just brush a few teeth in the first brushing session, then increase the number of teeth brushed when the pet accepts the procedure in later sessions.

The next brushing sequence involves brushing the inside surfaces of the teeth. Gently squeezing and pushing the lips on one side between the back teeth will keep the mouth open. Pulling the head back gently will also help keep the mouth open. Brush the inside surfaces on the opposite teeth. Repeat the procedures until you’ve completed the brushing. If your animal fights your attempts, you can restrain it by wrapping it in a large bath towel or blanket with only the head of the animal exposed. The whole process should only take a couple of minutes.
Your next step is to start using toothpaste. Do not use human toothpaste or baking soda. They both contain ingredients which can be harmful to animals. Pet toothpaste is available that will be pleasant-tasting to the animal and should help to get the animal to accept the brushing activity. Finally, you can get pet toothbrushes that will enable you to accomplish the brushing more effectively. Some veterinarians recommend a soft-bristled child's toothbrush. Regular brushing plus periodic professional cleaning will help animals to maintain healthy teeth and control periodontal disease.

**Chew Toys**

Rawhide bones and other chew toys enable animals to “exercise” their teeth. This activity helps the animal to maintain good blood circulation to the roots, and the friction against the teeth helps prevent plaque formation.

![Rawhide bones and other chew toys](image)

*Fig. 33-3: Rawhide bones and other chew toys are recommended for a dog's good dental health.*

**Diet**

In addition to the nutrients that various pet foods contain, texture of the food is also a consideration that affects dental health. Semi-moist and canned dog foods are soft and tacky. They tend to stick to the teeth, and this food debris on the teeth contributes to the formation of plaque. Table scraps and other human foods are other sources that can play havoc with an animal’s dental health.

**Controlling the Environment**

Animals can find a number of ways to crack or break teeth. Dogs, for example, will often like to chew on hard objects such as rocks or other debris that they find in their outdoor environment. Animal owners can do their pets a favor by making sure that their yards are clear of the kind of debris that may prove harmful to their animals. Large animals run the same kind of risk when they munch a piece of baling wire along with the hay, or other objects in their food that can cause a broken tooth. When animals crack or break a tooth, the likely remedy is removal of the tooth. Teeth extraction is no easy chore with animals. In many cases, their roots go deeper than in humans: as much as five inches with some of the horses’ teeth. Thus, there is always danger of breaking the animal’s jaw when the extraction is not done according to strict procedures.
With horses, in fact, it may take more than one operation to extract a tooth. The first operation may consist of pulling the tooth away from the gums an inch or so, then cutting off the top part of the tooth. Then the procedure is repeated on another day, until the entire tooth can be removed.

![Fig. 33-4: Tooth extraction forceps](image)

**Step 10: Birds’ Dental (Beak) Problems**

How is it possible for birds and fowl to have dental problems when they don’t have teeth? Their crop and gizzard aid in the digestive process by grinding their food, which is done by the premolars and molars in animals that do have teeth. The dental problems that birds do have involve how the top and bottom halves of the beak fit together. A poor fit may result from uneven wear or from an accident. When the upper part of the beak does not mesh snugly with the lower part, a bird will not be able to pick up food, crack it, or handle it. Then, too, living in captivity in cages may help create a malocclusion problem since they do not have the trees and rocks which they use in their natural habitat to groom themselves. When birds do have these uneven fits, they can starve to death. Birds show symptoms of the disorder by appearing very awkward and clumsy in feeding, and show signs of frustration when attempting to feed. The remedy for this condition is to have the beak filed, clipped, and trimmed by a veterinarian so that the upper and lower halves of the beak will fit together properly. When this is done as needed, a bird can lead a normal, healthy life.

**Step 11: Progress Check 33-2**

Answer the following questions by writing your answers on scratch paper.

1. List five observations that can be made which indicate the presence of dental disease.

2. What are five symptoms of dental disease that a veterinarian looks for when examining the oral cavity?

3. What are the two periodontal diseases common in dogs and cats?

4. Which of the two periodontal diseases above is curable?

5. What condition is likely to occur when the deciduous teeth do not fall out before the permanent teeth erupt?
6. What is involved in dental prophylaxis?

7. What home care is recommended for dogs with dental problems?

8. Even though birds do not have teeth, what kind of dental problems is it possible for them to get?

**Step 12: Answers to Progress Check 33-2**

Check your answers with the answer key at the back of this book. Correct any errors you may have made.

**Step 13: Lesson Summary**

Dental care is as important for animals as it is for humans in that it can alleviate distress, help assure good nutrition, and prolong the life of the animals who are taken care of properly.

Although animals have many of the same dental problems and diseases that humans have, they experience far less tooth decay (caries) than humans do. Caries is very rare in dogs and occurs far less often in other animals than in humans. When it does occur, tooth extraction is the likely treatment, but fillings and crowns are provided for large animals when considered vital to their nutrition and when economically feasible.

The more common dental problems in animals are periodontal disease, malocclusion, and broken teeth. Periodontal disease starts with gingivitis and will advance to periodontitis if not treated properly. Treatment normally involves professional teeth cleaning—scaling and polishing—and home care—brushing and control of diet and the environment. Malocclusion is a greater problem among horses and cows than with small animals and is treated with orthodontic procedures which include floating (filing) the teeth and other orthodontic procedures. Broken teeth usually result in tooth extraction, but in rare cases restorative measures such as fillings and crowns are administered to save the teeth.

Although birds do not have teeth, they can still suffer from malocclusion. When the upper and lower halves of their beaks do not make proper contact, feeding problems are created that can result in starvation when not treated with filing and trimming measures.

Veterinary assistants will be highly involved in many phases of dental care and treatments in the many veterinary clinics and hospitals that do professional teeth cleaning, malocclusion treatments, and extractions, and are likely to offer some other dental treatments along with the administration of antibiotics to fight dental infections. Knowledge of these conditions and procedures, plus the knowledge of how to carry out recommended home care, can be great assets to a veterinary assistant.

**Step 14: Mail-In Quiz #11**

- Be sure you have mastered the instruction in Lessons 31, 32, and 33.
- Mark your answers on these examination pages.
- When you have finished, TRANSFER YOUR ANSWERS TO THE ANSWER SHEET PROVIDED. Use blue or black ink on your Answer Sheet. Do not use red ink.
- Mail the Answer Sheet to the school in one of the envelopes provided. Your quiz results will be mailed to you.
MULTIPLE CHOICE: Select the BEST single answer for each of the following items:

1. Actually, a urinometer will give you the reading of the _____ of an animal’s urine.
   a. bacteria percentage
   b. specific gravity
   c. RBC count
   d. ammonia percentage

2. If you are using a microscope with an eyepiece lens of 5X magnification and an objective lens of 40X magnification, what is the total magnification you would get?
   a. 40 diameters
   b. 100 diameters
   c. 200 diameters
   d. 400 diameters

3. In a pH dipstick test on a dog’s urine, what color would the paper strip turn if the urine was normal?
   a. Blue.
   b. Red.
   c. Green.
   d. Orange.

4. After use, disposable needles should be _____.
   a. placed in a puncture-resistant refuse container
   b. bent or broken, then disposed of
   c. recapped, then disposed of
   d. placed in a plastic bag before disposal

5. What kind of blood examination will give a good indication of a body’s response to disease?
   a. An RBC count.
   b. A WBC count and a differential WBC count.
   c. A blood platelet count.
   d. A measurement of the volume of blood plasma.

6. In which of the following urine collection methods would the veterinary assistant be most likely to collect the sample?
   a. Injection.
   b. Clean catch.
   c. Catheterization.
   d. Bladder expression.
7. When urine, blood, or fecal samples cannot be analyzed soon after collection, they should be stored _____.
   a. at room temperature
   b. in a refrigerator
   c. in a freezer
   d. in a heated room

8. The usual purpose for collecting a fecal sample is to examine for _____.
   a. internal parasites
   b. external parasites
   c. anemia
   d. bladder dysfunction

9. Why is a drop of mineral oil place on the knife blade when doing a skin scraping to obtain a laboratory specimen?
   a. To reduce the pain for the animal.
   b. To ease the transfer of the specimen to a slide.
   c. To lubricate the lesion being scraped.
   d. To protect the veterinarian from splatter.

10. Which of the following diseases is classified as one of the zoonoses?
    a. Hepatitis.
    b. Panleukopenia.
    c. Distemper.
    d. Tuberculosis.

11. Rabies is transmitted to humans from the diseased animal’s _____.
    a. blood
    b. saliva
    c. urine
    d. feces

12. What percentage of the rural human population of the world is estimated to suffer from animal diseases?
    a. 10%
    b. 25%
    c. 50%
    d. 75%
13. What is the difference between furious rabies and dumb rabies?
   a. If not treated, furious rabies results in death of the victim; in dumb rabies it does not.
   b. Animals with furious rabies are hyperactive, while those with dumb rabies remain quiet.
   c. Dumb rabies can be treated; there is no effective cure for furious rabies.
   d. Only dogs carry furious rabies; foxes, skunks, and raccoons carry dumb rabies.

14. Which of the following diseases cannot be prevented by vaccination?
   a. Canine distemper.
   b. Cat scratch fever.
   c. Canine parvovirus.
   d. Rabies.

15. Which of the following diseases can be transmitted to humans who ingest infected food, milk, or water?
   a. Brucellosis.
   b. Leptospirosis
   c. Salmonellosis.
   d. All of the above.

16. Why do public officials consider euthanasia to be necessary in animal shelters?
   a. For quarantine purposes.
   b. To prevent zoonoses.
   c. To reduce the animal population to a size that can be cared for.
   d. To reduce the number of sick animals from the population.

17. The most common dental problem among animals is _____.
   a. periodontal disease
   b. caries
   c. impacted teeth
   d. deciduous teeth eruption

18. Caries is _____.
   a. a common dental disease in humans and animals
   b. prevalent in dogs, infecting about 85 percent of them over the age of six years
   c. very rare in dogs and cats
   d. never experienced by large animals
19. What dental disease is suspected when the gums are inflamed and they bleed when the animal chews?
   a. Malocclusion.
   b. Gingivitis.
   c. Caries.
   d. Impacted tooth.

20. Which of the following diseases is likely to result when there is permanent loss of tooth support?
   a. Malocclusion.
   b. Gingivitis.
   c. Periodontitis.
   d. Caries.

21. What condition is likely to occur when deciduous teeth do not fall out before permanent teeth erupt?
   a. Malocclusion.
   b. Gingivitis.
   c. Periodontitis.
   d. Impacted tooth.

22. What treatment is indicated when the condition in item 21 occurs?
   a. Scaling and polishing.
   b. Extraction of deciduous teeth.
   c. Administration of antibiotics.
   d. Extraction of permanent teeth.

23. Do animals need periodic dental checkups?
   a. Yes, it is recommended for many domesticated animals.
   b. No.
   c. Yes, but only if they are experiencing dental problems.
   d. Yes, for large animals, but checkups are not recommended for dogs and cats.

24. What attire should be worn for veterinary clinic staff members in the immediate area where an animal’s teeth are being cleaned?
   a. Cap and gown.
   b. Nose/mouth mask.
   c. Rubber gloves.
   d. All of the above.
25. **Why are an animal’s teeth polished when they are cleaned?**
   a. So they’ll look better.
   b. So the veterinarian can tell that they’ve really been cleaned.
   c. To make the tooth surfaces smooth and eliminate microscopic pits.
   d. To eliminate tartar.

**Congratulations!**

You have completed Lesson 33. When you feel confident that you have mastered the instruction in this lesson, please go on to your next lesson.
Lesson 34
Animal Feeding and Diets

Step 1: Lesson Preview

Animal feeding is a primary function of any animal care facility. Although feeding is often incidental to the primary reason that the animal is housed in the care facility, proper feeding and diets are necessary to maintain and promote the health and well-being of the animals.

There are a number of variables that determine how the veterinarian will decide what food and what portions to feed the various animals. First of all, like humans, animals require certain amounts of the various food components to maintain good health—or to regain good health when they are sick or injured. As with humans, these include proteins, carbohydrates, fats, minerals, and vitamins. Also, the nutritional requirements and recommended feedings per day vary widely for young growing animals, mature animals, old animals, pregnant animals and lactating (milk producing or nursing) bitches and queens. Then, there are other factors that enter into the picture, such as the conditions and diseases of the animals housed, including pre- and post-surgical patients, and animals that are displaying neurotic behavior because of the unfamiliar, controlled hospital environment.

And finally, another important consideration is the control and sanitation of the food, food storage areas, and feeding containers, to assure that the food is fresh and clean, and does not contain any elements that will contribute to infection, disease, and/or malnutrition. This is an area where the veterinary assistant will carry a large burden of responsibility, since this is the person who will likely be carrying out the feeding program established by the veterinarian.

Step 2: Learning Objectives for Lesson 34

When you have completed the instruction in this lesson, you will be able to:

- Assess the role that various food components play in animal health, such as proteins, carbohydrates, fats, minerals, and vitamins.
- Determine “rule-of-thumb” amounts of food per day, and number of feedings recommended per day, for cats and dogs in their various life stages.
- Understand what foods are recommended for cats and dogs, what foods do not meet their nutritional requirements, and what foods are not recommended for cats and dogs.
- Recognize the signs and symptoms of various ailments of cats and dogs that may be due to malnutrition and/or improper feeding.
- Apply appropriate food storage and sanitation measures in managing a feeding program.
Step 3: Animal Diets

Balanced diets are as important for animals as they are for humans. The right combination of foods varies from recommended diets for humans, however, and it also varies from species to species. There are also some similarities. For example, fat-rich diets result in obesity in humans and animals, and obesity is a factor in shortening life. Overfeeding of the various food components, (proteins, fats, and carbohydrates), can also cause disease conditions, and the same is true with a number of vitamin or mineral excesses or deficiencies. Also, lack of the proper nutrients in foods will result in malnutrition in people and animals.

Commercial Foods

The production of animal foods in the United States is big business. A visit to any supermarket or pet supply store will reveal a vast array of pet foods in three basic forms: dry food, canned food, and semi-moist food. The major animal food companies do intensive and continual research on foods for cats and dogs, as well as other animals. Commercial pets foods will most often provide the nutrients that cats and dogs need. Most of these companies will also produce food designed to meet the specific needs of the animals in their various life stages and conditions, such as varied formulas for puppies and kittens, old animals, etc.

Pet foods are regulated by federal and state laws, and generally these products contain the ingredients recommended by the National Research Council. This relates to the amounts of proteins, fats, carbohydrates, minerals, and vitamins contained in the food. The laws require that food labels specify the amounts of the various ingredients by weight.

Commercial pet foods come in three basic forms: canned food with a high moisture content, semi-moist foods, and dry foods. The major differences among these are cost, palatability, moisture content, and type of storage required. The table below shows a comparison of water, protein, and fat in typical commercial cat foods.

<table>
<thead>
<tr>
<th>Partial Composition of Commercial Cat Foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canned food</td>
</tr>
<tr>
<td>percent by weight</td>
</tr>
<tr>
<td>Moisture</td>
</tr>
<tr>
<td>Protein</td>
</tr>
<tr>
<td>Fat</td>
</tr>
</tbody>
</table>

While it appears that canned food has a lower percentage of protein than the others, the relative percentages of protein are much closer when the moisture factor is eliminated. Thus, the three types of food are comparable in terms of the basic ingredients contained. Canned food is the most palatable of the three, semi-moist is second best, and the dry food is the least palatable. Taste of the dry food can be enhanced by adding water to the food, which releases the aroma of the food when stirred in. For animals that will not eat dry food, a combination of dry and canned food is often used. Dry food is the least expensive of the three, semi-moist next, and canned food is the most expensive. Dry and semi-moist foods do not require refrigeration after opening like the canned food does, but should be kept in closed containers, and not in the original paper packaging. Dry food will still lose its nutritive value, however, if kept for three months or longer. In terms of the calories per ounce, dry food has the most, semi-moist comes in second, and canned food has the lowest (which is due to the large percentage of water in the canned food).
Food Ingredients

Pet foods produced by major companies are intended to contain all of the ingredients to provide balanced diets for the particular animals served. This includes the ingredients recommended by the National Research Council. Thus, the recommended amounts of protein, fat, carbohydrates, minerals, and vitamins are usually contained in these foods.

Proteins

These contain the essential substances for growth, tissue building, and repair of the body. Meat, poultry, and fish are the major sources of protein, and there are also a number of proteins from plants. They exist in the form of amino acids, over 20 of which are required for good nutrition. Too much protein, however, can cause kidney problems, while an inadequate amount may cause loss of body weight, anemia, and susceptibility to disease. Then, there are a number of proteins which are difficult to digest. The National Research Council recommends 22 percent in dry dog food for adult dogs, and around 30 percent for growing puppies. Increased amounts of protein are also required for gestating or lactating bitches, and for patients recovering from surgery or an illness. Strangely enough, if the protein level of the food is too low, dogs will often refuse to eat it.

As noted earlier, the proper balanced diet varies by species; thus there are important differences in the recommended formulas for dogs and cats. Cats are more closely true carnivores than are dogs, and thus require a heavier concentration of protein in their diets than dogs do. In addition, cats require taurine in their diet while dogs do not. Taurine is an essential amino acid, (a building block of protein), and a diet deficient in taurine can result in blindness or heart problems for cats. Dogs, on the other hand, can experience health problems when there is a steady ration of taurine in their diets. The bottom line, therefore, is that in order to maintain good health, cats should be fed cat food, and dogs should be fed dog food. Health problems are the likely result when these animals are not fed on diets which satisfy their specific needs.

Fats

These provide a concentrated source of energy and are a necessary component in the diets of dogs and cats. They release nearly twice the amount of energy per unit of weight than either proteins or carbohydrates do. Sources of fats are butter, margarine, lard, visible fats in meat, substances in nuts, and other foods. Once again, cats require a higher percentage of fats in their diets than dogs do, with dogs requiring about 5 percent of their food intake in fats and cats requiring close to twice that amount. Another advantage of fats in the diet is that they add to the palatability of the food. The “gourmet” cat foods on the market taste better to the animals than the regular cat foods because they have a higher percentage of fats. When there is too much fat in the diets of cats and dogs, the result is obesity, since fat in excess of the amount required for metabolism is stored in the body and becomes a layer of fat. Obesity is a serious deterrent to good health in cats and dogs, rendering these animals susceptible to a number of diseases, in addition to shortening their longevity. Obese animals are prone to have cardiac disorders, digestive problems, heat stroke, degenerative arthritis, skin diseases, and dystocia (difficult delivery). Frequent diarrhea is another common result when cats and dogs are offered overly rich fat portions. Another problem that results when animals are fed an overly rich fat diet is that they tend to refuse to eat regular foods when their diets are changed.
Carbohydrates

There is no known dietary requirement for either cats or dogs. It is held that dogs and cats can maintain a good dietary balance without carbohydrates when enough fat or protein is provided from which glucose can be derived. Carbohydrates are the major constituents of most plants, and the major sources of carbohydrates in food are sugars and starches.

