

Working with the Laboratory Dog

Training for the Enhancement of Animal Welfare in Research

Videotape Script: June 2001

The use of dogs in research in the United States must comply with the federal law known as the Animal Welfare Act, which is enforced by the United States Department of Agriculture. Dogs used in research are also covered by a Public Health Service policy and a publication entitled *Guide for the Care and Use of Laboratory Animals*. Additional information on the dog may be obtained from the book *Laboratory Animal Management: Dogs* published by ILAR, and from the Animal Welfare Information Center at the National Agricultural Library.

In providing care for dogs, their social needs should be considered, especially in the case of long-term housing. If research protocols permit, dogs are often best housed in compatible pairs or small groups. Dogs desire and benefit from interaction with people. Play, grooming, and petting can provide very positive experiences for the dogs and their care givers. Objects such as chew toys may also provide enrichment and outlets for normal behavior. Check with your facility staff for toys which are appropriate.

Dogs should have the opportunity for activity. This may be provided by interaction with their care giver, by giving them access to play areas or runs, or by being walked on a leash.

The ANIMAL WELFARE ACT requires that an exercise plan for dogs be put in writing and be approved by the attending veterinarian and the institutional animal care and use committee, or IACUC.

Typically, individually housed dogs must be exercised out of their cages unless they are provided at least 2 times the minimum floor space required by USDA regulations.

Group-housed dogs do not require exercise out of the cage if they are provided with at least 100% of the required floor space for each animal.

The Animal Welfare Act requires that pain and distress be minimized in laboratory animals. Researchers must consider alternatives to the use of animals for procedures that may be painful. Such alternatives are commonly known as the three R's:

- Replacement of animals with nonliving systems or animals of lower phylogeny.
- Reduction in the number of animals used.
- And, refinement in the methods used on animals.

Always assume that a procedure which causes pain or distress in humans may do so in other animals as well. Make refine-

ments in your procedure, for example, by using analgesics and by reducing tissue trauma.

If animals do experience pain and distress, you must be able to recognize the signs so that you can take corrective action. Watch for changes in appearance, behavior, body weight, food and water intake and clinical signs. Refer any abnormality to the attention of the veterinary staff at your institution.

Occupational Hazards

The barking produced by a room full of dogs may be loud enough to cause injury to a person's hearing when exposed over a long period of time. And even brief exposures can be a cause of stress in many people. Therefore, when working in a dog room, consider the use of hearing protection, such as headphones or foam inserts for your ears.

Although dogs can be very docile, they are capable of causing painful and even severe injuries. Dogs may bite when fearful, in pain or if provoked. They have powerful jaws, long canine teeth, and carnassial teeth, which are premolars in the upper jaw that have sharp, slicing edges for shearing flesh.

A dog's toenails can inflict painful scratches, as when an animal is struggling because it is either fearful or it is not well restrained.

Another occupational hazard is diseases that are communicable between animals and humans. Such diseases are known as zoonoses. Diseases that are transmissible from dogs are listed here.

For reasons of human safety, animal welfare and research integrity, it is important to have a health surveillance program to ensure that dogs obtained for research are free of these diseases. The program should also ensure that the dogs have received the appropriate vaccinations and parasite control.

Because of the potential risk for zoonotic disease, it is important to ALWAYS wash your hands after handling any animal. Other protective measures may be required by your institution.

Methods of Identification

Dogs in an animal facility are required by USDA regulations to be properly identified. Typical methods may be a uniquely

numbered tag worn on a collar, a tattoo on the inner side of the ear or an implanted microchip.

Anatomy of the Genitalia

Determining gender is very straightforward in dogs. The male has a conspicuous scrotum adjacent to the anus. The penis, sheathed in a prepuce, is located on the midline of the abdomen. Males typically have a small amount of discharge, called smegma, in the prepuce.

In the female, the vulva is close to the anus. Although not shown here, the vulva will take on a swollen, reddened and moist appearance during estrus. Also, estrus is signaled by the development of a hemorrhagic discharge from the vulva.