Minerals

A number of minerals are important components of animal diets. Calcium and phosphorus contribute to the hardness of bones and teeth. Calcium is also a factor in blood clotting and important for the nervous system. Potassium is required for functions within cells and for muscle metabolism. A deficiency will cause weakness, poor growth, and lesions of the heart and kidneys. Sodium and chloride are also required parts of animal diets, usually in the form of salt (sodium chloride). Magnesium is found in soft tissues and bone, and is important to the heart, skeletal muscles, and nervous tissues. In addition to the above, trace amounts of iron, copper, manganese, zinc, iodine, selenium, and cobalt are important in animal diets. Diseases and disorders that can be caused by mineral deficiencies in dogs are as follows:

- **Calcium/Phosphorus** - Rickets, soft bones, parathyroidism.
- **Iron** - Anemia.
- **Copper** - Anemia, skeletal disorders.
- **Magnesium** - Neuromuscular irritability.
- **Zinc** - Dermatoses, reproductive failure, growth retardation.
- **Iodine** - Goiter, growth retardation, reproductive failure, poor hair coat, anemia.
- **Selenium** - Muscular disorders.
- **Manganese** - Growth retardation, reproductive failure, improper bone formation.
- **Molybdenum** - Growth retardation.
- **Sulfur** - Growth retardation.
- **Cobalt** - Anemia.

As you can see, even when there are trace amounts of minerals required in the diet, lack of the mineral can still cause disorders. And, excesses of certain minerals can also cause problems. Excesses of copper or selenium, for example, can cause toxic hepatitis, and excesses of fluorine can cause mottling of tooth enamel, reproductive failure, and skeletal abnormalities.
Vitamins

Just as in human diets, vitamins are also required in animal diets. Vitamins do not supply energy, but they are necessary for growth and the maintenance of life. When animals are getting a well-balanced diet, they receive all the vitamins they need in their food. There may be special circumstances, however, when the veterinarian will recommend dosages of vitamins, such as during pregnancy, lactation and weaning, or for young animals in high growth periods, and for animals recuperating from surgery or disease.

There are two groups of vitamins: those that are fat soluble, and those that are water soluble. The chief difference between the two types is that the fat soluble vitamins can be stored in the body, while the water soluble vitamins dissipate and are not stored. This means that the animals’ diets must include water soluble vitamins on a regular basis, while the fat soluble vitamins are required only at longer intervals.

Fat Soluble Vitamins

These include vitamins A, D, E, and K as follows:

- **Vitamin A** - Necessary for production of visual eye pigment, maintenance of epithelial tissues, and normal growth and reproduction. Sources of vitamin A are fish liver oils and animal livers, and green and yellow vegetables. Lack of this vitamin can result in growth retardation and reproductive failure, and breakdown of certain tissue structures.

- **Vitamin D** - This vitamin is required for normal calcium-phosphorus metabolism. Sources of the vitamin are ultraviolet light and certain plant foods. Deficiency of vitamin D can lead to rickets in a young dog, or bone softening in older dogs. Excesses of the vitamin can also cause problems in bone metabolism.

- **Vitamin E** - This vitamin is known as an antioxidant, and is important to the structure of body cell membranes. Vitamin E comes from various seed oils, and is stored in the liver and other tissues. Deficiency of the vitamin affects the muscles, the retina of the eye, and reproductive performance.

- **Vitamin K** - This vitamin is necessary in the blood coagulation process. It is manufactured by the intestines, and is abundant in green leafy vegetables. Clotting processes are dependent on vitamin K and a deficiency can lead to hemorrhaging abnormalities.

Water Soluble Vitamins

These are the vitamins which are not stored in appreciable amounts in the body. They include several of the “B” vitamins, vitamin C, and others, as follows:

- **Vitamin B₁ (Thiamin)** - This vitamin is required for amino acids and carbohydrate metabolism. It is also necessary for energy production. Meats, whole wheat, and beans are good sources of this vitamin. Deficiency of thiamin has been known to cause beriberi, but will more likely cause a number of other ailments, including certain lesions, poor reproductive performance, weight loss, loss of appetite (anorexia), retarded growth, and nerve disorders.

- **Riboflavin** - This vitamin is necessary for complex metabolic functions. It is found in fish, liver, meats, milk, soybeans, eggs, and cheese. Deficiencies of riboflavin can result in weight loss, poor appetite, weakness, dermatitis, and eye lesions.
Niacin (Nicotinic Acid) - Dietary sources of this vitamin are fish, beef, pork, poultry, yeast, and milk. This vitamin assists in the oxidation-reduction processes in the cells. Deficiency of niacin can cause a disease called Black Tongue in dogs, which results in hemorrhaging along the digestive tract. This deficiency can also cause anorexia, weight loss, and spinal cord disorders.

Vitamin B₆ (Pyridoxine) - This vitamin is another one that is involved in complex metabolic functions. Sources are fish, liver, meats, milk, whole wheat, wheat germ, and yeast. Deficiency of pyridoxine can result in anorexia, retarded growth, and weight loss.

Pantothenic Acid - This vitamin is involved in the metabolism of proteins, carbohydrates, and fats. It is available in many foodstuffs, including liver, soybeans, eggs, and cereal grains. Deficiency of pantothenic acid can result in retarded growth and decreased appetite.

Folic Acid - This vitamin is involved in a number of biochemical reactions in metabolic processes. Sources of folic acid include liver, green leafy vegetables, and legumes. Deficiencies of the vitamin can result in retarded growth and poor appetite.

Vitamin C (Ascorbic Acid) - Dogs and cats do not need a dietary source of vitamin C because they synthesize the vitamin in their bodies. There are occasions, however, when this vitamin is used in treatment for various disorders.

Vitamin B₁₂ (Cyanocobalamin) - This vitamin contains cobalt, and is required for normal DNA synthesis. Animal products and dairy products are sources of vitamin B₁₂. Deficiency can result in anemia.

Water

Water is as important as any other nutrient, and should always be available to your animals. Water does many jobs within the body, including regulation of body temperature, and aids in digestion and the transportation of nutrients in the body. To remember how essential water is in maintaining health, you need only recall that life may continue for weeks in the complete absence of food, but only for days - or under extreme conditions for just hours - when water is not available.

Common Feeding Problems

Probably because of all of the commercial animal food products available, feeding and diet does not represent a problem with the vast majority of household pets. When improper diets do become a problem, the causes are usually overfeeding or feeding animals table scraps. And when the pet gets too much of the wrong balance of foods, it is likely to be a frequent visitor to the veterinarian.

The problem with feeding table scraps is that they usually contain high percentages of fats and carbohydrates. While these are welcomed by the animals because they taste good, they do not contain the balance of ingredients that the animals need. These kinds of table scraps promote obesity in two ways. First of all, a higher amount of fats and carbohydrates promotes the formation of fat layers in the animals. Secondly, animals who are fed these “better tasting” high fat and carbohydrate diets may turn their noses up at the well-balanced commercial pet foods. Too much sugar or dairy products (such as in leftover milk and cereal from breakfast) will often cause diarrhea in the pet. Pet owners should be advised that unusual or abnormal defecating or urinating patterns are often a signal that the diet is causing a problem.
Then, also, though it is a rare occurrence, it is possible to poison a dog or cat with some foods that are palatable to humans. The best example is chocolate, which can act as a poison to dogs in any appreciable amount. A substance in chocolate (theobromine) is very toxic to dogs, especially to puppies, and any appreciable amount can lead to death. Onions and milk are other human foods that can cause digestive problems in animals. And, animals should never be fed table scraps that contain hot and spicy ingredients.

### Step 4: Progress Check 34-1

Answer the following questions by writing your answers on scratch paper.

1. What are the three basic forms of commercial dog and cat foods?
2. What are the major differences among the above foods?
3. How can the taste of dry dog food be enhanced so that it is more palatable and tastes better to the animal?
4. What form(s) of dog food require(s) refrigeration after the original container is opened?
5. Which nutrient is essential for growth, tissue building, and repair of the body?
6. What amino acid is required in a cat’s diet, but can cause digestive and health problems if fed to dogs?
7. How do dogs and cats compare as to their dietary requirements of proteins, fats, and carbohydrates?
8. Which of the nutritive ingredients contains the highest amount of energy per unit of weight?
9. What are the disadvantages of obesity in cats and dogs?
10. What minerals contribute to firmness and hardness of bones and teeth?
11. What mineral deficiencies can lead to anemia in cats and dogs?
12. What is a primary difference between fat-soluble and water-soluble vitamins?
13. What are the main fat-soluble vitamins?
14. What are the main water-soluble vitamins?
15. Why is it not advisable to feed dogs and cats appreciable amounts of table scraps?

### Step 5: Answers to Progress Check 34-1

Check your answers with the answer key at the back of this book. Correct any errors you may have made.
Step 6: Feeding Management

Considerations In Managing a Feeding Program

Managing and carrying out a feeding schedule in a veterinary care facility represents a big responsibility for a veterinary assistant. Imagine, for example, operating a feeding schedule in a veterinary clinic that is housing eight cats and fifteen dogs. Some of the animals may be very young and some very old. Some may be pregnant or require different diets because of various ailments or injuries, and some may be refusing any food they are given. The veterinary assistant must determine what foods to order and keep in stock, and determine how much of each will be used each day. It becomes quite a problem in logistics to figure out how to keep a needed supply of fresh foods in stock for all of the animals. So, let’s look at a number of considerations that will be used in the basic reasoning to determine how to manage the program.

Important Practices in Feeding Programs

It is the veterinarian, of course, who will determine what foods and how much should be fed to the animals each day. As we have indicated, animals require more or less food, and feedings, depending on their various life stages and conditions. It also depends on whether the veterinarian practices a free choice feeding schedule. Free choice feeding means that the animals are fed from self-feeding hoppers and can eat as much and as often as they like. This type of feeding, also referred to as ad lib feeding, or self feeding, is practiced by some pet owners as well as some veterinarians. When this is practiced, it is usually only the dry solid particle food, sometimes mixed with semi-moist food, that is used in the program. Cats and dogs will seldom overeat if they are accustomed to free choice feeding. Animals that are not accustomed to this practice may well overeat for a period of time, but later adjust and only eat the amounts that satisfy their dietary needs. It is likely, however, that some of the animals may never adjust to this practice, and will continue to overeat as long as they are being fed free choice. Special feeding hoppers to accommodate this type of feeding are available, in which a small opening at the bottom of the hopper serves as the feeding dish, and as the animal eats, more food drops into this space from the reserve supply in the hopper. Many animal care facilities favor this free choice feeding because it is less labor intensive and has certain other advantages. These include retention of a more constant level of nutrients in the blood stream and elimination of boredom for confined animals—being able to nibble on food occasionally gives the animal something to do. This practice also serves as an advantage for feeding cats according to some of the researchers who claim that cats actually like to have several small amounts of food per day rather than one or two larger feedings. When the animals are not on this self-feeding program, the amount per feeding and the number of feedings each day are determined by the veterinarian: usually one or two per day except in animals who are nursing or are in late pregnancy, and kittens and puppies who require two to four feedings per day. These animals require substantially more food than adults of their particular breeds because of the additional amounts necessary to meet growth requirements.
Whether the animals in an animal care facility are on a free choice feeding program, or if they are given one or two feedings per day, it will often be up to the veterinary assistant to keep track of the food and to initiate the order for food so that an ample supply will be continually available for the animals. One of the methods used to calculate how much food will be required is to estimate how much food will be eaten per day and then calculate how much will be needed. A rule-of-thumb that is often used for dogs is to estimate that it will require one-half pound of dry food for every 10 pounds of animal weight per day—whether the animals are on free choice feeding or given specified amounts in feedings. A 40-pound dog, therefore, would be expected to eat two pounds of food per day. Thus, if you had 15 dogs you would have to estimate the total weight of all the dogs, then multiply that figure by one-half pound to arrive at the estimated amount of food needed per day. So if the total weight of all the dogs was 450 pounds (average weight of 30 pounds per dog), then you would multiply 450 x 0.5 pounds. And the result of 22.5 pounds would be the amount of food required each day for feeding the dogs.

To apply a rule-of-thumb estimate for cats, on the other hand, you might calculate one-fourth (0.25) pound of food per 10 pounds of body weight for cats. So if you had eight cats that you estimated weighed a total of 60 pounds, you would multiply 0.25 pounds x 60 and get a total daily requirement of 15 pounds of food per day for the cats.

There are, of course, a number of other considerations you would use in calculating how much food you should keep on hand to feed the animals in the animal care facility. You would likely have to stock different types and kinds of foods to accommodate different tastes and appetites. Also, surgical patients and animals with various ailments may well require special diets.

**Feeding Puppies**

From birth until midway into the fourth week of life, puppies get all of their nutrition from the dam's milk. They can then begin to supplement the milk with solid food, generally canned or semi-moist food, until they are weaned at about the seventh week of life. Most puppies will be completely weaned at five to six weeks of age, and none should take longer than eight weeks. Then, since puppies need nutrition for body maintenance and growth, it is important that they get the necessary amount of food. This is accomplished with three to four feedings per day, until they reach half of their adult weight, at about four months. Then the feedings can be decreased to two or three per day until the age of six months. After that, puppies should still be fed twice a day until they are a year old, at which point the feedings can be reduced to one per day. The basic reason that puppies require multiple daily feedings while adults can thrive on a single daily feeding is that the puppy cannot eat enough food at a single feeding to satisfy maintenance and growth requirements. Dry food should be mixed in with the canned or semi-moist food as the puppy grows, until at the choice of the veterinarian, most or all of the diet can consist of the dry food. It should also be kept in mind that each animal is a unique individual, with individual tastes and appetites. There are often wide variations in the amounts and types of commercial foods that are preferred by animals.

One of the most common problems in feeding animals is overfeeding, which can easily lead to obesity. This is certainly true with puppies, and some authorities feel that free choice feeding with puppies will lead to overfeeding and obesity.
Veterinary Assistant

Feeding Adult Dogs
After the first year of life, a dog becomes an adult and no longer needs extra nutrition to meet growth requirements. At this point it will get along just fine on one feeding a day. A number of veterinarians suggest two feedings per day throughout life, however, since they feel that this schedule reduces begging for food, results in less gulping of food and ravenous eating, and that the dog is better able to digest the food eaten.

Feeding Older Dogs
Older dogs are normally less active than their younger counterparts and will therefore require less food. Also, their digestion process is not as efficient as when they were younger and they are not able to digest protein as well as they were earlier. Thus, not only should the amounts of food be carefully regulated, but their diets should also be changed from what they were. There are several commercial dog foods on the market for older dogs that have less protein and other variations in the formulas to meet their needs. A good question to ask is, “how old should the dog be before the diet is changed?” The answer will vary depending on the activity of the animal and the breed. A dog may be considered old when it reaches seven or eight. Smaller breeds will normally have longer life spans than the larger dogs and thus do not become “old” until later. How active and mobile the dog is will give you a key as to whether it should be considered to be an old dog.

Another variation in feeding that is recommended for older dogs is to increase their daily feedings from one to two per day unless, of course, they are on free choice feeding. The smaller portions at two feedings will enable the animals to better digest their foods.

Feeding Pregnant and Lactating Bitches
Just as puppies require more food and more frequent feedings than adult dogs of their size to provide for the growth period, pregnant and lactating bitches will also require more food and more frequent feedings to provide for the growth of the unborns and the newborns. Beginning in the fifth week of pregnancy, the food should be increased by 20 percent. Then, as the pregnancy progresses, it should be increased to 50 percent more than normal up to the time of delivery. The additional food should be higher in protein than the dog’s normal diet. Also, during this period the number of feedings per day should be changed from one to two or three which will assist the bitch in being able to digest her food better.

The diet should be light in the first week after the puppies are born to guard against an overproduction of milk. Then, from the second through the fifth postnatal week, the food should be increased by three times more than the bitch would normally eat, with a heavy concentration of high protein foods. After that, the diet should be drastically, but gradually, reduced down to the dog’s normal diet. This reduction of food will assist the bitch in the drying out process after weaning has been accomplished.
Feeding Kittens

Kittens will get all of their nutrition from the queen’s milk in the first four weeks of life. Starting in the fifth week then, they can begin eating other foods. They should be started on small amounts of highly palatable, moist and meaty foods. Their food should be easily digestible, with the proper amount of protein and other nutrients, and have the smell and taste that attracts them to the food. Special formulas are available from the major commercial pet food companies which are highly suitable during this period. In this four-week weaning process, the portions of food should be gradually increased until the kittens become independent of the queen's milk after the eighth week. During the time of weaning, the queen should be separated from the kittens during the day, but should be permitted to be with them at night. Kittens should be fed four to five times per day during the weaning period. When the kittens are separated from the queen at eight weeks, their feedings per day should be gradually decreased until they are six months old, their age of maturity. They can then be offered two feedings per day of dry food, or mostly dry food, thereafter.

Feeding Adult Cats, Including Pregnant and Lactating Queens

Providing a proper diet for cats is more challenging than it is for dogs. Cats can do very well on the commercial foods, either in the dry, semi-moist, or canned forms. Cats, however, are much more finicky than dogs in terms of what they will eat. Thus, they often present a feeding problem when they are kept in the animal care facility. As is true with dogs, the queen who has just given birth is feeding for herself and the litter, and should be fed three or four times per day, and will eat up to three times her normal diet for the first three weeks while the kittens are nursing. Food should be cut down after that so that the milk production will decrease, and stop by the time weaning is completed. Pregnant queens also should be given more than their normal rations in the late stages of pregnancy, but not as great an increase as is true with dogs.

One of the measures taken to get cats and dogs to accept “hospital food” is to use the food dish from home to signal that eating is the normal procedure they are accustomed to. In fact, many veterinarians advise that cats’ diets should not be changed abruptly. When there is a sudden change, cats sometimes suffer from vomiting, diarrhea, and often, a loss of appetite. When changing a cat’s diet, therefore, it is recommended that small quantities of the new food be added to the old, with new food gradually increased over a period of time, until the cat becomes accustomed to it and accepts it. Therefore, it may be necessary to feed them the same diet that they are accustomed to at home when they are in the hospital.