Approaching a Dog

When first approaching a dog, take a moment to assess how the dog is reacting to you, and adjust your manner accordingly. Some dogs will eagerly approach you, but others may be fearful and withdraw to the back of the cage. Take care not to be bitten in these situations. Some individuals who are afraid will bite defensively. These are often referred to as "fear biters". Be careful to use nonthreatening postures and movements, such as crouching low to place your body on the same level as the dog, and using a soft but high-pitched reassuring tone of voice. If a dog appears aggressive, stop and get assistance from experienced staff.

Transportation

Many dogs can be easily lead short distances with a leash, as from housing areas to procedure rooms. Transport cages can be used for dogs that will not follow on a leash, or when dogs will be transported long distances.

Lock the wheels to prevent the cage from rolling when placing or removing a dog.

To lift a dog, circle your arms around the trunk. Place one arm around the chest and one behind the rear limbs. To prevent injury to your back, lift with your legs, not your back.

For most procedures it is best to move the dog onto an examination table. Make sure ALL four legs are securely on the table. Position the dog in a recumbent pose and prevent him from standing.

Restraint

A simple rule for physically restraining animals is to use the least amount of restraint necessary to accomplish the procedure safely.

However, consideration must be given to protecting both the animal and personnel. Since each dog has a unique personality, it is helpful to understand the normal behavior patterns when evaluating the best means for handling and restraint.

Don't forget that for some dogs, the most humane way to restrain them may be to administer tranquilizers, sedatives, or anesthetics before any handling.

Here are some things to avoid: Don't distress the animal by applying excessive restraint. To prevent the dog from injuring himself, never leave an animal alone on a table. Avoid making loud noises or fast movements that may startle the dog.

Restraint in Sternal Recumbency

The basic restraint position used for many procedures is sternal recumbency, in which the dog's sternum, or breastbone, lies in contact with the table.

One arm is placed under the dog's chin to control the head, while the other arm is placed over his back to prevent him from standing up. If necessary, the dog's head can be stabilized against your neck to provide better head control. This restraint position is useful for access to the cephalic and jugular veins.

Another restraint position is LATERAL RECUMBENCY, where one flank of the dog is in contact with the table. Holding onto the downward limbs prevents the dog from sitting up from this position.

Note how a finger is inserted between the forelegs to prevent them from being pressed together too tightly.

At the rear limb, you can also place your hand on the knee to stabilize the leg for venous procedures.

These methods of restraint are appropriate for most situations because dogs are generally cooperative. However, if an animal is fractious, other methods may be necessary and you should get help from experienced staff to avoid injuring yourself or stressing the animal.

The use of a muzzle will usually cause stress to a dog, and they are not needed for most individuals. But a muzzle should be considered any time a dog's temperament or past behavior suggests that a bite is likely. A muzzle must be fitted snugly so that it protects against bites, but at the same time it must be comfortable for the dog.

Muzzles made from leather or synthetic fabrics are available in many sizes. Use one that is appropriate to the size of the dog.

A good-fitting muzzle should slip easily over the dog's snout but it should also fit snugly without being too tight. Adjust the size of the strap to fit firmly but comfortably.

A quick muzzle can be fashioned out of a long strip of gauze. This can be useful in a situation where you fear the dog may bite.

First, make a large loop with a loose knot in a single throw. [freeze #1] A large loop allows you to keep your hands at a safe distance until the muzzle is tied. Slowly and gently, slip it

over the dog's jaws. Secure the knot on top of his nose, [freeze #2] and then tie another loop with a single-throw knot below the mouth. [pause] Finally, tie it behind the head, with a bow. Although all knots must be secured, the muzzle should not be so tight anywhere as to pinch the skin. This would be painful and would cause the dog to struggle.

To remove the muzzle, untie it at the back, and again keeping your hands away from the dog, slowly pull the gauze strip towards you. Note how the steady, gentle pull loosened the knots around his jaws without hurting him. That is why only single-throw knots should be used.