Force-Feeding

It is vital that cats and dogs receive proper nutrition while they are patients in an animal hospital. When they simply refuse to eat, therefore, it is necessary to force-feed them. There are a number of ways of accomplishing this, but the most common method involves the use of a catheter, which is inserted through the esophagus into the stomach. A syringe containing the food is affixed to the end of the catheter and the plunger is depressed, forcing the food into the stomach. There are also times after a recuperating animal has been taken home when it will still refuse to eat. In these instances, the veterinarian will teach the owner how to force-feed the animal with the catheter and syringe.
**Keeping Records**

Because nutrition is so important to recuperating animals, a record card is normally attached to the cage, with the date and amount of food eaten written on it each day so that there will be a record to indicate the amount of food eaten while in hospital care. Thus, if the animal has not been eating, or eating only miniscule amounts, the veterinarian will be alerted that a change of diet or force-feeding measures need to be taken.

**Food Sanitation Measures**

Animals in the hospital should always be fed from clean (sanitary) containers. Since the various kinds of feeding dishes also differ in the ease of keeping them clean, veterinarians will choose the type that are the easiest to maintain and sanitize. This is why the stainless steel containers are often the choice in the hospital setting. Before use by another animal, the dishes should be thoroughly sanitized by washing with soap and water, soaking them in disinfectant and /or exposing them to the sun for several hours, and, in cases when there is possibility of transmission of infectious disease, they should be autoclaved. In dealing with this sanitation problem, some animal hospitals have taken to using disposable paper feeding containers. And everything that has been said about food containers is also true of water containers. The animals should always have free access to clean water, and this is most often provided with stainless steel or aluminum containers that attach to the cage door.

The second aspect of sanitation involves the cleanliness of the feeding area and the purity of the food. Any spilled or uneaten food should always be disposed of in a timely manner. If this is not done, various insects, mice, rats, and other vermin will be attracted to the area. Not only do unsanitary conditions increase the possibility of bacterial or other infections to the animals, but these conditions also raise the possibility of bites from the unwelcome invaders and numerous other problems.

**Food Storage Measures**

Animal foods should be kept in a dry, well-ventilated area that is temperature controlled between 45 and 60 degrees Fahrenheit. The temperature is important because temperatures above 60° F are conducive to the hatching and development of insect larvae that can contaminate the foods. Dryness is important because a damp environment will permit and accelerate the growth of molds. The area should also be free of cracks or crevices that would permit dust and dirt to enter, or permit easy access to rats, mice, cockroaches, beetles, etc. When vermin do pose a problem, they should be controlled with traps and insecticides.

Another important concern in a feeding program is the preservation of the food. Extreme heat or cold can deteriorate the nutrients in the food, which is another reason for controlling the temperature in the food storage area. Then, too, the nutrients in the dry food will deteriorate when stored in the original packaging for too long a period of time. This is another reason for monitoring the inventory of food, so that excesses are not ordered which can become old and stale. Normally, the dry food stored in the original packaging should be used within three months, or the nutrients will deteriorate. A second concern with the dry food is that once the paper sack has been opened, the unused food should be kept in a sealed clean and dry metal container. The unopened packs of dry food should be stored off the floor, on pallets or shelves, and there should be space allowed for air circulation between the packages every three or four feet or so. Then, finally, the date of storage should be indicated on the sacks, and the oldest food should be used first to ensure that the animals will always be getting food that has not been in the storage room too long.
Step 7: Progress Check 34-2

Answer the following questions by writing your answers on scratch paper.

1. Why do some animal care facilities favor a self-feeding program for the animals in place of specified amounts at specified times?

2. When animals are not on a free choice feeding program, how many times per day are they normally fed?
   - Puppies and kittens - _____
   - Adult cats and dogs - _____
   - Pregnant bitches and queens - _____
   - Lactating bitches and queens - _____

3. As a rule-of-thumb, how much food should be provided for adult cats and dogs per day?

4. What is the most common problem in animal feeding?

5. When is “extra” food required for dogs and cats?

6. How should the diet of older dogs be varied from that of younger adult dogs?

7. What measures are often taken to encourage cats and dogs to eat in the hospital?

8. Why is it important to keep records of how much animals are eating in the hospital?

9. What food sanitation measures should be taken with food dishes and food served in the animal care facility?

10. How long can dry pet foods be used before they begin to lose their nutritive values?

11. What are important considerations in food storage?

Step 8: Answers to Progress Check 34-2

Check your answers with the answer key at the back of this book. Correct any errors you may have made.
Step 9: Lesson Summary

Proper feeding of animals is a primary concern when they are confined in an animal care facility. Cats and dogs should be fed balanced diets with suitable amounts of protein, fats, carbohydrates, minerals, and vitamins that will maintain their bodies and provide for growth needs if they are growing, pregnant, or lactating animals. Quality commercial pet foods in the canned (moist), semi-moist, or dry forms are all highly suitable to provide the nutrients they need. The foods should be regulated in terms of the amounts and feedings to accommodate the needs of the particular animals, and records should be maintained of the food taken to assure that they are getting the needed nutrients. Although there are times when dogs and cats will refuse to eat when they are confined and away from their homes, the most common feeding problem is overfeeding and the onset of obesity. Animals that refuse to eat must be force-fed, and generally this is done by catheter and syringe. A number of problems can arise when proper storage measures and sanitation measures are not applied. The feeding area should be kept clean and leftover food should be discarded. Food should be stored in a room that does not get overly hot or cold, and in a dry area where the air can circulate around the packages. An organized and well-maintained feeding program in an animal care facility will generally indicate that all functions of the organization are carried out very effectively.

Congratulations!

You have completed Lesson 34. When you feel confident that you have mastered the instruction in this lesson, please go on to your next lesson.
Lesson 35
Poisonous Reptiles, Insects and Plants

Step 1: Lesson Preview

Animals can often be the victims of poisons. And the situations they encounter may result in skin irritations, debilitating disorders, or life threatening escapades. In sniffing along as they protect their territory and explore new ground, dogs are really adventurers snapping to try to capture bees, pawing new ground and blundering into a snake, or sampling the leaves of an oleander bush on a boring afternoon. There are a wide variety of insects, plants, and snakes which can deliver poisonous substances to animals and humans alike, some of which can actually take the life of the victims.

It is up to the veterinarian and the staff of the animal clinic to be aware of the dangers of poisons that can afflict animals so that they can be properly diagnosed and treated, or so that animal owners can be made aware of the dangers common to the areas where they live.

While poisonous snakes are deadly, the number of threatening encounters that animals have with them are far less than those with plants and insects. And the encounters with plants and insects can occur in their own yards and neighborhoods.

In this lesson, we will be examining these threats to animal welfare that are prevalent in many parts of the United States, so that you as a veterinary assistant can be of the greatest assistance to a veterinarian when dealing with animals that are suffering from poisoning incidents.

Before we consider the devastation that these poisoning incidents wreak, however, you should be aware that these poisoning methods have evolved to defend the lives of the perpetrators. And, you should also be aware that some of them provide substantial benefit to humans. Many scientists have concluded that the benefit of these toxic substances outweigh their negative impact, and some are used as medication in treating human and animal diseases, as well as in research to improve our understanding of life processes. Examples are digitalis from the foxglove plant prescribed to regulate heart beat rate, and quinine from cinchona bark which has long been used in the treatment of malaria. These facts, however, are of no solace to the animals and humans who experience the pain and suffering of the toxins, up to - and including - death.
Advice to Clients

All veterinary assistants should fully understand the procedure to follow when a client telephones and reports that an animal has been poisoned. Time is really of the essence. Because many poisons act quickly, the owner should be urged to transport the victim to the animal hospital as soon as possible. Further, veterinarians will likely have suggestions for keeping the animal calm and warm to avoid shock and rapid increase in circulation, and in some cases, the veterinarian may suggest that the owner administer an emetic if a poisonous substance has been eaten or swallowed. It is particularly urgent, however, that the animal receives the professional care of the veterinarian as soon as possible. Every animal health facility should have established procedures to follow in reported poisonings, even though quite a number of reported poisonings turn out to be some other ailment.

Step 2: Learning Objectives for Lesson 35

When you have completed this lesson, you will be able to assist the veterinarian in diagnoses and treatment of animals that have been poisoned by encounters with plants, insects, and snakes.

Step 3: Toxic Plants

There are two types of poisonous plants that are of concern in veterinary medicine. They are the house plants, some of which may be ornamental, and then there are all the other poisonous plants, and some poisonous weeds, which exist in their natural habitat.

The household plants present the largest danger to kittens and puppies (and young children), but may be ingested by any household pet. They are of special danger if they produce berries that invite the animal to partake in a snack. All other poisonous plants affect large animals to a high degree, but the danger still lurks for the small animals that venture into their domain.

Poisonous Household Plants and Ornamentals

The table below lists the principal ornamental poisonous plants that represent the greatest source of animal plant poisoning. Since many of these ornamental plants are not in their natural habitat, the degree of toxicity may vary widely. There has been a lack of substantial research done on most of these ornamentals, so it is difficult to predict many of the effects.

This table includes the common name of the plants, identifying characteristics, toxic effects, and recommended treatment.

Please note that when symptomatic is listed as the treatment, it means that it is an attempt to relieve the pain and suffering and provide comfort to the animals, but does nothing to remove the cause or eradicate the poison itself.
<table>
<thead>
<tr>
<th>Name</th>
<th>Characteristics</th>
<th>Effects</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angel wings, Caladium</td>
<td>Heart-shaped herbs with thin highlighted veins, variegated leaves, yellow-green.</td>
<td>Immediate intense pain, irritation to mucous membranes, swollen tongue, and diarrhea.</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Spider Plant, St. Bernard’s lily</td>
<td>Glossy succulent narrow strip-like herbs; may have yellow or white band, long cream hanging stems with small white flowers.</td>
<td>Vomiting, salivation, retching and anorexia in cats. Death from diarrhea may result.</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Cyclamen, Snowbread, Shooting star</td>
<td>Deep and light-green herbaceous plants with heart-shaped serrated leaves. Upright stems and pink or white flower.</td>
<td>Gastrointestinal (GI) problems, convulsions and paralysis. Toxins cause irritations and are absorbed from the GI tract.</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Dumbcane</td>
<td>Erect unbranched fleshy plant with leaf scars on stem. Large leaves, thickly veined and sheath-like petiole. Blade with white or yellow spots.</td>
<td>Immediate intense pain, burning and inflammation of the mouth and throat, anorexia, vomiting, possible diarrhea, tongue extended, head shaking, excessive salivation. Possible death, but infrequent.</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Foxglove</td>
<td>Erect plant with simple petioled, alternate-toothed, hairy ovate leaves. Purple red, pink, or white tubular flowers.</td>
<td>Acute abdominal pain, vomiting, bloody diarrhea, frequent urination, irregular slow pulse, tremors, convulsions, but rarely death.</td>
<td>Symptomatic</td>
</tr>
<tr>
<td>Dragon free</td>
<td>Robust palm-like plant with lance-shaped, thin, variegated, alternate nonpetioled leaves. Yellow, red, or green strips along leaf margins in some. Leaf scars from lost lower leaves, terminal leaves are retained as plant matures.</td>
<td>Vomiting and severe diarrhea indicating gastrointestinal tract irritation.</td>
<td>Symptomatic, to correct electrolyte and fluid balance.</td>
</tr>
<tr>
<td>Name</td>
<td>Characteristics</td>
<td>Effects</td>
<td>Treatment</td>
</tr>
<tr>
<td>-----------------------------</td>
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</tr>
<tr>
<td>Poinsettia, Christmas flower</td>
<td>Shrub with milky white sap; alternate petioled, distinctly veined lobed leaves, with bright red, pink, or white coloration. Flowers small and inconspicuous.</td>
<td>Irritates mucous membranes, excessive salivation and vomiting, but not death.</td>
<td>Symptomatic; gastric cleansing, activated charcoal, and saline cathartics sometimes used.</td>
</tr>
<tr>
<td>English holly, European holly</td>
<td>Evergreen shrub with leathery leaves and glossy upper surface; spiny-toothed, alternate and petioled. Fruits and red to yellow berries with many seeds and an aromatic taste.</td>
<td>Abdominal pain, vomiting, and diarrhea have been observed following ingestion of two berries. Death rare.</td>
<td>Symptomatic, at best.</td>
</tr>
<tr>
<td>Kalanchoe, Airplant, Cathedral bells</td>
<td>Fleshy opposite petioled leaves; bright red, orange, or pink flowers. Stems become untidy with age.</td>
<td>Depression, rapid breathing, teeth grinding, muscle incoordination, paralysis, and death in rats.</td>
<td>Symptomatic; atropine has been effective in rabbits.</td>
</tr>
<tr>
<td>Daffodils and Hyacinths</td>
<td>Ornamentals that grow from bulbs and flower in early spring.</td>
<td>Following ingestion of bulbs, vomiting, diarrhea, and rare death.</td>
<td>Symptomatic.</td>
</tr>
<tr>
<td>Philodendron</td>
<td>Climbing vines with aerial roots; leaves are large, unlobed, or lobed and heart-shaped.</td>
<td>Immediate pain, irritation to mucous membranes, excessive salivation, tongue swelling, and kidney failure. Excitability, nervous spasms, convulsions, and occasional encephalitis have been reported in cats.</td>
<td>Symptomatic.</td>
</tr>
<tr>
<td>Mistletoe</td>
<td>Evergreen, ovoid, opposite leaves on round highly branched green stem. White berries with single seed.</td>
<td>Vomiting, profuse diarrhea, dilated pupils, rapid laboring breathing, shock, and death from cardiovascular collapse.</td>
<td>Symptomatic.</td>
</tr>
<tr>
<td>Name</td>
<td>Characteristics</td>
<td>Effects</td>
<td>Treatment</td>
</tr>
<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td>Azalea, Rhododendron</td>
<td>Evergreen shrub with alternate leaves; funnel-shaped flowers in clusters or solitary.</td>
<td>Salivation, tearing, vomiting, diarrhea, breathing difficulty, muscle weakness, convulsions, coma, and death.</td>
<td>Symptomatic; gastric cleansing, activated charcoal, saline cathartics, calcium injection, antibiotics to control possible pneumonia.</td>
</tr>
<tr>
<td>Sanserviera, Snake plant</td>
<td>Hardy, succulent houseplant, leaves erect and flat or cylindrical with or without a yellow stripe along the margins, and horizontal gray bands throughout. Many yellow star-like flowers on tall central spike.</td>
<td>Vomiting, salivation, diarrhea, and destruction of red blood cells.</td>
<td>Symptomatic; fluids and electrolytes may be necessary.</td>
</tr>
<tr>
<td>Schefflera, Umbrella tree</td>
<td>Evergreen with glossy compound leaves that hang like an umbrella; veins are pronounced.</td>
<td>Mucous membrane irritation, salivation, anorexia, vomiting, and possibly diarrhea.</td>
<td>Symptomatic.</td>
</tr>
<tr>
<td>Jerusalem cherry</td>
<td>A shrub with tapered and often serrated leaves; small star-shaped white flowers; red shiny berries with many seeds.</td>
<td>Anorexia, abdominal pain, vomiting, diarrhea, salivation, weakness or paralysis, breathing difficulty, heartbeat irregularity, circulatory collapse, and convulsions.</td>
<td>Symptomatic; gastric cleansing, activated charcoal, electrolytes, and fluids. Sometimes anticonvulsants.</td>
</tr>
<tr>
<td>Yew</td>
<td>Evergreen tree or small erect shrub with tapered and serrated leaves. Small star-shaped white flowers. Red shiny berries with many seeds.</td>
<td>Nervousness, trembling, muscle incoordination, breathing difficulties, and collapse. Heartbeat irregularities progressing to heart failure and death.</td>
<td>Symptomatic at best; usually futile once clinical signs appear. Atropine may be helpful.</td>
</tr>
</tbody>
</table>

After reviewing this table, you can see that common house plants and ornamentals can certainly cause severe problems for the animals that ingest them, or their berries or bulbs. Also, you have no doubt noted that in most instances when these toxic substances are ingested by an animal, the only treatment recommended is symptomatic and can only reduce the pain and suffering, with the hope that when the poison runs its course the animal will be able to survive (which is most often the case). One other danger around the house that should be pointed out is that the pits of certain fruits are very poisonous to animals. For example, while apricots and peaches are not toxic to our pets, their pits, which contain hydrocyanic acid, are very toxic to animals when ingested.

In the section which follows we will consider the major troublesome plants that exist in their natural habitat. Many of them affect large animals only, and many others affect all animals.
Poisonous Plants in the United States

As you have seen, poisonous plants affect animals in many ways, causing death, chronic illness, loss of weight, abortion, and birth defects, to name the most serious results. They also cause substantial economic losses to the livestock industry in the death of animals and decreased productivity. These problems can be reduced with improved land management. Animals will graze abnormally when hungry, but when their food needs are met they will not resort to eating the poisonous plants. Thus, on land that is overgrazed, the animals will likely resort to eating the poisonous plants. Also, some poisonous plants may be a part of their regular diet. These are plants that are not harmful unless ingested in large amounts. When these plants constitute the only food available, the animals are subject to poisoning because of the large amounts ingested.