The dog has five toe nails on the front feet and four or five toe nails on the rear feet. Note the dew claw, which is equivalent to the human thumb nail and is located just below the carpus. These toe nails are a proper length. But when too long, they can cause a malpositioning of the toes, or become caught in caging. Long toe nails also present a greater risk of scratch injuries to people.

A dog's nails should be routinely trimmed. There are two types of nail trimmers, the guillotine type and the scissor type. Both are safe and effective when used properly.

To trim a nail, first identify the quick. This is the sensitive tissue at the base of toenails in all species, including humans. You do not want to cut the quick because it would be painful to the dog, and would bleed profusely.

Position the clippers carefully to avoid cutting the quick. If the nail is unpigmented, you can see it as a triangular area towards the base of the nail. If the nail is pigmented, where you cannot see the quick, trim on the thin and curved tip of the nail.

The scissor type trimmer has a nail guard behind the blades to prevent cutting too much of the nail. And on the front feet, don't forget to trim the dew claw.

Routine Care Procedures

Clipping Fur

For many procedures, the first step is to clip the fur. Because the dog's skin is sensitive, it is important to use the clipper correctly to avoid scratching or burning the skin. Position the clipper with the blade laid flat on the skin to allow the teeth to work best in cutting the hair. And, clip against the direction of the fur. Where fur grows in multiple directions, you should reposition the clipper for each track of growth. Never angle the clipper to drag the blade across the skin, which will cause scratching. When clipping for a long period of time, feel the blade with your hand to ensure that it is not getting hot. Also, avoid going over the same spot repeatedly, which may abrade the skin. With care, you can prevent causing a rash commonly called "clipper burn". And last, avoid rushing because working too fast will increase the chance of injury to the dog.

Oral Administrations

Whenever possible, embedding medication in a ball of moist food is an easy and effective method of administration. Because dogs generally swallow without chewing their food, they do not notice the presence of a pill and swallow it quickly. This is also an opportunity to provide the dog with a special treat and some friendly attention.

When it is necessary to administer a pill by hand, place it between your thumb and index finger. Your third finger is used to open the animal's lower jaw. With your other hand lift the upper jaw to open the mouth. Press the lips inward at the space behind the canines, but be careful not to pinch the lips against the teeth. The pill must be administered far back in the throat, near the base of the tongue, where it will be swallowed by reflex action. Otherwise, the tongue can easily push the pill out of the mouth.

To facilitate swallowing, hold the jaws closed and massage the throat.

The Pill Gun

A device known as a pill gun offers an advantage of easily delivering a pill to the back of the throat. Load the pill in the tip, which is made of a soft rubber so as not injure the throat.

Insert the pill gun into the side of the mouth, in the space just behind the canine teeth. Once it is advanced to the back of the throat, press the plunger to release the pill. Again, if delivered far back in the mouth, the pill will be swallowed by reflex action. But if the pill ends up more forward in the mouth, hold the dog's jaw closed and massage the throat.

Oral Liquid Administration

When liquids in volumes up to twenty ccs must be administered, it is best to use a syringe. Oral gavage with an orogastric tube should be considered for the administration of larger volumes. This will be demonstrated in tape 2. To administer by syringe, allow the dog to maintain a position comfortable for his head. A slight upward tilt will help fluids drain towards the throat. Administer at a rate comfortable for swallowing. If too fast, the dog may become frightened, or the material may spill out of the animal's mouth.

Use of the Elizabethan Collar

In some instances, an Elizabethan collar may be used to prevent a dog from traumatizing an area of his head or body, such as the site of a surgical incision. It should be sized to extend past the animal's nose, which will prevent licking or chewing of areas on his body and scratching on his head. The edge around the neck should be padded. [Pause until 21:26:09] The collar should be fitted to the neck to allow just enough space to pass your fingers through the opening. Any tighter would be uncomfortable for the dog.

Dogs will quickly adjust to wearing an Elizabethan collar. It is very important, however, to determine that it does not interfere with the animal's access to food and water. And it should be removed when no longer needed.

Injections and Blood Collection

For injections and blood collection, the sizes of needles used are commonly in the range of 20 to 25 gauge. To minimize the pain of the procedure, always use the smallest size of needle that is appropriate for the procedure.