The following lists many of the poisonous plants in North America that are a danger to animals. Along with the common name of the plants, this table lists the habitat, affected animals, plant characteristics, toxic effects, and treatments.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Habitat</th>
<th>Affected Animals</th>
<th>Characteristics</th>
<th>Effects</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water hemlock</td>
<td>Open, moist to wet environments, all areas.</td>
<td>All</td>
<td>White flowers, stems hollow except at nodes. Tuberous roots.</td>
<td>Rapid onset of symptoms, death within 30 minutes. Salivation, muscular twitching, dilated pupils, violent convulsions, death.</td>
<td>Sedatives to control spasm and heart action, prognosis good if alive two hours after ingestion.</td>
</tr>
<tr>
<td>Bittersweet</td>
<td>Roadways, lake beds, flooded areas, overgrazed range, southwest.</td>
<td>Sheep, and rarely cattle.</td>
<td>Multibranched up to 2 ft. high, yellow flower head. Leaves divided into segments.</td>
<td>Salivation, vomiting, green nasal discharge, depression, anorexia, abdominal pain, lesions, kidney degeneration.</td>
<td>Avoid overgrazing, remove from pasture.</td>
</tr>
<tr>
<td>Oaks</td>
<td>Deciduous woods, all areas.</td>
<td>All grazing animals.</td>
<td>Deciduous trees with up to four leaves clustered at tips of twigs.</td>
<td>Anorexia, rumen stasis, constipation, followed by tarry diarrhea, dry muzzle, rapid weak pulse, frequent urination, lesions, death.</td>
<td>Symptomatic.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Habitat</td>
<td>Affected Animals</td>
<td>Characteristics</td>
<td>Effects</td>
<td>Treatment</td>
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</tr>
<tr>
<td>Cocklebur</td>
<td>Fields, waste areas, shores of ponds and rivers, all areas.</td>
<td>All animals, common in pigs.</td>
<td>Coarse herb, fruit covered with spines, two beaked, with two compartments.</td>
<td>Anorexia, depression, nausea, vomiting, rapid weak pulse, difficult breathing, muscle spasms, convulsions, lesions, Gl inflammation, acute hepatitis, nephritis.</td>
<td>Oils and fats may be beneficial, plus warmth and stimulants.</td>
</tr>
<tr>
<td>Buckeye</td>
<td>Woods and thickets, eastern U.S. and California.</td>
<td>All grazing animals.</td>
<td>Trees or shrubs, leaves opposite and palmately compound. Seeds large, glassy brown, with large white scar.</td>
<td>Depression, incoordination, twitching, paralysis, inflammation of mucous membranes.</td>
<td>Stimulants and purgatives.</td>
</tr>
<tr>
<td>Coffeepod, Sicklepod</td>
<td>Cultivated and abandoned fields along fences, roadsides, Eastern U.S.</td>
<td>All grazing animals, common in pigs.</td>
<td>Few rounded leaflets, long seed pods, seeds shiny, brown, and rhomboid.</td>
<td>Diarrhea and coffee colored urine; animals eat and are alert shortly before death; lesions, cardiac and muscle degeneration, congestion.</td>
<td>Ineffective in down animals. Remove animals from source.</td>
</tr>
<tr>
<td>Coffee weed, Syptic weed</td>
<td>Roadsides, waste areas, and pastures. Eastern U.S.</td>
<td>Cattle, horses, chickens, goats, sheep, rabbits.</td>
<td>Herbs more than 3 feet tall, alternate ovate to lanceolate leaves, yellow flowers, long, flat pods with outlined seed contents.</td>
<td>Diarrhea and coffee colored urine; animals eat and are alert shortly before death; lesions, cardiac and muscle degeneration, congestion.</td>
<td>No treatment known; symptomatic may help.</td>
</tr>
<tr>
<td>Larkspurs</td>
<td>Open foothills or meadows, mostly western.</td>
<td>All grazing animals, mostly cattle.</td>
<td>Erect herbs, flowers each with one spur. Leaves lobed or divided.</td>
<td>Straddled stance, arched back, repeated falling, constipation, bloat, salivation, vomiting, and death from respiratory and cardiac failure.</td>
<td>No suggested treatment; tonicity decreases with maturity.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Habitat</td>
<td>Affected Animals</td>
<td>Characteristics</td>
<td>Effects</td>
<td>Treatment</td>
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<tr>
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</tr>
<tr>
<td>Tansy mustard</td>
<td>Dense in wet years, southwest.</td>
<td>Cattle.</td>
<td>Two feet tall stem and leaves covered with fine pubescence. Flower small with four spreading yellow or yellow-green petals.</td>
<td>Partial to complete blindness, inability to use tongue or swallow, emaciation, and death if not treated.</td>
<td>Administer profuse water with stomach tube plus nourishment if animal is weak. Prognosis good if treatment started early.</td>
</tr>
<tr>
<td>Lantana</td>
<td>Ornamental and wild; lower coastal plain of SE U.S., and southern California.</td>
<td>All grazing animals.</td>
<td>Shrubs, leaves opposite. Flowers in flat-topped clusters, yellow, pink, orange, or red. Berries black.</td>
<td>Anorexia, jaundice, watery feces, photosensitization. Lesions, degeneration, changing liver or kidney. Death due to liver insufficiency or kidney failure.</td>
<td>Keep animals out of light sources after eating plant.</td>
</tr>
<tr>
<td>Skunk cabbage</td>
<td>Low, moist woods and pastures, high mountain valleys, all areas.</td>
<td>Sheep, cattle.</td>
<td>Erect herbs, leafy throughout. Leaves large and plaited, small white or greenish flowers.</td>
<td>Vomiting, excess salivation, heartbeat irregularity, difficult breathing, muscle weakness and paralysis, coma.</td>
<td>Respiratory and heart stimulants.</td>
</tr>
</tbody>
</table>
# Poisonous Plants of North America (Partial List)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Habitat</th>
<th>Affected Animals</th>
<th>Characteristics</th>
<th>Effects</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red maple</td>
<td>Moist land and swamps, eastern.</td>
<td>Horses.</td>
<td>Large tree, leaves opposite, 2-6 in. across, with 3-5 lobes radiating, triangular and coarsely toothed. Red to yellow flowers.</td>
<td>Anemia and loss of red blood cells, weakness, rapid heartbeat, depression, (blue) cyanotic coloration, jaundice, brownish discoloration of blood and urine.</td>
<td>Isotonic fluids, oxygen and blood transfusion may be helpful.</td>
</tr>
<tr>
<td>Copperweed</td>
<td>Arid, alkaline soils in foothills, sagebrush plains, southwest.</td>
<td>Cattle, sheep.</td>
<td>Tall herb with narrow leaflets. Flowers in many heads resembling goldenrod.</td>
<td>Anorexia, marked depression, weakness, coma, death without struggle within three days.</td>
<td>Supplement diet or change pasture.</td>
</tr>
<tr>
<td>Beefsteak plant, Perilla mint</td>
<td>Ornamental moist pastures, roadsides.</td>
<td>Cattle, horses and others.</td>
<td>Freely branched squared stems, opposite purple or green leaves, white flowers.</td>
<td>Difficult breathing, death on exertion, pulmonary emphysema, and edema.</td>
<td>Treatment ineffective when signs severe. Steroids, antihistamine, and antibiotics.</td>
</tr>
<tr>
<td>Mesquite</td>
<td>Dry ranges, washes, draws, southwest.</td>
<td>Mostly cattle, also sheep.</td>
<td>Shrub or small tree with gray bark, paired spines, leaves divided.</td>
<td>Excessive salivation, continuous chewing, partial paralysis of the tongue, facial muscle tremor, and edema.</td>
<td>Combined stocking of cattle and sheep reduces losses.</td>
</tr>
<tr>
<td>Black locust, False acacia, Locust tree</td>
<td>Open woods, roadsides, pinelands, on clay soil mostly, eastern U.S.</td>
<td>All grazing animals, mostly horses.</td>
<td>Tree or shrub, pair of spines on each leaf, white to cream flowers, brown pods with 4-8 seeds.</td>
<td>Diarrhea, anorexia, weakness, posterior paralysis, depression, weak pulse. Death infrequent.</td>
<td>Laxatives and stimulants suggested. Symptomatic.</td>
</tr>
<tr>
<td>Rattlebox, Purple sesbane</td>
<td>Waste areas, southeastern U.S. and coastal plain</td>
<td>All</td>
<td>Fruits small, yellow, red, or black when ripe, structured like tomatoes.</td>
<td>Rapid pulse, weak respiration, diarrhea, death.</td>
<td>Remove animal from source. Saline purgatives.</td>
</tr>
<tr>
<td>Common Name</td>
<td>Habitat</td>
<td>Affected Animals</td>
<td>Characteristics</td>
<td>Effects</td>
<td>Treatment</td>
</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>Black walnut</td>
<td>Eastern seacoast, west to Michigan, midwest and south to Georgia and Texas.</td>
<td>Horses.</td>
<td>Tree with compound radiating tapered leaflets, thick husk nut.</td>
<td>Reluctance to move, depression, fever, rapid pulse and respiration. Distal limb edema, laminitis with continued exposure.</td>
<td>Remove shavings promptly, treat for limb edema and laminitis, nonfatal.</td>
</tr>
<tr>
<td>Oleander</td>
<td>Common throughout U.S.</td>
<td>All</td>
<td>Evergreen shrub or tree, leaves whorled and prominently finely pinnately veined.</td>
<td>Nausea, depression, increased pulse rate, bloody diarrhea, weak irregular heart beat, death.</td>
<td>No specific treatment; atropine in conjunction with propranolol reported helpful. Death possible.</td>
</tr>
<tr>
<td>Castor bean</td>
<td>Warmer regions.</td>
<td>All</td>
<td>Palately lobed leaves, black large seeds, with three in spiny pod.</td>
<td>Nausea, vomiting, diarrhea, thirst, blood poisoning, cessation of rumination, death.</td>
<td>Gastric cleansing, warmth, sedation.</td>
</tr>
<tr>
<td>Locoweed</td>
<td>Mostly western.</td>
<td>All grazing animals.</td>
<td>Leaves alternate and pinnately compound.</td>
<td>Depression, emaciation, incoordination, dry, lusterless hair. Abortions, congestive heart failure.</td>
<td>Avoid grazing source.</td>
</tr>
<tr>
<td>Tall fescue</td>
<td>Pacific northwest and southeastern U.S., plus Oklahoma.</td>
<td>Mostly cattle and horses.</td>
<td>Coarse, deeply rooted grass, broad, dark-green, ribbed, rough upper surface, smooth sheathed leaves.</td>
<td>Lameness and tissue disintegration in affected limbs, progressing to gangrene, loss of body mass, arched back, and rough coat.</td>
<td>None recommended.</td>
</tr>
<tr>
<td>Arrowgrass</td>
<td>Salt marshes, wet alkaline soils, lake shores.</td>
<td>Sheep, cattle.</td>
<td>Grasslike, but with thick leaves. Globular heads of fruits.</td>
<td>Salivation, difficult breathing, excitement followed by depression, incoordination, prostration, convulsions, death.</td>
<td>Often, animal found dead similar to cyanide poisoning. No treatment indicated.</td>
</tr>
</tbody>
</table>
Step 4: Progress Check 35-1

Answer the following questions by writing your answers on scratch paper.

1. What are the benefits that poisonous snakes, insects, and plants provide, if any?

2. What advice will a veterinarian generally give a client when told on the telephone that the client’s dog has been poisoned by a rattlesnake?

3. What is the most frequent type of treatment recommended for an animal that has ingested parts of an ornamental or house plant?

4. Which of the following would be most likely to cause death if an animal ingested its poisonous substance, English holly, daffodils, poinsettia, or yew?

5. Why are daffodils and hyacinths dangerous to animals?

6. Why are peaches and apricots dangerous to animals?

7. What possible disastrous result can occur when an animal ingests poison from a spider plant?

8. What popular plant found in nearly all households throughout the Christmas season is poisonous to animals and may cause death?

9. What major illness can result as a secondary condition when cats are poisoned from ingesting philodendron leaves?

10. What is one of the resulting circulatory ailments in animals that ingest poison from a snake plant?

Step 5: Answers to Progress Check 35-1

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.

Step 6: Insects

Over two-thirds of the species of the world are insects. The damage they do to agricultural products represents tremendous economic losses, even with all the controls and pesticides that have been developed to combat them. And then, of course, there is the damage they inflict when they bite or sting animals and humans. In many cases, the bite or sting results in a poisonous substance being injected into the body of an animal. This may cause only a mild disorder and irritation as is the case with most mosquito and fly bites. The problem can be much more severe, however, and can cause serious diseases in animals and humans which, in some cases, are fatal.

There are two ways that insects can be poisonous to animals. One is by injecting venom that is poisonous to animals; the second is by acting as vectors (carriers).
Venom Producers

In some cases, the insects inject poisonous venom into an animal. Ants, wasps, and bees have developed stingers that are hollow. The venom is delivered from special abdominal glands and storage sacks. Venom squirters include scorpions that spray acetic acid on their victims, and the bombardier beetles that deliver a caustic liquid at a very high temperature. In the case of the honeybee, the stinger is barbed, and when it penetrates the target it remains attached to the victim and causes the death of the bee so that it can only sting once. This is not true of the other stingers and venom squirters who can sting and sting again.

Vectors

A vector is a carrier that picks up the infectious material from a diseased source, and then transmits the disease to a victim. For example, a mosquito can feed on the blood of a diseased horse, and then deliver the poisoned blood to a non-diseased horse, thus infecting it. Some of the most serious diseases transmitted by vectors are malaria, typhoid fever, yellow fever, bubonic plague, cholera, dysentery and sleeping sickness. Malaria and typhoid fever are transmitted by mosquitoes, bubonic plague by fleas.

What we haven't mentioned here are “biters” and “chewers.” These insects, mainly flies, cause a skin irritation with their biting and chewing actions, which will cause discomfort and sores that are then susceptible to secondary infections. The fly, on occasion, can also act as a vector.

Now, let's consider some of these insects to learn more about their habits and how they affect animals.

Spiders

Spiders deliver their venom through sharp fangs, and almost all spiders are venomous; but few have mouth parts large enough to penetrate animals and humans, nor can most of them produce enough venom to cause damage to the victim. A few, however, are very dangerous.

Widow Spiders

The first of these are classed as widow spiders, which includes the black widow. The black widow is recognizable by the red hourglass figure on its ventral abdomen. The black widow is most abundant in the western states, while the brown widow is found in the south and the red widow in Florida. These spiders eject a very powerful venom that disable the nervous system, resulting in painful cramping of all large muscles. An anti-venom for horses is available but not generally administered unless the bite can be confirmed and the stricken animal considered to be a high risk case. Symptomatic treatment will usually alleviate the condition, and quite often will require a number of different measures which may include various intravenous solutions plus Demerol and morphine and muscle relaxants.

Brown Spiders

The most common of the brown spiders is the brown recluse spider. It is distinguished by a brown violin-shaped marking on the upper thorax, but may not be evident in all of them. The venom attacks the cell membranes and causes considerable skin damage at the site of the injection. Early treatment is often successful in these bites. The problem most often is that the bites may not be detected until extensive damage has been done. As soon as the bites are discovered, application of cold packs is likely to be helpful and corticosteroids can also prove beneficial. Bites from the hairy brown spider usually result in minor damage, but can result in kidney and liver damage.
**Scorpions**

Scorpions inject venom with a barb at the end of their tail. When an animal is stung by a scorpion a great deal of pain and swelling results, but the sting will not be fatal. Some species, however, have stout claws and a sting that can be fatal to humans. In Mexico it is reported that scorpion stings to humans result in a thousand deaths per year, more than those resulting from snakebite. The first aid treatment for scorpion bites involves trying to prevent the venom from being carried to the heart. This is done when possible by putting a tourniquet between the bite and the heart, and cutting at the site of the bite to promote bleeding that hopefully will extricate venom. A suction device is most often used to increase the bleeding. The veterinarian may also administer the appropriate serum, and perhaps administer medicine that will have a calming effect. Every effort is made to keep the victim calm and quiet, so that circulation will not be increased.

**Ants, Bees and Wasps**

In these insects, glands associated with the female reproductive system have evolved to the secondary function of venom production. And, in many instances, the ovipositor (egg producing organ) has become modified to produce a stinger. Also, in several instances, animal saliva has evolved into venom.

We don't normally think of ants as venom producing insects, because while their bites may cause minor irritation, we don't give that much thought to the damage. When they have had the opportunity to attack in massive numbers, however, the resulting injection of their venom is enough to cause death to their victims.

Bee stings may be very painful and may even prove fatal to individuals who are allergic to their venom. In these cases, the victims require specialized treatment, and if the right anti-venom is applied, the victim will survive the bee sting.

Wasps come in many varieties, many of which are not stingers. While a wasp sting may be painful, wasps do not represent a serious threat unless they attack in swarms.

**Fleas, Mites, Lice and Ticks**

These are all parasites that attach and live on host animals.

*Fleas* require warmth and moisture to complete their life cycle, and therefore, to continue to survive. Many animal clinics and other commercial businesses do a booming business in flea control, especially during unseasonably warm and moist summers. They can cause severe itching which is unbearable to dogs and cats, but dog and cat flea management has improved substantially in recent times and pet owners concerned with the well being of their pets can find relief for their animals at their animal clinic.

*Mites* cause a contagious skin disease called mange. Infested animals can suffer intense irritation and hypersensitivity which can lead to debilitation and even death. Scabies lesions appear on the heads and necks of cattle and horses, and the disease can be treated with one of four “dip” treatments that a veterinarian can apply. The lesions formed may heal spontaneously in summer months when cattle are kept on pasture.

*Ticks* are bloodsucking parasites capable of transmitting many infectious agents. They can cause a number of diseases in livestock including screwworm infestations, anemia, sweating sickness, tick paralysis, and skin wounds that are susceptible to secondary infections. A number of tick control practices are followed where these infestations are prevalent. These involve a number of management measures involving the veterinarian in treating the infected animals and recommending various pasture practices.
Various species of sucking and biting lice infest domestic animals. The louse eggs are glued onto the animal’s hair, and are pale and translucent, making them difficult to detect. Animals affected include horses, cattle, sheep, goats, pigs, dogs, and cats. Infested animals experience severe dermal irritation and respond by rubbing, scratching, and biting the infected areas. Severe infestations result in loss of hair and scarification. Louse control usually involves the application of approved pesticides. Each state has its own regulations concerning the approved pesticides. Dipping or spraying infested animals is a frequent treatment and involves following specific directions for carrying out the procedures.

**Flies and Mosquitoes**

There are many varieties of mosquitoes; over 3000 species have been described worldwide, with about 150 in temperate North America. As vectors, they are capable of transmitting many diseases to livestock and other animals, and generally are likely to cause them extreme annoyance and blood loss. They have been responsible for transmitting several of the most serious diseases that have plagued mankind. While treatment with various repellents is practiced to a degree, it has not proved to be a satisfactory control. Elimination of their breeding sites has been the most effective measure in addition to the use of larvicides, which prevent the new generations from emerging.

While mosquitoes are stingers, flies are biters and chewers, though on occasion they may act like vectors by transporting disease organisms from one location or animal to another. The major danger that flies usually present constitutes sores and irritations caused by their biting and chewing. The result is often a secondary infection, which can become serious, permitted by the open wound created by the fly.

**Step 7: Progress Check 35-2**

Answer the following questions by writing your answers on scratch paper.

1. Aside from biting and chewing, what are the two ways that insects can be harmful to animals?
2. Which insect loses its stinging organ and dies after implanting the stinger?
3. Explain how a vector infects animals.
4. What are the most serious diseases spread by vectors?
5. What are the characteristic markings of black widow spiders?
6. What are the primary first aid measures for scorpion bites?
7. What environmental conditions allow fleas to thrive?
8. What is mange?
9. What are ticks?
10. What measures work best in attempts to control mosquitoes?
Step 8: Answers to Progress Check 35-2

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.