Blood Collection

For small amounts of blood, such as one to ten cc, the cephalic vein is a good site for blood collection. Position the dog in sternal recumbency. The elbow should be braced to prevent the dog from moving the limb during the procedure. The assistant's thumb is placed over the forelimb, close to the elbow, to distend the vein. Occlusion is always applied between the site of venipuncture and the heart, in which direction the blood is flowing. Because veins are thin-walled and easily collapsed, the occluding pressure should be gentle. At the same time, it is helpful to roll the vein laterally, stretching and stabilizing the vein for venipuncture.

Make sure that the distended vein is visible. If necessary, reposition the dog or adjust the occlusion to enhance your view of the vein.

Alcohol is swabbed to cleanse the area and to improve the vein's visibility. Before inserting the needle, remember to break the adhesive seal in the syringe barrel to prevent a jarring motion that could traumatize the vein wall.

Direct the needle bevel up, or, away from the vein. You may insert the needle into the vein in a single movement, or in stages – that is, by first introducing the needle under the skin parallel to the vein, and then repositioning the needle to enter the vein. Avoid attempting to draw blood too quickly because excess negative pressure can collapse a small vein, making blood collection difficult, and it can injure the blood cells, resulting in hemolysis. Once blood sampling is completed, it is critical to release the occlusion of the vein before the needle is pulled out. Otherwise, the pressure will force blood to leak out through the puncture site into the surrounding tissues, which will cause bruising and soreness. As the needle is withdrawn, apply pressure to the puncture site for a few minutes until bleeding stops.

The jugular veins, located on the left and right sides of the neck, allow for a rapid collection of large volumes of blood. A maximum amount of one percent of the animal's body weight may be collected at one time, followed by a two-week rest period from further blood collection.

Note how occlusion at the base of the neck makes the jugular vein stand out.

Despite its large size, the jugular vein may be difficult to puncture because it often rolls away from the needle, due to its loose attachment to subcutaneous tissues. Your hand at the base of the neck will help stabilize it, but you may also have to use a jabbing motion to insert the needle into the vein. [Pause until needle being withdrawn. Can cut the following paragraph if the motion segment is cut...to avoid repetitiveness.]

When withdrawing the needle, apply pressure for one minute to the puncture site in the vein.

Low on the hind limb, the lateral saphenous vein, sometimes called the lateral recurrent metatarsal vein, may be used to collect small volumes of blood. This vein, however, is not often used. Because of its smaller size, and its fragility, it is prone to forming a hematoma.

With the dog on his side, brace one hand on the knee of his uppermost rear leg, to both control movement and to distend the vein.

Hold the front limbs by the carpus. Insert one or more of your fingers between the front legs to avoid pinching them together.

Note that the vein crosses the lateral side of the rear leg, diagonally, just above the tarsus.

To minimize the risk of causing a hematoma., it is best to insert the needle under the skin and then to reposition it to enter the vein.

Intramuscular Injection

Intramuscular injections are most commonly administered in the anterior muscles of the thigh and along the lumbar spine. There are no major vessels or nerves in either site, so that both routes are very safe for the animal. Volumes of up to 2 to 5 cc, depending on the size of the dog, may be injected in any one site. For these demonstrations, the limbs are shaved to expose the anatomical landmarks.

For the anterior thigh injections, grasp the quadriceps muscle mass and use your fingertips to locate the femur. Direct the needle perpendicular to the leg and insert it into the center of the muscle mass. Aspirate to make sure the needle has not entered a vessel, and then inject slowly. Finally, massage the area to disperse the material and prevent leakage back to the skin.

The epaxial muscles along the lumbar spine may be used as well. This site also lacks major vessels and nerves that could be harmed by an injection. Place your hand on the animal's back, fingers pointing towards the tail. Lay your index finger on the ridge of the spine. Rest your little finger against the last rib. Gently press your other fingers into the abdomen to feel the edge of the epaxial muscles. Direct the needle perpendicular to the body and insert it into the center of this muscle mass, midway between the spine and the muscle edge. Aspirate, inject slowly, and then massage the area.