Step 9: Poisonous Reptiles

Of the many reptiles in the United States, relatively few are poisonous and inject life-threatening venom. And all but one of these is snakes; the exception being the gila monster, which is a lizard. So, although there are about 2,500 snake species worldwide, of which about one-third are poisonous, we need only concern ourselves with a relatively small number of snakes, and of course, the gila monster.

Snakes

Poisonous snakes in the United States include pit vipers and coral snakes. Pit vipers include rattlesnakes, the coppermouth, and the cottonmouth.

Rattlesnakes

Rattlesnake poison consists of a venom made up of several components. When injected into a victim, the venom attacks circulatory system tissues, and to a lesser degree, nervous tissues, although the composition of the venom may vary from one type of rattlesnake to another. Dogs experience the highest death rate from rattlesnake strikes, but horses and cattle will generally survive unless the strikes are on the muzzle, head, or neck area. Dogs and other small animals are more susceptible because of their lower body weights; they receive a higher percentage of venom per unit of body weight than is true for larger animals. Dogs are the more likely victims also because they are more likely to adventure into areas where the snakes live and are prone to show curiosity and courage when discovering a rattlesnake.

The specialty organs consist of two pit chambers between the nostril and the eye on either side of the lower part of the face. They sense their prey by detecting very minor temperature differences between prey and the environment, then zero in on the prey by opening their jaws very wide and stabbing with their fangs.

They range in size from the diamondback, which may be three to six feet long, to the pigmy, which may measure two feet or less. With the exception of the diamondback, most rattlesnakes are of the smaller variety. These snakes can strike from up to half the length of their body, and thus, a four foot snake can strike at a distance of two feet. Also, it is commonly held by some that the rattlesnake must be coiled to strike. Such is not the case, because the snake can strike from any position. Though rattlesnakes vary widely in color and size, they are recognizable by the rattlers at the end of their tails. And though many have thought that they make a rattling sound by shaking their rattlers before they strike, they can make the attack without this characteristic sound. They are not prone to attack unless they sense danger to themselves, so most often the victims have stepped on them or surprised them in another way. They are more likely to slither away when sensing a threat when they can manage an escape.
There are about 30 varieties of rattlesnakes in North America. Those in the United States include those in the following table:

<table>
<thead>
<tr>
<th>VARIETIES OF RATTLESNAKES IN THE UNITED STATES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SOUTHEASTERN U.S.</strong></td>
</tr>
<tr>
<td></td>
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<tr>
<td><strong>EASTERN U.S.</strong></td>
</tr>
<tr>
<td><strong>EASTERN COAST AND WEST TO KANSAS AND OKLAHOMA</strong></td>
</tr>
<tr>
<td><strong>SOUTHWESTERN U.S.</strong></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>WESTERN U.S.</strong></td>
</tr>
<tr>
<td><strong>TEXAS TO CALIFORNIA</strong></td>
</tr>
<tr>
<td><strong>ARIZONA</strong></td>
</tr>
</tbody>
</table>

The Copperhead

The copperhead is also a pit viper. It is not offensive unless disturbed, and it prefers rocky regions. There are three varieties of this snake and they get their name from the color of their head—either pale or deep red. When threatened, they make a staccato tapping noise by beating their tail against the ground. Its venom is not likely to be fatal to animals.

The Cottonmouth

The cottonmouth is also generally called a water moccasin, is another pit viper, and is a large aquatic snake. It inhabits the southeastern United States. It also vibrates its tail when threatened and has often been observed holding its head up, mouth open, exposing a white interior (from which it gets its name). Like the other pit vipers, it has potent venom, but is not responsible for unusually high animal fatalities.

The Coral Snake

The coral snake is in the same class as the cobra, and its venom (like the cobra’s) attacks the nervous system and can quickly disable a victim and cause paralysis and death. It is feared in the southern United States because of its highly potent venom. It is a small, innocent-appearing yet deadly snake with wide bands of red and black separated by yellow bands, which is a pattern unlike other more harmless red-black- and yellow snakes. Unlike the pit vipers that make their strike and then withdraw their fangs, the coral snake strikes and hangs on. The only good news with this vicious snake is that it is not eager to make its strike.
The Gila Monster

The gila monster is a venomous lizard that can be a deadly killer. It is not dangerous if it is handled carefully. It hunts for food during the night and can exist without nourishment for months, living on the fat stored in its tail. This is the only poisonous lizard in the United States and inhabits the desert areas of Arizona and New Mexico. It can move very rapidly and it has a tenacious grasp with its jaws, and can hold on and grind on its prey for several minutes.

Snakebite Treatment

Snakebite treatment is very similar to that of the scorpion, which was discussed earlier. Most important is getting the victim to a veterinarian at the earliest possible moment. Aside from that, as with the scorpion sting, the tourniquet should be placed between the bite and the heart, and cuts made at the site of the strike to encourage the outflow of blood with the help of suction. Keeping the victim calm and warm to reduce circulation is also important.

Step 10: Progress Check 35-3

Answer the following questions by writing your answers on scratch paper.

1. What are the poisonous snakes of the United States?
2. What is the only venomous lizard in the United States?
3. Which animal experiences the highest death rate from rattlesnake bites?
4. What is the striking range of a rattlesnake?
5. What is the largest rattlesnake in the United States?
6. How do the strikes of pit vipers differ from that of the coral snake?
7. How can coral snakes be differentiated from harmless snakes with the same colors?
8. What are the objectives of snakebite first aid treatment?
9. What is the normal response of a venomous snake when threatened?
10. What are the effects of rattlesnake venom when an animal is struck?

Step 11: Answers to Progress Check 35-3

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.
Step 12: Lesson Summary

In this lesson you have learned many important facts about poisonous plants, insects, and venomous snakes that will enable you to serve a veterinarian more effectively when dealing with the unfortunate animals suffering from these poisoning incidents. An important thing that you have learned is that time is of the essence when an animal has been poisoned. Since many poisons act quickly and have irreversible effects if not treated immediately, it is of prime importance to get the animal under a veterinarian’s care as soon as possible.

You have also learned that while many of the poisons in plants or injected by insects or reptiles are deadly, death is seldom the result with proper and timely treatment.

While poisoning incidents do not occur that frequently for the veterinarian to handle, effective treatment must be given when it is required on an emergency basis.

Congratulations!

You have completed Lesson 35. When you feel confident that you have mastered the instruction in this lesson, please go on to your next lesson.
Lesson 36
Large Animal Care

Step 1: Lesson Preview

Man has always been dependent on large animals, for a variety of life-sustaining reasons. In earlier days, large animals were a main provider of transportation, food, and clothing, and they performed a multitude of farm and other heavy labor. As technology advanced and modernization occurred, they were used less for transportation and some other functions. Today, however, we are still dependent on large animals for many of our needs.

In the beginning, veterinary practice was founded to care for large animals. Large animal care was the largest part of veterinary practice. Then, shortly before the mid-twentieth century, small animal care began to increase rapidly, and has continued to grow to the point that small animal clinics and hospitals abound in all communities throughout the United States. And while large animal care facilities are less abundant than small animal care practices, they still form an important and critical part of veterinary medicine today.

The animals classified as large animals that are cared for by large animal veterinary practitioners include horses, livestock, pigs, sheep, goats, poultry, and a variety of zoo animals. (While poultry may not be large in size, they are usually found where large animals reside – on farms, etc. – and are normally the concern of large animal veterinarians.)

Large and small animal practices are similar in many ways, but there are also substantial differences. Small animal veterinarians normally work in an animal hospital or animal clinic. The veterinarians who care for large animals regularly treat the animals on the farm or at the location where they live. This means that they must transport their equipment, medicines, etc., to the location where the animals live. A second major difference between the two types of practices stems from the relationship of the owners to their animals. Small animals are normally members of a “family,” and most are kept as pets and/or companions by their human owners. The owners usually have a caring relationship with their pets and are prone to care for them without regard to economic considerations. Large animal owners, on the other hand, will usually have an economic interest in their animals, derive income from them, and may not always be interested in treating an animal when a financial loss would occur. While they still are likely to form emotional attachments to their animals—as with race horses, work horses, and riding horses—they are also forced to consider the financial cost of treatments if they cannot produce profits. However, they are also eager to keep their animals healthy and on diets that will lead to optimum productivity. A third difference in dealing with large animals comes from the basic fact that they are large in size, and less easily maneuvered and manipulated. So, while the examinations and treatments of large and small animals have similar objectives, they are different in the way the procedures are carried out—simply because of the size of the animals and because they are carried out in the field, up to and including surgery.
Veterinary Assistant

This means that the job of the veterinary assistant working with large animals is different in many respects from that of the veterinary assistant working in a small animal clinic. In this lesson you will learn the most productive ways that veterinary assistants can carry out their duties when working with a large animal veterinarian.

Step 2: Learning Objectives for Lesson 36

When you have completed the instruction in this lesson, you will be able to:

- Assist the veterinarian with physical examinations and other examinations of large animal patients.
- Assist the veterinarian with restraint of large animals.
- Assist the veterinarian with the diagnoses and treatments of large animal patients.
- Identify the signs and symptoms of the major common diseases of large animal patients.
- Assist the veterinarian in the administration of medicines to large animal patients.

Step 3: Physical Examinations of Large Animal Patients

Usually, whenever the veterinarian (and the veterinary assistant) examines or treats large animal patients, it is done where the animals live, which may be in the animal's stall or in an open barn, or barnyard or field.

Physical Examinations

The first concern of the veterinarian will be the assessment of the animal’s health condition. Thus, a physical examination will usually be the first order of business. This may be a complete examination, or an exam that covers only areas of concern relating to the animal’s reported condition.

The three areas of concern in the physical examination are:

1. Reported conditions, ailments, etc., by the owner which will likely reveal why he called the veterinarian.
2. Close observation of the animal by the veterinarian and the assistant to determine if any deviations from normal can be detected.
3. Examination of the animal to record TPR (body temperature, pulse rate, and respiration rate), and any other procedures called for by the veterinarian. This may include blood samples or other body substance samples.

The veterinary assistant will be able to help in several of these procedures, and should make it a habit to observe the animal and note any condition that has not been reported by others.
Reported Conditions and Symptoms

After listening to the owner’s report of the problems the animal has exhibited, the veterinarian will usually follow up with questions to get as much pertinent information as possible. For example, if the owner says, “She hasn’t been taking food, and I think she’s losing weight,” the veterinarian might then respond with, “When did this start and how long has it been going on?” And then, “Have you changed the feed recently?” or “Where do you store the feed? Can I take a look at it?” and/or “Have you noticed any other changes in the animal’s behavior?” or “Can I see where the animal has been in the pasture?”

With the knowledge and experience the veterinarian has, a number of possible answers to the animal’s problem may suggest themselves. The veterinary assistant should attempt to follow the questions and answers carefully in order to gain as much information about the animal as possible. Oftentimes, the answers to the veterinarian’s questions will help to form the basis of further examinations, what laboratory tests should be done, etc.

Observations

Weight loss in large animals can be a sign of disease or other abnormal condition. For example, thinness in an animal may indicate that the animal has not been eating normally. This could be due to a problem with teeth and chewing, making it painful for the animal to masticate its food. Aside from the animal being thin, other signs of weight loss include listlessness, sunken-appearing eyes, and ribs that are visible and appear to be stretching against the skin.

Diarrhea may be indicated if the animal has feces sticking to its rump, beneath the tail.

Mucous membranes should be observed to see if they have a full-pink color. When mucous membranes of the mouth and eyelids appear to be pale-pink or a deep red, an abnormal condition is indicated. Some of the conditions indicated may be congestion, anemia, or shock.

The coat of a healthy animal will appear glossy and dense with hair. An animal with a dry coat and hair that appears shaggy may well have an abnormal condition.

Wounds discovered while observing the coat, such as skin growths, sores, or other unusual conditions of the skin, should be noted and reported to the veterinarian.

Lameness, which can be reflected by an unusual gait, may indicate not only a problem with a leg but also other diseases.

Constipation will be difficult to detect unless you are able to observe the animal defecating. When the animal strains to do so with very little fecal material emerging, constipation is the symptom that will be helpful to the veterinarian’s diagnosis.
Veterinary Assistant

Examination of the Animal

Veterinary assistants are often asked to help restrain an animal during the physical examination. They can also do the TPR after they have gained practice under the veterinarian’s guidance. These basic measurements are helpful to the veterinarian just as your TPR is valuable to the physician when you go to the doctor.

**Body temperature** of large animals is usually taken with a rectal thermometer. Temperature is measured in degrees Fahrenheit (°F) or in degrees centigrade (°C), which is also referred to as Celsius. Most often the rectal thermometer will show the Fahrenheit scale. Important points on the Fahrenheit scale are 32°F for freezing of water (at sea level), and 212°F for boiling of water (at sea level). Corresponding temperatures on the Celsius scale are 0°C for freezing and 100°C for boiling. It may never be necessary for you to convert Fahrenheit temperatures to Celsius, but if it is, you can calculate the equivalent temperature with the following formulas:

- To convert Fahrenheit to Celsius—subtract 32 from the Fahrenheit temperature, then multiply the result by .5555 (or °C = °F − 32 x .5555).
- To convert Celsius to Fahrenheit—multiply the Celsius temperature by 1.8, and then add 32 to the result (or °F = °C x 1.8 + 32).

The table below will give you Fahrenheit - Celsius equivalents within many ranges.

<table>
<thead>
<tr>
<th>Fahrenheit</th>
<th>Celsius</th>
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</thead>
<tbody>
<tr>
<td>96.8</td>
<td>36.0</td>
</tr>
<tr>
<td>97.7</td>
<td>36.5</td>
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<td>98.6</td>
<td>37.0</td>
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<td>39.5</td>
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<tr>
<td>104.0</td>
<td>40.0</td>
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<td>104.9</td>
<td>40.5</td>
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<td>105.8</td>
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<td>106.7</td>
<td>41.5</td>
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<tr>
<td>107.6</td>
<td>42.0</td>
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</tbody>
</table>

So, from the table you can see as an example that the normal human body temperature of 98.6°F is the same as 37.0°C. And, as a veterinary assistant you should be aware of the normal body temperatures of the animals that you are working with.
Here are some of the normal temperature ranges for some large animals that are assumed to be accurate within 1 °F (Fahrenheit) and 0.5 °C (Celsius):

- **Cattle** - 100° to 103.6 °F or 38.3° to 38.6 °C.
- **Horses** - 99° to 101 °F or 36° to 38.5 °C.
- **Swine** - 101.6° to 103.6 °F or 38.7° to 39.8 °C.
- **Sheep and Goats** - 101.0° to 103.8 °F or 38.3° to 39.9 °C.

To take the rectal temperature of a large animal, stand alongside the hindquarter of the animal and insert the thermometer through the anus. Never stand directly behind the animal, especially a horse, as you are likely to be kicked. Precautions should be taken to assure that the thermometer does not disappear into the animal’s rectum, as it would be difficult to retrieve. A recommended practice is to attach a sturdy string to the thermometer, and if left unattended, to use a clip to attach the string to hairs on the animal’s tail. Your veterinarian will undoubtedly have a preferred method for carrying out this procedure. You should practice your technique under the guidance of a veterinarian before attempting to do the procedure by yourself.

### Pulse Rate

The pulse rate is a measure of the number of heartbeats per minute by counting the pulses of an artery, with your forefinger (never your thumb) held with only slight pressure over the selected artery. There are alternate locations for taking the pulse rate of large animals, depending on how you are directed by the veterinarian, and on what methods you can get to work the best for you. Whichever site you choose, you should gently palpate the site to encourage the flow of blood in the area. The three recommended locations are:

1. The external maxillary artery along the lower jaw, and just in front of the jaw muscle, or
2. Over the middle coccygeal artery in the central ventral surface of the tail, or
3. Over the femoral artery in the medial surface of the hind leg.

To take the pulse, you should have a reliable watch with a second hand or an electronic watch that has a reading in seconds. Rather than taking the pulse for a full minute, most often the beats are counted for 30 seconds, then multiplied by two, to get the pulse rate for one minute.

Here are some pulse rates of the most common large animals:

- **Cattle (adults)** - 60 to 80 beats per minute.
- **Calves** - 100 to 120 beats per minute.
- **Sheep, Goats, and Swine** - 70 to 90 beats per minute.
- **Horses** - 28 to 42 beats per minute.

The pulse rate (heartbeat rate) in horses can be best obtained with a stethoscope over the left chest just behind the elbow of the front left leg. With pigs, it may be very difficult to get a pulse rate because of the abundant fat in the necessary areas.
Respiration Rate

Respiration is the entire breathing cycle; that is, breathing in (or inspiration), and breathing out, or expiration. This can be determined by observation, usually at a little distance from the animal by watching the chest area over the lungs. It is also frequently done with a stethoscope, which is auscultated over the lungs. Once again, when counting inspirations or expirations, you can time the number of cycles for 30 seconds, then multiply by two to get the respiration rate per minute.

Normal respiration rates for some large animals are:

- **Cattle** - 10 to 30 respirations per minute.
- **Sheep, Goats, and Swine** - 10 to 20 respirations per minute.
- **Horses** - 8 to 15 respirations per minute.

There is one other measurement that is frequently taken with cattle, sheep, and goats, all of which are ruminants. It is done to help determine if an animal has any digestive disturbances. The procedure is performed with a stethoscope and is an attempt to determine if there are any rumen contractions. The measurement is taken by placing the stethoscope over the triangular area behind the ribs, below the lumbar vertebrae, and anterior to the hip area. When auscultating with the stethoscope, you should be able to detect one to three rumen contractions per minute.

Step 4: Restraint of Large Animals

Restraint is always a major consideration when dealing with and treating large animals. Since the animals do not understand what is happening when they are subject to examinations and treatments, they are prone to exhibit the “fight or flight” syndrome that they all possess. This means that they will attempt to flee from or to show aggression to a stranger encroaching on their domain. An animal regards its immediate surrounding area as a “fight or flight” space. This means that when a stranger invades this space, the animal begins preparing to flee or to fight. The brain sends signals to the adrenal gland via the sympathetic nervous system, which causes the heart rate to increase and produce general excitement and a state of alertness in the animal. Further movement into the animal’s “fight or flight” space will cause the animal to flee from the danger zone, if possible, or to show avoidance or aggression when they cannot escape the “danger” area. Thus, in dealing with these animals, they have to be maneuvered into a situation which will make restraint possible. Each veterinarian has preferred methods of applying restraint to large animals. Before you can attempt restraint measures, you should have detailed instruction from the veterinarian you will be working for, plus hands-on practice under the direction of the veterinarian. Many veterinarians have a “bedside manner” with animals that encourages them to do just what the veterinarian wants. You will be able to learn a great deal by watching them work, and seeing how they go about controlling the animals.

Keep in mind also that restraint measures are very different for the different animals. In each case, the basic purposes of restraint are the same; that is, to secure the animal in a certain position so that an examination or procedure can be carried out. Also, you want to carry out the procedure so that neither the animal nor the restrainers get kicked, bitten, or otherwise injured. The procedures being carried out will range from taking TPRs for a physical examination to drawing blood or performing surgery on the animals. Also, restraint measures vary from animal to animal. You would not attempt to apply the same restraint measures to cattle that you use successfully with horses. To get you familiar with some large animal restraint techniques, here are several of the basic procedures for the large animals.
Restraint of Horses

When approaching a horse for purposes of restraint - as with all animals - you should not startle it. A startled animal is likely to show the “fight or flight” syndrome, and attempt to escape your advances. Instead, you should talk to the animal and display a friendly attitude. Since horses are accustomed to their owners handling them from the left side, this is where you should approach from. When you approach with a halter, it should be kept out of view; otherwise, the horse will sense that you are trying to control it. If sweet-talking does not coax the animal to allow you come near, you may be able to bribe it with a handful of oats or hay. When allowed to approach, you should position yourself very close on the left side in the neck area, and slip the halter around the horse’s neck, then extend it over the muzzle, and finally, buckle it along the head. Then you can attach a lead shank to the halter and lead the horse where you want it to go. When leading the horse, keep one hand on the shank close to the halter, and keep your body close to the horse.

The Twitch

A twitch is commonly used to restrain horses. This is a loop of chain with the ends fastened onto a handle. It is placed around the upper lip of the horse, then twisted to exert painful pressure. To attach, place the loop around your left forearm, then grasp the horse’s lip, slide the loop of chain over the lip, and tighten to close the chain loop to exert pressure. The resulting pain to the horse will distract it, and allow the veterinarian to carry out a procedure on some other part of the body. A metal clamp twitch which is used to squeeze the lip is also used for this purpose, as are chain shanks. Some of these devices may be fastened in place so that they do not have to be held.

Ropes

Ropes are also used extensively for restraint purposes, in which case various knots are tied such as a halter tie, bowline, bowline on bight, and half-hitch. The veterinarian, of course, should instruct you and direct you in using the preferred methods.

Lifting Horses’ Legs

To examine a front foot of a horse, position yourself very close, facing the rear end of the animal, then with grasp just below the first (carpus) joint with your shoulder exerting pressure against the horse to encourage it to put its weight on the other three legs, and lift the foot for examination. To examine a rear foot, the procedure is much the same. Facing the rear of the animal with your shoulder against the horse, slide your hand down the leg and lift it when the hand is just above the foot.

For safety’s sake, you should always stand very close to the horse on the side, and certainly not behind the horse. Horses can cause severe injury by kicking anyone standing directly behind them. When you can maintain body contact with the animal, you can sense any movements that the horse starts to make and avoid being in the way of those movements.
Stocks
Stocks are also frequently used to restrain horses. These are fashioned from sturdy metal poles that form framed enclosures, leaving only enough room for minimal movement so that the horse has nowhere to go. The head of the horse is controlled by ropes which are affixed from the horse's halter to the front part of the frame.

The idea of restraining horses by causing discomfort and pain is not appealing to horse lovers. These measures are deemed necessary, however, to prevent accidents and injury to horses or to veterinarians and their assistants.

RestRAINT OF CATTLE
Cattle are generally more docile than horses, so restraint measures are often easier to apply—with the exception of bulls, which may present certain problems. When it is necessary to apply restraint to cattle, they are sometimes roped or directed into squeeze chutes.

Roping Cattle
This method is used when there are skilled personnel to carry out the procedure when the animals are free out in the open. One person ropes the head, and another the feet, then the animal is stretched out for the procedure.

Squeeze Chute
Frequently, cattle are restrained by driving the animals into squeeze chutes. A squeeze chute contains a head gate, a tail gate, and a squeezing mechanism along the sides so that the head, tail, and body of the animal can be restrained in a secure position. To get the animals into the chute, they are driven through a passageway that opens into the chute. When an animal enters and sticks its head through the head gate, the gate is closed and the animal cannot escape.

With bulls, you should remember that they are always prone to show aggressive behavior, but with skillful persons handling them, they can be driven into squeeze chutes.

With cattle, it is good to remember that they kick forward and/or to the side in a hooking motion instead of kicking backward like horses do. Also, it is good to remember that stocks do not work well for restraining cattle—they are prone to self-inflicted injury when this method is applied.

RestRAINT OF SHEEP AND GOATS
Sheep and goats can be maneuvered into small enclosures and caught so that they may be restrained.

Sheep can be restrained with one arm around the neck and the other grasping the flank. Then they are often “sat-up” on the rump for examination and treatment by the veterinarian.

Goats can also be grasped around the neck and by the flank and held. They can be carried against your chest, with one arm around the front legs and the other around the rear legs.

Sheep should not be grasped by the wool and the same applies to mohair goats. Their fleece may be damaged if this is done and cause bruises to the skin. Nor should sheep or goats be held by the horns for restraint. They will struggle to get away when this is done and defeat the purposes of the restraint.
Restraint of Pigs

Pigs can be restrained by driving them into a confined area where they can be handled. Then the animal can be restrained with ropes or by putting a bucket over its head. Pigs have the tendency to bite when they are restrained, and these bites can result in serious injury to a handler. Swine can become very aggressive when they are trying to avoid restraint, but sometimes they can be enticed by dropping food along the path you want them to take.

Once again, it is important to remember that before attempting restraint with any of the animals discussed above, that you should gain precise instruction from your veterinarian, and practice the methods under the doctor’s direction before you attempt to carry it out on your own. When things go wrong in trying to restrain animals, serious injury may result to the handlers or to the animals.

Step 5: Progress Check 36-1

Answer the following questions by writing your answers on scratch paper.

1. What are three basic differences between a small animal veterinary practice and a large animal practice?

2. What are three areas of concern in a physical examination of a large animal?

3. Name seven important observations that may indicate illness when examining an animal.

4. The normal body temperature for humans is 98.6°F or 37.0°C. What are the normal body temperature ranges for horses and cattle?

5. Which of the following animals has the highest normal pulse rate: cattle, calves, sheep, goats, swine, or horses?

6. What is the “fight or flight” syndrome that horses are prone to display when a stranger comes into view?

7. What are two common methods for restraining cattle?

8. Restraint with stocks is generally used with which animal?

9. Explain how sheep are often restrained.

10. What are the two major injuries that can occur to handlers when trying to restrain horses or pigs?

Step 6: Answers to Progress Check 36-1

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.
A veterinary assistant will often be called on to assist the veterinarian in the treatment of large animals. Quite often, assistance will be required in giving injections, in drawing blood, or in administering a liquid substance to an animal intravenously.

**Administering Injections**

You will recall that the four basic types of injections are those which are administered intradermally (into the skin), subcutaneously (just beneath the skin), intramuscularly (directly into a muscle mass), and intravenously (into a vein). Most often, a veterinary assistant will be able to help restrain the animal and also help to prepare an aseptic site for the injection. However, you should be fully aware of the complete process in each of the types of injections so that you can provide the best possible assistance.

**Subcutaneous**

Subcutaneous injections are the easiest to administer, and it usually takes only a few seconds to complete the injection. As with all injections, the site is cleansed with an alcohol sponge, or the veterinarian’s favorite antiseptic. Then the needle on the syringe is driven beneath the skin into fatty tissue at a 45° angle, and the contents discharged. There are many areas of the body where these injections are made. It takes longer for the injected material to be absorbed with subcutaneous injections than with either of the other intramuscular or intravenous injections.

**Intradermal**

Intradermal injections are a method of administering certain vaccines. They are given with a very small needle, directly into the skin at about a 10° to 15° angle. These injections cause a small lump to form in the skin where the vaccines are injected.

**Intramuscular**

Intramuscular injections are driven into a muscle mass at a 60° to 90° angle, usually in the pelvic or leg region, and quite often the contents contain a large amount of fluid. Once the needle is injected, the veterinarian pulls back on the plunger of the syringe for assurance that the needle is not positioned in a blood vessel. If any blood appears in the syringe when this is done, the needle is withdrawn and another site for the injection is selected. If it was carried out, the needle could damage a blood vessel, or the contents could be toxic to the blood stream. The needles for these injections are heavier and more sturdy, and have a larger diameter than needles used for subcutaneous injections.
Intravenous

Intravenous injections are the most difficult to administer and require the most restraint because they take longer to complete and no movement of the patient can be permitted. They are generally given into the jugular vein of the neck, which lies in a groove on the side of the neck, in the lower neck area. With pigs, however, these injections are sometimes administered into a vein in the ear. To “raise a vein” for the injection, which means finding a good site, finger pressure is applied over the vein at the base of the groove toward the heart to stimulate blood flow in the area. When the area for the injection has been selected, it is sponged thoroughly with antiseptic. Then, the injection is made with a long needle (which has been removed from the syringe) at about a 20° angle. When a blood droplet appears (for assurance that the needle is in the vein), the syringe is connected to the needle and the injection is completed. This procedure is used to prevent mishaps which might include breaking the needle.

When an intravenous injection is made for the purpose of withdrawing a blood sample, a vacutainer is often used. This is a syringe that consists of a vacuum tube that sometimes contains coagulant. This vacutainer syringe will automatically withdraw the blood once it is attached to the needle in the procedure described above.

Oral Medications

Oral medications are sometimes administered by veterinary assistants. They are given in four different ways:

1. They are given as a bolus, which is a large, soft “taste-good” pill that can be coated with food, or the medication can be mixed with a sweet substance such as molasses or honey, or sometimes they are frozen to make them more palatable.

2. The medication can be mixed with water and placed in the mouth and given as a drench.

3. The medication can be given with feed, which is the least desirable method, since there is no assurance that the animal will ingest all of the medicated food.

4. The medication can be administered through a tube that is inserted through the esophagus into the animal’s stomach. This is the only sure way of guaranteeing that all of the medication will be ingested.

Oftentimes, the type of medication being administered to the animal will dictate the method chosen. Sometimes when pills or capsules are given to mature horses they are lubricated with mineral oil to prevent them from lodging in the esophagus, which could present a real problem. This is why pills or capsules are never administered to foals or ponies; it could be fatal if they lodged in the esophagus.

Special Procedures

There are several common procedures that are called for regularly with large animals, which are performed by the vast majority of large animal veterinarians. These include artificial insemination, mostly with cattle; dehorning, primarily with cattle and goats; castration, primarily with horses and cattle; and Cesarean birth operations, when normal delivery of offspring poses a threat to the new mother’s life. Spaying of heifers is sometimes carried out, but is not a frequent procedure with large animals.
Artificial Insemination

Artificial insemination has been a great economic benefit to farmers and ranchers. Instead of mating a bull with a cow, the sperm is obtained and frozen if not immediately used. The sperm from one ejaculation can be used to impregnate 20 or more cows, at a time convenient to the owner of the cattle. The success rate of achieving pregnancy by this method is approximately 80%. A second benefit of this procedure is that selective breeding can be easily achieved, which can result in producing more productive milk cows or higher quality beef animals.

There are three methods of collecting semen from the bull. These include the use of an artificial vagina, electric stimulation by what is called an electroejaculator, and massage of the accessory sex glands. Use of the artificial vagina is the most widely used method, in which the bull is encouraged to mount a teaser animal and the erect penis is directed into the artificial vagina which receives the ejaculation and collects the semen. The device used is manufactured by animal product supply houses. Use of the electroejaculator is the second preferred method for collecting sperm, and used primarily with bulls that are unable to mount. The massage method is least favored.

The semen is used by injecting it into the cow’s vagina at the neck of the uterus. As you can imagine, personnel skilled with handling bulls and skilled in carrying out the procedures must be used to accomplish this.

Dehorning

Dehorning of cattle and goats is a common procedure intended to prevent injury that animals can cause each other. Two basic methods are used. The first is the surgical procedure performed by a veterinarian, and the second the use of caustic salve on the horn buds of calves, which chemically destroys the horn roots, and is routinely done in the first or second week of life. When this is done with older calves, the horns are removed with a Barnes dehorner. Sometimes, but not always, a local anesthetic is used with the older calves, but dehorning is nearly always a painful procedure for the calves.

Castration

Castration is the most common surgical procedure performed on large animals. The veterinary assistant’s task is usually to scrub the scrotal area and to help with general restraint. This is normally carried out with horses and other large animals in a standing position and is sometimes done in the field. It is sometimes done with a short-acting intravenous anesthetic or with a local anesthetic when performed with the animals in a standing position. Once the scrotum is cut open, an instrument called an emasculator is used to crush and sever the spermatic cord.

Cesarean Birth

Cesarean birth operations are done on large animals when the veterinarian has diagnosed that the normal birth process cannot occur successfully. These are regularly referred to as “Cesarean sections.” In this operation, the animal is under anesthetic and an incision is made in the uterus so that the offspring can be withdrawn. These have become fairly commonplace, and the veterinary assistant’s tasks often involve caring for the newborn by assuring that breathing passages are clear, and otherwise following the veterinarian’s directives which may involve handling the placenta and nursing functions in the newborn.
Step 8: Progress Check 36-2

Answer the following questions by writing your answers on scratch paper.

1. What are the injection sites for the following types of injections?
   - Intradermal - ______
   - Subcutaneous - ______
   - Intramuscular - ______
   - Intravenous - ______

2. Why is the plunger pulled back just after an intramuscular injection is made?

3. What are the usual functions of a veterinary assistant in assisting the veterinarian with injections?

4. What type of injection is most difficult to administer, and why?

5. Which injection is normally made with the needle only, separated from the syringe?

6. What are four methods of giving oral medications to large animals?

7. What are the benefits of artificial insemination in cattle?

8. What is the advantage of using the electroejaculator in artificial insemination?

9. What is the purpose of dehorning?

10. What is a Cesarean section?

Step 9: Answers to Progress Check 36-2

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.
Step 10: Animal Diseases

Although the veterinary assistant will not be the one who diagnoses or treats large animals with diseases, it will be of great benefit to have basic knowledge of these ailments to better assist the veterinarian in dealing with them.

Federal, state, and county veterinarians along with all of the private veterinarians in the United States have done a tremendous job over the years in devising vaccines and treatments for large animal diseases and in actually eradicating some of them. Glanders, formerly a very serious threat to horses, and tuberculosis, which infected cattle and other species, are no longer the threat they once were. The same cannot be said for most other countries of the world. The relatively good state of large animal health in the United States is due in part to strict quarantine regulations for imported animals, and inspection and vaccination of animals that are transported from state to state. All of that said and done, however, there are still many diseases that must be diagnosed, treated, and controlled in the United States.

Upper Respiratory Tract Infections in Horses

Just as humans are plagued by colds and different forms of the flu at various times, horses are also subject to several of these highly contagious respiratory infections. These include:

**Influenza (Flu)**

Influenza (flu) is caused by a virus and attacks the lining of the respiratory tract. The symptoms include fever, coughing, loss of appetite, and a nasal discharge of droplets which are highly infectious to other horses. Influenza can be controlled by vaccination. Treatment includes isolation in a well-ventilated stall. Dust and mold in the stall should be controlled, and there should be access to fresh water. Veterinarians treat the disease with cough suppressants and decongestants, and sometimes use inhalation therapy. Antibiotics are sometimes used to control a secondary bacterial infection when it is a danger. Sometimes the disease is allowed to run its course without medicines, applying only strict isolation and control of the environment.

**Strangles**

Strangles is caused by a bacteria and is also highly infectious. Fever, nasal discharge, loss of appetite, and depression are common symptoms. In addition to respiratory tract infection, lymph glands in the neck and throat become swollen and painful, and rupture about two weeks after initial infection. The bacteria spewed forth as a result may continue to live for an extended period of time, and infect other animals months later. Treatment includes antibiotics and other measures that are used for influenza (above).

**Viral Rhinopneumonitis**

Viral rhinopneumonitis is caused by a virus, which produces cough, fever, loss of appetite, and nasal discharge. It is spread by aerosol (particles in the air) and also can attack the reproductive tract and cause abortion in pregnant mares. A vaccine is available for this disease. Treatment is the same as for influenza (above).
Viral Arteritis

Viral arteritis causes inflammation of the arteries of the respiratory system. Symptoms include coughing, fever, depression, muscular weakness, nasal discharge, and congestion of the nasal mucous membranes. A vaccine is available for the disease. Treatment includes those measures used for influenza (above) and is used to reduce and control the symptoms of the disease.

As you probably noted, the signs and symptoms of the above four diseases are very similar, but fortunately, so are the treatments. A problem could result, however, if a horse was misdiagnosed and the other horses were vaccinated for the mistaken disease; then other horses could be infected from discharges from the misdiagnosed horse.

Other Horse Diseases

Other horse diseases include:

Equine Infectious Anemia (EIA)

Equine infectious anemia (EIA) is a viral disease spread by a transfer of blood from an infected horse to another, by biting insects, or perhaps from surgical instruments or needles that have not been cleaned of the infected blood of a horse. Anemia, fever, weight loss, lethargy, and swelling of the abdomen are symptoms of the disease. There is no treatment for this disease, and once the horse is infected, it has the condition for life. Also, there is no vaccination for this disease. The Coggins' test has been developed to identify EIA antibodies in the blood, and this is a required procedure before a horse can be shipped from one state to another.

Tetanus

Tetanus is very rare in modern times because of widespread vaccination. It is caused by a bacteria which enters the horse's body through wounds. It is prevalent in wounds that have closed, not permitting air to enter, because the bacteria thrives in an anaerobic environment. The main symptom is muscle spasms, and when these affect the muscles of the jaw, the ailment has been referred to as “lockjaw.” Another sign of the disease is a prominent third eyelid caused by retraction of the muscles of the eyeball. Horses may die from this disease when the breathing muscles are affected. Not all horses with the disease die, however, especially when the onset of the disease is slow, and good care and treatment is provided. Treatment includes antibiotics, tetanus antitoxin, and muscle relaxants. The vaccination for the disease includes tetanus toxoid and antitoxin. This vaccination is always provided to horses that have undergone surgery unless they are already on it, in which case a booster is normally given.