Intramuscular injections may also be made in the caudal thigh. This site does have large vessels and nerves, particularly the sciatic, which may be injured by injections made incorrectly. It is essential that the needle is directed away from the femur to avoid these structures. Otherwise, the needle may enter a vessel, resulting in an intravascular injection, or it may traumatize a nerve, resulting in paralysis.

Note the position of the sciatic nerve on the lateral aspect, and the position of the femoral nerve and vessels on the medial aspect. The figures also show the CORRECT orientation of the needle, directed caudally AWAY from the femur.

Grasp the muscle mass posterior to the femur and insert the needle in a caudal direction, away from the bone. Aspirate, inject slowly and massage the area when finished.

Subcutaneous Injection

Dogs have a loose attachment of skin to underlying muscles, which allows injections to be made subcutaneously. Injections are commonly made over the trunk between the shoulders, where the skin is loosest and least sensitive to the momentary pain of injection.

Raise a fold of skin, like a tent, and direct the needle into the base. Aspirate to ensure that the needle has not entered a vessel, and then inject. Finally, massage the area to disperse the material and to prevent leakage back to the skin.

A common ERROR is to insert the needle too high in the skin fold, near the peak of the tent. Note how the needle can penetrate through the opposite side of the skin fold, resulting in the loss of the injection material onto the skin surface. This mistake can easily be overlooked in animals with long fur or when a small volume is injected.

Use of Sedatives and Anesthetics in the Dog

There are many choices of these agents available for use in the dog. Refer to a text on laboratory animal medicine for recommended drugs and doses. However, because of complexities in drug interactions and effects on the animal, it is essential that you consult with a veterinarian to determine a dosage regimen that is appropriate for the length and type of the procedure and the need for analgesia.

When used alone, sedatives provide a tranquilizing effect which assists in handling an animal. Some agents also have an analgesic effect. None of these agents can be used alone for painful procedures, such as surgery. However, they are useful adjuncts to general anesthetics to achieve a balanced anesthesia.

The common anesthetics are very different classes of drugs, with very different properties.

Gaseous anesthetics offer good analgesia. Because gas is delivered by a dialable vaporizer, the duration of anesthesia can be matched to the length of a procedure.

Ketamine, known as a dissociative anesthetic, provides minimal analgesia. And when used alone in the dog, it can cause seizures. Therefore, it must be combined with other agents to not only prevent seizing, but also to provide sedation and analgesia.

Pentobarbital, though still used, has disadvantages of a low safety margin, hepatic enzyme induction, prolonged and rough anesthetic recovery, and regulatory restrictions as a controlled substance.

Analgesic agents are primarily used for pain relief. In general, they should be used for routine post-operative care unless otherwise scientifically justified. There are two common classes of drugs – the opioids and the nonsteroidal anti-inflammatory drugs. The opioids may also be used in combination with general anesthetics for achieving a balanced anesthesia. Of those listed, buprenorphine has the longest duration of action and is therefore preferred in post-operative care.

Euthanasia

Animals should be euthanized when killed for any purpose including research. Euthanasia may be defined as a gentle death that is free of pain and distress. In addition to using an appropriate method, proper administration of euthanasia includes the use of humane handling and restraint of the animal in the procedure leading up to its death and if possible rapidly rendering the animal unconscious before the moment of its death. It is important to consult with a veterinarian on selecting a method of euthanasia and how to conduct it properly. The method must take into account the following considerations:

- one - humaneness for the animals;
- two - aesthetics for the operator and observers;
- three – sensitivity to the emotional attachment by others to the animal.
- four - safety for the operator to perform; and
- five - training of the operator in the method used, in the proper handling of the animals to be euthanized, and in the concepts of euthanasia;

A preferred method for all species, whenever possible, is the use of anesthetic agents, such as the barbiturates, or a specific euthanasia formulation.

For more information, refer to the Report of the American Veterinary Medical Association's Panel on Euthanasia and guidelines from the Universities Federation for Animal Welfare in the United Kingdom.



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