Equine Encephalomyelitis

Equine encephalomyelitis, or sleeping sickness, results in inflammation of the brain and spinal cord. It is caused by a virus transferred by mosquitoes from birds to horses, humans, or other animals. Symptoms of the disease include fever, loss of coordination, drooping lower lip, depression, and circling in one direction. Treatment for the disease is rarely effective and so the death rate is very high for animals who contract the disease. Vaccination against the disease is available and usually given to horses annually.
Diarrhea
Diarrhea would normally be considered a symptom of another disease, but it can have a devastating effect on horses, especially younger ones, resulting in their death when not treated successfully. Diarrhea is an increase in the water content in stools and causes animals to become dehydrated with excess acid in the blood that cause electrolyte imbalances. Bacteria, viruses, and parasites can cause this imbalance. Salmonella is sometimes the cause of diarrhea, which can also have devastating effects on human beings. Because of the threat to humans from the causative agents, veterinary assistants should be very sanitary-minded when assisting with animal patients who have this disorder. Aside from extreme attention to sanitation, treatments will include a number of intestinal drugs, antibiotics, and charcoal administered by mouth. Also, the administration of intravenous fluids over several days may be required.

Parasitisms
Parasitisms in the form of various bloodsucking and other worms can wreak havoc when they infest an equine population. Fortunately, they can be easily detected and identified by fecal analysis. Some of the various forms are:

- **Strongylus** - which is a bloodsucking worm that sucks blood from the colon of horses. The result is usually anemia and tissue damage at the attack site, and the larvae can migrate to cause blood vessel damage, rupture, and death.

- **Ascarids** - in the form of large roundworms that commonly invade the small intestines of foals and young horses. In large numbers, these parasites can cause rupture of the intestine and death of the foal or colt. Or, the larvae can migrate through the lungs and cause coughing.

- **Pinworms** - are common in foals and adult horses. They invade the anus and rectum and cause itching which results in loss of hair from the scratching done by the host to rid itself of the parasites.

- **Bots** - are larvae of flies called *Gastrophilus* which lays its eggs in the hair of a horse. They migrate to the stomach and small intestine, where they can cause peritonitis and death. In the process, the larvae are passed in the feces and then develop into adult flies.

Treatment of the above conditions will depend on identification of the types of worms in the fecal analysis, and owners should be encouraged to submit fresh samples for analysis when these conditions are suspected.

Diseases of Food Producing Animals

Hog Cholera
Hog cholera is a highly infectious disease that has been brought under control by vaccination. It is caused by a virus and affects small blood vessels. The resulting hemorrhages most often result in death. The disease resulted in large economic losses before the vaccine was perfected.
Brucellosis

Brucellosis is also known as Bang’s disease, malta fever, or contagious abortion. It affects cattle, swine, goats, and other species, including humans. In humans, the infection is known as undulant fever, and is therefore a threat to veterinarians and veterinary assistants. The disease causes the pregnant female to abort in the last third of her pregnancy, and in bulls the disease can infect the testicles. It is caused by a bacteria, and infection is caused by ingestion of the bacteria. Vaccination is available, but it is a tricky procedure, since vaccination of bulls can cause the disease rather than prevent it. Therefore, only the females of the species are vaccinated. A federal program is in effect that provides for regular testing of blood and milk to identify the causative agents. Humans can contract the disease from raw milk or as a result of unsanitary procedures when attending to infected animals.

Anthrax

Anthrax is a bacterial disease that infects cattle, sheep, goats, horses, and humans. The bacteria attack the bloodstream and is often fatal due to collapse in the cardiovascular system. The disease is spread by biting insects or by direct contact with the bacteria. Once again, this is a disease that is a danger to veterinarians and veterinary assistants treating or examining infected patients. Humans can also contract the disease by eating infected meat. This disease has been prevalent in several regions of the southern United States. When the bacteria are exposed to air, spores are formed which can remain infectious. Thus, animals that succumb to the disease should be buried in lime or incinerated. A vaccine is available for the disease.

Blackleg and Malignant Edema

Blackleg and malignant edema are caused by bacteria that may enter the body through a wound or be absorbed into the bloodstream from the intestines. These are classed as clostridial diseases, named for the causative bacteria. Once again, the bacteria are anaerobic and form spores, so they are very resistant to extermination. Animals with the disease may show high fever, experience severe convulsions, and die suddenly. Treatment with penicillin and disinfection of wounds may be helpful in the early stages of the diseases. Vaccination is available to prevent the disease.

Foot and Mouth Disease

Foot and mouth disease is caused by a virus that may infect cattle, swine, sheep, and goats. The resulting infection is identifiable by blisters on the toes and in the mouth, along with weight loss, and may cause death of young cattle. This disease has been a scourge throughout the world, including the United States, in earlier times. It is highly contagious and infected animals are slaughtered and the carcasses burned or buried to prevent spread of the disease to other animals. The disease is well controlled in the United States, but animal health authorities and veterinarians are constantly alert for any signs of the disease. There are occasional outbreaks of this disease in foreign countries from time to time, but usually timely measures are taken to destroy the infected animals and prevent the spread of the disease.
Step 11: Progress Check 36-3

Answer the following questions by writing your answers on scratch paper.

1. What are common symptoms of upper respiratory tract diseases in horses, and what treatments are recommended?
2. What upper respiratory tract infection causes swelling of the lymph glands, and which disease infects the arteries?
3. What test is given to determine if a horse has equine infectious anemia?
4. What ailment has also been referred to as lockjaw?
5. Diarrhea can be devastating to young horses. How is it treated?
6. How are horse parasites detected and identified?
7. Name two diseases of large animals that are also threats to their human handlers when appropriate sanitary procedures are not taken.
8. What diseases may cause severe convulsions with high fever and often result in death?
9. Which disease of cattle produces blisters on the toes and in the mouth, and is accompanied by weight loss?
10. Which disease has a vaccination which prevents heifers from getting it, but actually acts as an infectious agent when given to bulls?

Step 12: Answers to Progress Check 36-3

Check your answers with the Answer Key at the back of this book. Correct any mistakes you have made.

Step 13: Lesson Summary

In this lesson, you have learned how a veterinary assistant can help the veterinarian in conducting physical examinations of large animal patients, including making observations, interviewing the animal owner, and taking TPRs. You have also learned the common methods of restraining large animals, which involves a number of devices. You have become acquainted with a number of procedures and treatments for large animals, including administering injections, and how various special procedures are carried out. Then, finally, you have learned the major diseases of large animals and what the symptoms and regular treatments are.

Large animal veterinarians employ veterinary assistants more today than ever before in their practices. When assessing what you prefer to do, you will now be better able to evaluate whether you are more suited to assist in small animal practice, or work with a large animal veterinarian.
**Step 14: Complete Mail-In Quiz #12**

- Be sure you have mastered the instruction in Lessons 34, 35, and 36.
- Mark your answers on these examination pages.
- When you have finished, TRANSFER YOUR ANSWERS TO THE ANSWER SHEET PROVIDED. Use blue or black ink on your Answer Sheet. Do not use red ink.
- Mail the Answer Sheet to the school in one of the envelopes provided. Your quiz results will be mailed to you.

MULTIPLE CHOICE: Select the BEST single answer for each of the following items:

1. **Which form of commercial cat and dog food has the best nutritive balance for these animals?**
   a. Dry food.
   b. Canned food.
   c. Semi-moist food.
   d. They are all comparable.

2. **Which form of commercial food do dogs and cats find most palatable?**
   a. Dry food.
   b. Canned food.
   c. Semi-moist food.
   d. They are all comparable.

3. **Which of the following nutritive components are least necessary for cats and dogs?**
   a. Protein.
   b. Fat.
   c. Carbohydrate.
   d. Minerals.

4. **Which of the following nutritive components has the most energy per unit of weight?**
   a. Protein.
   b. Fat.
   c. Carbohydrate.
   d. They are all comparable.

5. **Which of the following is required in the diets of cats, but not in dogs?**
   a. Carbohydrate.
   b. Milk.
   c. Bread.
   d. Taurine.
6. Which of the following minerals contribute to the hardness of bones and teeth?
   a. Iron and selenium.
   b. Calcium and phosphorus.
   c. Sulfur and cobalt.
   d. Iodine and zinc.

7. Which of the following is poisonous to dogs?
   a. Chocolate.
   b. Celery.
   c. Marinara pasta sauce.
   d. Raisin bread.

8. Which of the following is the most common feeding problem with cats and dogs?
   a. Underfeeding.
   b. Overfeeding.
   c. Deficiencies in protein.
   d. Deficiencies in carbohydrates.

9. A rule-of-thumb for feeding adult dogs is to feed them ½ pound of food for every 10 pounds of body weight. Which of the following should be fed less than this ratio of food?
   a. Lactating bitches.
   b. Pregnant bitches.
   c. Puppies.
   d. Old dogs.

10. Which of the following statements is true?
    a. Vaccine is usually administered by intramuscular injection.
    b. Subcutaneous injections are made into the skin.
    c. Intradermal injections are made into a muscle.
    d. Usually, an intravenous injection is made with the needle separated from the syringe.

11. Which of the following is a major objective of first aid treatment for a rattlesnake bite?
    a. Keep the patient active with exercise.
    b. Apply cuts at the bite site immediately, before consulting the veterinarian.
    c. Increase the blood circulation.
    d. Reduce the blood circulation.
12. At what maximum distance can a three-foot rattlesnake strike a victim?
   a. 3 feet.
   b. 2½ feet.
   c. 2 feet.
   d. 1½ feet.

13. What is the characteristic marking of a brown spider?
   a. A violin-shaped marking on the upper thorax.
   b. A red hourglass figure on the ventral abdomen.
   c. A green light-bulb shaped figure on its head.
   d. Red stripes in the head-thorax region.

14. Which of the following causes mange?
   a. Fleas.
   b. Mites.
   c. Ticks.
   d. Lice.

15. Which of the following poisonous plants is most likely to cause death once the clinical signs of the poisoning appear in an animal?
   a. Foxglove.
   b. Yew.
   c. Poinsettia.
   d. Caladium.

16. Which of the following poisonous plants can cause partial to complete blindness in an animal?
   a. Mistletoe.
   b. Oleander.
   c. Tansy mustard.
   d. Umbrella tree.

17. Which of the following insects has been responsible for transmitting bubonic plague?
   a. Fleas.
   b. Mosquitoes.
   c. Ants.
   d. Beetles.
18. Which of the following is a symptom of anemia in an animal?
   a. Pale pink mucous membranes.
   b. Shaggy coat.
   c. Diarrhea.
   d. Lameness.

19. To take the body temperature of a horse by rectal thermometer, you should stand _____.
   a. directly behind the animal
   b. on the right side at the rear of the animal
   c. on the left side at the rear of the animal
   d. in any of the above positions

20. When approaching a horse with the intention of restraint _____.
   a. do not let the horse see you coming
   b. approach from the rear of the horse
   c. display the halter so the horse can see it
   d. approach from the front, to the left side of the horse

21. When approaching a horse with the intent of restraint, the first control you should try to apply is to _____.
   a. put the halter on
   b. apply a twitch
   c. encourage the horse to follow you by coaxing it with oats or a carrot
   d. tie a rope around the horse's neck using a half-hitch

22. Which of the following restraints controls a horse by exerting pain to its upper lip?
   a. A hobbling device.
   b. A twitch.
   c. A rope cinch.
   d. Any of the above.

23. When approaching a horse to examine a rear foot, you should _____.
   a. stay at least two feet away from the horse
   b. approach from the rear
   c. stay close to the horse, and maintain hand and body contact
   d. approach from the front, to the right side of the horse
24. The squeeze chute is generally used to restrain _____.
   a. horses
   b. goats
   c. pigs
   d. cattle

25. To restrain a sheep, you should attempt to _____.
   a. put a bucket over its head
   b. place one arm around its neck and then grasp the flank with the other
   c. hold it by pulling its wool
   d. apply the twitch

Congratulations!

You have completed Lesson 36. When you have completed this quiz and reviewed your answers, transfer your answers to the Answer Sheet and mail it to the school in the envelope provided.
Lesson 28

Progress Check 28-1

1. **D** narcosis  =  A drug-induced state of sleep.
2. **A** analgesic  =  A drug that relieves or eases pain.
3. **E** anesthetic  =  A drug substance that produces a loss of sensation.
4. **C** basal anesthesia  =  A loss of consciousness produced by a preliminary medication.
5. **B** regional anesthesia  =  An injection into a main nerve trunk causing insensitivity to pain within that body area.

Progress Check 28-2

1. Chloroform is currently one of the most widely used primary anesthetics. **False**
2. The effects of an intravenous anesthetic injection are longer lasting than an inhaled anesthetic. **True**
3. A lesser amount of principal anesthetic may be used with the additional administration of a preanesthetic. **True**
4. There is a tendency for a patient’s blood pressure to increase when administering halothane. **False**
5. Ether is widely used because of its nonflammable quality. **False**
Lesson 29

Progress Check 29-1

1. E palliative medication = An analgesic.
2. D capsule = A gelatin container.
3. A tablet = A pellet of medication without a coating.
5. B per orum = A liquid or solid medication administered by mouth.

Progress Check 29-2

1. A subcutaneous injection into the chest cavity is called an intrathoracic injection.
2. A liniment is an example of a topical application.
3. An intramuscular injection is slower acting than an intravenous injection.
4. An intravenous injection distributes the medication directly into the bloodstream.
5. Medications that, when administered together, cancel the effectiveness of each other are called counteractors.
Lesson 30

Progress Check 30-1

1. **D** scutes = A plating similar to a turtle shell covering a hard tick.
2. **E** warbles = Breathing holes through which spiny grubs emerge.
3. **F** otodectic mange = The infestation of mites in the external auditory canal.
4. **C** siphonaptera = A grouping of parasites to which fleas belong.
5. **B** arachnida = A class of eight-legged parasites of which spiders and ticks are members.
6. **A** demodectic mange = The infestation of mites in the hair follicles.

Progress Check 30-2

1. Roundworms attack the digestive tracts of animals and do not travel to other parts of the body. **False**
2. Each proglottid segment of the tapeworm is a sexually functional individual. **True**
3. Pinworm infestation is not considered a serious ailment and is easily treated with medication. **True**
4. It would be difficult to confuse coccidiosis with distemper since the symptoms are so different. **False**
5. A fluke is a parasitic flatworm similar in shape to a pinworm. **False**
Lesson 31

Progress Check 31-1

1. What is the difference between a diagnosis and a prognosis? A diagnosis seeks to identify the ailment or illness of an animal; a prognosis is a forecast of the probable course or outcome of a disease.

2. What important rule should you always remember when focusing a microscope lens? Always start with the lens in the lowest position (close to the slide) and focus by moving the lens upward, to bring the field into focus. By moving the lens downward to focus, you run the risk of having it come into contact with the slide.

3. What does a centrifuge do? A centrifuge rotates specimens at a high rate of speed and causes different substances in the sample to separate into layers. Thus, samples start out homogenized and end up layered, or de-homogenized.

4. What is a hemocytometer? A hemocytometer is a special device used under the microscope to do a physical blood count, primarily of white blood cells.

5. What is a urinometer? A urinometer is a special kind of hydrometer used to determine the specific gravity of urine samples.

6. What is a refractometer? A refractometer measures the refractive index of a fluid or translucent substance. It has to do with how light rays are bent when passing through the object being tested, which gives a density result that is compared to standard scales. Refractometers are used to determine specific gravity of urine, and are used extensively in eye examinations.

7. In doing a pH dip stick test on a dog’s urine, what color would you expect the paper strip to turn if the urine was normal? Orange.

8. What colors would you expect a cat’s urine to be if it contained more than normal amounts of blood, or bile, or drugs? With blood, the urine would appear dark reddish; with bile the urine would be yellowish-brown or greenish-yellow; with drugs in the urine, it may be blue, green, or orange.

9. Why would you be concerned if an animal’s urine had a strong aroma? A strong aroma in urine indicates the presence of bacteria.

10. What is the tear test? The tear test is a dip stick (paper strip) test used to determine if the eye’s tear ducts are functioning normally.
Progress Check 31-2

1. When disposable needles and syringes are used, how should they be disposed of? They should be placed in a sharps container, which is a puncture-resistant refuse container.

2. What precautions should be taken when handling specimens for laboratory examinations? All specimens should be treated as if they contained infectious organisms. Handlers should wear rubber gloves, decontaminate the work area when finished, and remove and dispose of the gloves, and wash their hands as a final step.

3. Identify the following acronyms:

   CBC — Complete blood count.
   PCV — Packed cell volume.
   RBC — Red blood cell.
   WBC — White blood cell.

4. When disease is present, what would you expect a WBC count to show? A higher than normal white blood cell count.

5. What are neutrophils and lymphocytes? These are two of the five types of white blood cells (leukocytes) described in your lesson.

6. What is EDTA? EDTA is an anticoagulant used to preserve blood samples for laboratory examinations.

7. What are two methods of preparing blood samples for microscopic examination on slides? A blood smear is spread across a slide, or a specimen is placed in the center of the slide and covered with a coverslip.

8. When blood, urine, or fecal samples cannot be analyzed soon after collection, they should be refrigerated.

9. What are the normal reasons for collecting skin specimens and fecal samples? Skin samples are usually collected to examine for external parasites. Fecal samples are collected to examine for internal parasites.

10. Describe the flotation method of examining a fecal sample. A specimen is placed in a test tube along with a sugar solution. After a short period, any parasite eggs present will rise to the top since they are lighter (less dense) than the sugar solution. This top part of the contents is placed in contact with a slide so that any present parasite eggs will adhere to the slide. The slide is then examined under the microscope for parasite eggs.
Lesson 32

Progress Check 32-1

1. What epizootic has occurred several times throughout history, spreading through wide areas, and requiring the destruction of thousands of diseased animals? **Foot and mouth disease.**

2. What doctor discovered evidence that a disease could be transmitted from animals to man, and developed the first vaccine? **Edward Jenner.**

3. What federal agency is at the forefront in fighting animal diseases? **The Agricultural Research Service of the U.S. Department of Agriculture.**

4. One of the primary reasons for the transfer of diseases to animals in the United States has been: **Importation of diseased animals from other countries.**

5. Which levels of government enforce quarantine regulations? **All of them—federal, state, and local.**

6. What are four of the main tasks that county and city animal health agencies perform? **Issuing animal licenses, enforcing vaccination regulations, picking up and holding lost pets and strays, placing quarantines on areas prevalent with infectious disease, investigating reports of diseased animals, capturing and examining animals suspected of having rabies, examining animals for tuberculosis when there is cause, seeing to it that livestock diseases are reported to the county veterinarian, taking proper action when animal bites are reported, and educating the public with regard to animal and public health and welfare.**

7. What are zoonoses? **Diseases that can be transmitted from animal to man.**

8. What respiratory disease has been common to people who work with and handle birds? **Psittacosis**

9. What disease has been a scourge throughout history, at several different times infecting thousands of cattle over wide areas? **Foot and mouth disease.**

10. What zoonoses can be transmitted to people who ingest infected milk, food, or water? **Brucellosis, leptospirosis, salmonellosis, and toxoplasmosis.**

11. What four infectious diseases common to dogs, which are not zoonoses, are treated by veterinarians on a regular basis? **Canine distemper, canine parvovirus, kennel cough, and canine hepatitis.**

12. What cat disease is the feline equivalent to canine distemper? **Feline panleukopenia.**

13. What highly infectious disease is carried by the deer tick? **Lyme disease.**

14. What dog disease attacks the gastrointestinal tract and heart, and affects the animal's most vital functions? **Canine parvovirus.**
15. What canine disease is similar to the common cold? **Kennel cough.**

16. What are three reasons given for the use of euthanasia?

1. To eliminate the suffering of old and sick animals with no prognosis for improvement.

2. To prevent an epizootic (the widespread infection of many animals).

3. To reduce the animal population to numbers that can be fed, cared for, and managed in a healthy environment.

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**Lesson 33**

**Progress Check 33-1**

1. What is caries? **Caries** is tooth decay which is corrected by drilling out the decayed part of the tooth and filling it with an artificial substance or by capping it with a crown.

2. What is the first sign of gum disease? **Gingivitis**, which is evidenced by inflamed gums that have turned red and bleed easily, is the first sign of gum disease.

3. What offensive substances are removed from teeth when they are scaled and polished (cleaned)? **Plaque and calculus (tartar)** are the offensive substances removed from teeth when they are cleaned.

4. Why is proper occlusion important for animals? **When animals have malocclusion they cannot properly masticate and digest their food and are prone to suffer from weight loss and malnutrition.**

5. What is the outside layer of a tooth, and what substance lies underneath it? **In the top (crown) of the tooth, enamel** is the outside layer; **in the bottom (root area) of the tooth, cementum** is the outside layer. Underneath these outside layers is dentin, which makes up the mass of the tooth.

6. Which specialty field of dental care deals with each of the following areas?

   - Malocclusion: **Orthodontics**
   - Gum disease: **Periodontics**
   - Root canal repair: **Endodontics**
   - Dentures: **Restorative dentistry**
Progress Check 33-2

1. List five observations that can be made which indicate the presence of dental disease.
   
   1. Painful mastication.
   2. Slow eating.
   3. Favoring one side of the mouth for chewing.
   4. Reluctance to drink cold water.
   5. Intermittent chewing.
   6. Dropping food from the mouth after it is partially chewed.
   7. Unmasticated grain in feces (horses).
   8. Excessive salivation and blood-tinged mucus.
   9. Reluctance to eat hard grain (large animals).
  10. Loss of weight and poor general health.
  11. Swelling about the face and jaw.

2. What are five symptoms of dental disease that a veterinarian looks for when examining the oral cavity?

   1. Plaque on the teeth.
   2. Tartar (calculus) on the teeth at the gumline.
   3. Foul-smelling breath.
   4. Broken, loose, or missing teeth.
   5. Dental fistula evidenced by open sore below the eye.
   7. Bleeding or receded gums.
   8. Inflamed gums.
   9. Periodontal pockets in the gingival sulcus.
  10. Pus discharge in the mouth.
  11. Abnormal eruption of permanent teeth.
3. What are the two periodontal diseases common in dogs and cats?
   
   1. Gingivitis
   
   2. Periodontitis

4. Which of the two periodontal diseases above is curable? Gingivitis. It can be cured with antibiotics, teeth cleaning, and home care. Periodontitis will remain a problem during the life of the animal, but the effects can be lessened with proper treatment.

5. What condition is likely to occur when the deciduous teeth do not fall out before the permanent teeth erupt? Malocclusion. The permanent teeth would normally occupy the positions where the deciduous teeth are, and so they are out of alignment, which gives rise to poor bite.

6. What is involved in dental prophylaxis? Teeth cleaning, scaling and polishing, proper home care, brushing, and control of diet.

7. What home care is recommended for dogs with dental problems? Brushing the teeth, dry food, chew toys, and control of the environment so that hard objects or other items that could cause dental problems are not available to the animal.

8. Even though birds do not have teeth, what kind of dental problems is it possible for them to get? Malocclusion, where the upper and lower halves of the bill do not close properly.

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### Lesson 34

### Progress Check 34-1

1. What are the three basic forms of commercial dog and cat foods?
   
   1. Canned
   
   2. Semi-moist
   
   3. Dry

2. What are the major differences among the above foods?
   
   Cost
   
   Palatability
   
   Moisture content
   
   Type of storage required
3. How can the taste of dry dog food be enhanced so that it is more palatable and tastes better to the animal? **Flavor is released when water is stirred into the food.**

4. What form(s) of dog food require(s) refrigeration after the original container is opened? **Canned foods.**

5. Which nutrient is essential for growth, tissue building, and repair of the body? **Protein (in the form of amino acids).**

6. What amino acid is required in a cat's diet, but can cause digestive and health problems if fed to dogs? **Taurine—All well-balanced commercial cat foods contain taurine. Taurine, however, should NOT be fed to dogs.**

7. How do dogs and cats compare as to their dietary requirements of proteins, fats, and carbohydrates?
   - **Cats and dogs both need protein and fat in their diets.**
   - **Cats require a higher percentage of protein and fat than dogs.**
   - **There is no evidence that either cats or dogs require carbohydrates in their diets.**

8. Which of the nutritive ingredients contains the highest amount of energy per unit of weight? **Fat.**

9. What are the disadvantages of obesity in cats and dogs? **Obese cats and dogs are more vulnerable to cardiac disorders, digestive problems, heat stroke, arthritis, and skin diseases, along with shortened life span and other ailments.**

10. What minerals contribute to firmness and hardness of bones and teeth? **Calcium and phosphorus.**

11. What mineral deficiencies can lead to anemia in cats and dogs? **Iron, copper, and cobalt.**

12. What is a primary difference between fat-soluble and water-soluble vitamins? **Fat-soluble vitamins are stored in the body, whereas water-soluble vitamins are not stored in any appreciable amount. Water-soluble vitamins, therefore, should be included in the diet on a regular basis.**

13. What are the main fat-soluble vitamins? **Vitamins A, D, K, and E.**

14. What are the main water-soluble vitamins? **Several of the “B” vitamins and vitamin C, among others.**

15. Why is it not advisable to feed dogs and cats appreciable amounts of table scraps? **The animals are not likely to get the balanced nutrition they need to maintain their best health, especially if the scraps contain high-fat and high-carbohydrate foods.**
Progress Check 34-2

1. Why do some animal care facilities favor a self-feeding program for the animals in place of specified amounts at specified times? Self-feeding is less labor intensive, promotes retention of a constant level of nutrients in the blood, and gives animals something to do (eliminates boredom) when they are confined.

2. When animals are not on a free-choice feeding program, how many times per day are they normally fed?

   - Puppies and kittens—three or four times a day.
   - Adult cats and dogs—once or twice a day.
   - Pregnant bitches and queens—two or three times a day.
   - Lactating bitches and queens—two or four times a day.

3. As a rule-of-thumb, how much food should be provided for adult cats and dogs per day?

   - Cats should be given about ¼ pound of food for each 10 pounds of body weight.
   - Dogs should be given about ½ pound of food for each 10 pounds of body weight.

4. What is the most common problem in animal feeding? Overfeeding, which can lead to obesity and susceptibility to a number of ailments and diseases.

5. When is extra food required for dogs and cats? When they are puppies and kittens, lactating bitches and queens, and pregnant bitches and queens in the later stages of pregnancy. During this time, extra food is required to accommodate their nutritional needs for growth and body maintenance.

6. How should the diet of older dogs be varied from that of younger adult dogs? Feedings should probably be increased to two a day (to aid digestion) and include less protein-enriched food.

7. What measures are often taken to encourage cats and dogs to eat in the hospital? Their regular feeding dishes from home are used, and sometimes they are given the same foods that they are accustomed to eating at home.

8. Why is it important to keep records of how much animals are eating in the hospital? If they are not eating full portions, or not eating at all, they may suffer from malnutrition and become susceptible to other ailments and diseases.

9. What food sanitation measures should be taken with food dishes and food served in the animal care facility? Dishes should be sanitized before being used for a different animal, and uneaten and spilled foods should be cleaned away and disposed of.
10. How long can dry pet foods be used before they begin to lose their nutritive values? **Three months normally, if kept in their sealed packages and containers.**

11. What are important considerations in food storage? **Packaged food should be stored at temperatures between 45 °F and 60 °F and should be kept in a dry area with good air circulation. Canned and semi-moist foods should be refrigerated once opened. Dry foods should be kept in sealed metal containers once opened.**

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**Lesson 35**

**Progress Check 35-1**

1. What are the benefits that poisonous snakes, insects, and plants provide, if any? **Medicines are produced from their toxic substances, and research is conducted with them that helps us understand life processes.**

2. What advice will a veterinarian generally give a client when told on the telephone that the client’s dog has been poisoned by a rattlesnake? **Transport the animal to the animal clinic as soon as possible, and keep it calm and warm with a blanket to resist shock and prevent the heart beat rate from escalating.**

3. What is the most frequent type of treatment recommended for an animal that has ingested parts of an ornamental or house plant? **Symptomatic.**

4. Which of the following would be most likely to cause death if an animal ingested its poisonous substance; English holly, daffodils, poinsettia, or yew? **Yew.**

5. Why are daffodils and hyacinths dangerous to animals? **The animals can be poisoned by eating the bulbs.**

6. Why are peaches and apricots dangerous to animals? **They can be poisoned by eating the pits.**

7. What possible disastrous result can occur when an animal ingests poison from a spider plant? **Death from diarrhea is a possible result.**

8. What popular plant found in nearly all households throughout the Christmas season is poisonous to animals and may cause death? **Mistletoe.**

9. What major illness can result as a secondary condition when cats are poisoned from ingesting philodendron leaves? **Encephalitis.**

10. What is one of the resulting circulatory ailments in animals that ingest poison from a snake plant? **Destruction of the red blood cells (hemolysis).**
Progress Check 35-2

1. Aside from biting and chewing, what are the two ways that insects can be harmful to animals? **By injecting them with venom, and by serving as a vector.**

2. Which insect loses its stinging organ and dies after implanting the stinger? **The honeybee, but not the bumblebee.**

3. Explain how a vector infects animals. **By transferring blood from an infected animal to a non-infected animal.**

4. What are the most serious diseases spread by vectors? **Malaria, typhoid fever, yellow fever, bubonic plague, cholera, dysentery, and sleeping sickness.**

5. What are the characteristic markings of black widow spiders? **A red hourglass figure on the ventral abdomen.**

6. What are the primary first aid measures for scorpion bites? **Prevent venom from reaching the heart of the victim by placing a tourniquet between the bite and the heart; cutting at the site of the bite to release infected blood with the help of suction devices; try to keep the patient calm and warm to prevent increased circulation of blood.**

7. What environmental conditions allow fleas to thrive? **Fleas require warmth and moisture to complete their lifecycle, so hot and humid summer days means an increase in the flea population.**

8. What is mange? **Mange is a contagious skin disease caused by mites.**

9. What are ticks? **Bloodsucking parasites capable of transferring many infectious conditions, including screwworm infestations, anemia, sweating sickness, tick paralysis, and skin wounds.**

10. What measures work best in attempts to control mosquitoes? **Elimination of their breeding sites through land management practices.**

Progress Check 35-3

1. What are the poisonous snakes of the United States? **Rattlesnakes, cottonmouth, copperhead, and coral snakes.**

2. What is the only venomous lizard in the United States? **The gila monster.**

3. Which animal experiences the highest death rate from rattlesnake bites? **Dogs.**

4. What is the striking range of a rattlesnake? **Up to one-half its length.**

5. What is the largest rattlesnake in the United States? **The diamondback.**
6. How do the strikes of pit vipers differ from that of the coral snake? Pit vipers strike and then release their fangs; the coral snake strikes and hangs on for several minutes.

7. How can coral snakes be differentiated from harmless snakes with the same colors? The pattern of colors is different; the coral snake has bands of red and black separated by yellow bands, the harmless snakes do not.

8. What are the objectives of snakebite first aid treatment? To control circulation so that poisoned blood does not reach the heart, by applying a tourniquet between the bite and the heart; to make cuts at the bite site to encourage outflow of poisoned blood with the aid of suction; to keep the patient calm and warm.

9. What is the normal response of a venomous snake when threatened? To escape the danger by slithering away if it can, and to strike if it can’t.

10. What are the effects of rattlesnake venom when an animal is struck? Destruction of the vascular system tissues, and to a lesser degree, destruction of the nerve tissues.

Lesson 36

Progress Check 36-1

Answer the following questions by writing your answers in the blank spaces.

1. What are three basic differences between small animal veterinary practices and large animal practices?
   1. Small animal veterinarians see animal patients in their animal clinics or in animal hospitals, while large animal veterinarians most often see patients where the animals live–on farms, at race tracks, etc.
   2. Small animal owners usually form emotional attachments with their pets–the animals are considered members of the family. Large animals usually represent investments that the owners hope to make a living or profits from.
   3. Large animals are usually much larger than small animals, and are often more difficult to control, with the exception of chickens which are normally tended to by large animal veterinarians.

2. What are three areas of concern in a physical examination of a large animal?
   1. Reported conditions by owners.
   2. Close observation to detect abnormal or unusual conditions or behaviors.
   3. The basic examination including TPR and any body substance samples called for.
3. Name seven important *observations* that may indicate illness when examining an animal.

   1. Weight loss
   2. Diarrhea
   3. Pale pink or deep red mucous membranes
   4. A dry shaggy coat
   5. Wounds or skin growths
   6. Lameness
   7. Constipation

4. The normal body temperature for humans is 98.6 °F or 37.0 °C. What are the normal body temperature ranges for horses and cattle?

   - **Cattle:** 100° to 103.6 °F or 38.3° to 38.6 °C.
   - **Horses:** 99° to 101 °F or 37.5° to 38.5 °C.

5. Which of the following animals has the highest normal pulse rate: cattle, calves, sheep, goats, swine, or horses? **Calves.**

6. What is the “fight or flight” syndrome that horses are prone to display when a stranger comes into view? Horses are threatened by strangers, and when a person not known to the horse approaches, the horse becomes very alert and reacts physically with increased tension and excitability in preparation to flee from the area. Or it will stand its ground and show aggression if it cannot flee or avoid confrontation.

7. What are two common methods for restraining cattle?

   1. Roping the head and feet of the animal and stretching it out.
   2. Driving the animal into a squeeze chute.

8. Restraint with stocks is generally used with which animal? **Horses.**

9. Explain how sheep are often restrained. Place one arm around the neck, the other holding the flank, and then move the animal into a “sitting-up” position.

10. What are the two major injuries that can occur to handlers when trying to restrain horses or pigs? Horses can cause serious injury by kicking anyone standing behind them. Pigs can cause serious injury by biting.
Progress Check 36-2

1. What are the injection sites for the following types of injections?

   Intradermal — Into the skin.
   Subcutaneous — Into the fatty tissue just beneath the skin.
   Intramuscular — Into a muscle.
   Intravenous — Into the bloodstream, via a vein.

2. Why is the plunger pulled back just after an intramuscular injection is made? To assure that the needle is not in a vein.

3. What are the usual functions of a veterinary assistant in assisting the veterinarian with injections? Sometimes preparing and loading the syringe; cleansing the injection site with antiseptic; restraint.

4. What type of injection is most difficult to administer, and why? Intravenous, because the needle must be kept in the vein, it takes longer than other injections and it requires more restraint to assure that there is no movement by the patient.

5. Which injection is normally made with the needle only, separated from the syringe? Intravenous.

6. What are four methods of giving oral medications to large animals? The bolus (large pill); the drench (flushed with water); given with feed; and through a tube inserted into the stomach.

7. What are the benefits of artificial insemination in cattle? Easier, more economical, and more convenient. One bull ejaculation will provide for 20 or more inseminations. The process makes selective breeding to produce high quality stock easier.

8. What is the advantage of using the electroejaculator in artificial insemination? It enables bulls who cannot mount to impregnate cows.

9. What is the purpose of dehorning? To prevent injury that animals with horns can do to each other.

10. What is a Cesarean section? Surgical removal of the newborn when natural birth is a danger to the mother.
Progress Check 36-3

1. What are common symptoms of upper respiratory tract diseases in horses, and what treatments are recommended? **Symptoms:** fever, coughing, loss of appetite, nasal discharge, and depression. **Treatments:** cough suppressants, decongestants, and sometimes inhalation therapy. The animal should be isolated in a stall which is dust-free and mold-free, and have a supply of fresh water. Antibiotics are sometimes used for bacterial infections, and to treat secondary infections when a virus is the causative agent.

2. What upper respiratory tract infection causes swelling of the lymph glands and which disease infects the arteries? Lymph gland swelling - **Strangles.** Infects the arteries - **Viral arteritis.**

3. What test is given to determine if a horse has equine infectious anemia? **The Coggins’ test.**

4. What ailment has also been referred to as lockjaw? **Tetanus.**

5. Diarrhea can be devastating to young horses. How is it treated? Extreme attention to sanitation, intestinal drugs, antibiotics, and charcoal administered orally, plus intravenous solutions administered over several days to seriously dehydrated horses.

6. How are horse parasites detected and identified? **By examination and laboratory analysis of fresh fecal samples.**

7. Name two diseases of large animals that are also threats to their human handlers when appropriate sanitary procedures are not taken.
   
   1. **Brucellosis** (a.k.a. Bang’s disease, malta fever, or contagious abortion).
   2. **Anthrax.**

8. What diseases may cause severe convulsions with high fever and often results in death? **Black leg or malignant edema.**

9. Which disease of cattle produces blisters on the toes and in the mouth, and is accompanied by weight loss? **Foot and mouth disease.**

10. Which disease has a vaccination which prevents heifers from getting it, but actually acts as an infectious agent when given to bulls? **Brucellosis.**