



**Title:** TTU Deer Facility

**SOP Number:** 059

**Purpose:** The purpose of this SOP is to describe the facility physical characteristics, feeding and nutrition, and veterinary care involved in keeping Texas Tech University owned white-tailed deer.

---

## **DEER PEN**

Ungulates are prey animals - their flight response is very strong, so enclosure design and maintenance are critically important

### **A. Space:**

1. A minimum of 15,000 square feet (100' x 150' or reasonable modification of these dimensions) for one or two adult deer, 3,000 square feet of space to be added for each additional deer up to a total of five. Beyond five deer, an additional 2,000 square feet per deer is required. Fawns may be held with their natural mother until weaned. Fawns 16 months or less will count as ½ adult.
2. Sorting/treatment/sick pens should be a minimum of 75 square feet, to allow for ease of access to the deer and the intended purpose, but not allowing the deer an excessive amount of space to allow for injury from collision with walls.

### **B. Rotation:**

1. It is desirable that two or more pens be available for rotation purposes.
2. If one pen is used consistently, vegetation may be destroyed, and parasitic organisms may build up in the soil.
3. After three years of continuous use, a pen should be rejuvenated as needed.
4. To rejuvenate the pen it should be tilled, fertilized, and reseeded with a grass seed mixture. If appropriate, over seeding.

### **C. Wall or Fence:**

1. Material: High tensile wire designed for deer.
  - a. Changes in wire gauge may be acceptable under certain circumstances
2. Height: Eight feet minimum, although higher may be desirable.
  - a. In some cases, the fence may need to be higher due to topography.
3. Dog Proofing (optional):
  - a. An additional 1 ½ feet of wire mesh fencing (same specifications as above), attached to the bottom of the fence and buried beneath the ground, is necessary to prevent dogs from digging in.

### **D. Poles:**

1. Corner, bracing, line and t-post will be constructed according to the fence manufacturer's recommendation.
2. Corner, bracing, line and t-post may vary from manufacturer's recommendation if soil conditions, topography, environmental conditions or other factors necessitate a variance. In no case may the variance be reduced below the minimum requirements of the fence manufacturer's requirements.
3. The wire must be firmly attached to the poles as required by the manufacturer.

### **E. Shelter:**

1. If adequate natural shelter is not present, at least one pole shed must be available for protection from the sun and wind.

2. Shelter must be provided to accommodate all deer within the pen.
  3. The number of sheds necessary will depend on topography, wind, or other environmental conditions.
  4. Dirt is added to the covered/sheltered area to provide a raised area in the event of excessive rainfall events
- F. Maintenance:
1. Drainage:
    - a. Pen space should be well drained, either naturally or through use of tiles.
    - b. Poor drainage may cause a number of disease problems (any problems, which develop after the pen is in use, should be treated immediately).
  2. Walkways: (suggested)
    - a. A 3-6-foot-wide strip of well mowed or crushed stone or gravel should border the inside perimeter of each pen in order to provide adequate abrasion (to prevent a turned-toe condition from developing in the hooves).

## CARE AND SANITATION

- A. Deer must be cared for and observed daily.
- B. An adequate supply of fresh water must be available at all times.
- C. Salt should be provided in the form of salt blocks, unless a complete feed is being fed. Salt blocks may also serve as nutritional enrichment.
- D. The pen areas in general, food racks, and water containers in particular, should be kept clean and free of debris and are cleaned as needed.
- E. Large amounts of fecal matter should not be allowed to accumulate in the treatment pens, because of insect and disease concerns and the areas are cleaned as needed.
- F. White-tailed deer are not to be mixed with other species of deer or ungulates because of disease or behavior problems.
- G. Sick or injured deer should receive immediate veterinary care.

## HERD HEALTH

White-tailed deer are hardy animals but are vulnerable to diseases that afflict other cervids. Sheep should not be raised side by side with whitetail deer as they are carriers of bluetongue. Infectious diseases of deer can be caused by pathogens that include some viruses, bacteria, parasites and abnormal proteins known as prions. In rare instances, these pathogens are the cause of disease epidemics that result in significant mortality in a local population. These outbreaks are most common in herds with high deer density, which can increase the spread of the disease.

### 1. DISEASES

#### A. Viral diseases

1. Shipping fever
  - a. Shipping fever pneumonia is a respiratory disease of multifactorial etiology with *Pasteurella haemolytica* and, less commonly, *P multocida* or *Haemophilus somnus*, being one of the infectious agents involved.
  - b. Control and Prevention
    - 1) Revolves around transport time, which should be minimized, and rest periods, with access to food and water, should be provided during prolonged transport.

- 2) Adaptation to high-energy rations should be gradual. Vitamin and mineral deficiencies should be corrected.
- 3) The administration of vaccines on entry to the new farm has been reported to increase the mortality associated with shipping fever pneumonia.
- 4) Vaccinations for the viral and bacterial components of shipping fever pneumonia should be given 2-3 weeks before transport and can be repeated on entry to the new farm.

## 2. Hemorrhagic disease

- a. Hemorrhagic disease is an infectious disease of white-tailed deer, with outbreaks occurring sporadically.
- b. Hemorrhagic disease (HD) includes both epizootic hemorrhagic disease (EHDV) and bluetongue (BTV) viruses.
- c. These diseases are very closely related and produce similar symptoms in deer. The presence of BTV in deer can often be confused with that of EHDV.
- d. Domestic ruminants such as cattle and goats show no signs of illness or only mild signs when infected. In contrast, domestic sheep may develop severe illness when infected with the bluetongue virus.
- e. HD is transmitted by biting midges of the genus *Culicoides*, thus disease outbreaks tend to occur from August to October, when midges are most abundant. Some infected deer may not show obvious symptoms; others may die in one to three days.
- f. Typical symptoms include fever; excessive salivation; swollen neck, tongue or eyelids; sloughed or interrupted growth of hooves; reduced activity; and emaciation (significant weight loss).
- g. Humans are not at risk by handling or eating venison from an infected deer. Eating the meat of deer that have recovered from the disease poses no health hazard. However, deer may have developed secondary bacterial infections due to HD and thus, may not be suitable for consumption.
- h. The uses of steroidal and non-steroidal anti-inflammatory drugs are the first line of treatment.
- i. Treatment is symptomatic, and often unsuccessful.

## 3. Cutaneous fibromas

- a. Cutaneous fibromas are wart-like growths caused by a virus that often infects deer through an open wound or insect bite.
- b. These growths can cover large portions of the body, but they are usually small, occur in single or multiple growths and range from a fraction of an inch to several inches in diameter.
- c. Fibromas are a more common occurrence in bucks because they are more likely to incur wounds while fighting and when rubbing antlers.
- d. Although sometimes grotesque in appearance, fibromas generally do no harm to deer, unless they interfere with a deer's sight or capability to eat.
- e. The virus does not infect other wild or domestic animals, or humans.

- f. Fibromas are confined to the skin and, therefore, are removed when the deer is processed for consumption. Thus, they do not affect or impact the quality of the venison.

## B. Bacterial diseases

### 1. Clostridial Infections (Blackleg, Enteritis and Foot Rot, etc.)

#### a. Control and Prevention

- 1) Use the dose associated for the active immunization of healthy sheep against diseases caused by *Clostridium chauvoei*, *Cl. septicum*, *Cl. haemolyticum* (known elsewhere as *Cl. novyi* type D), *Cl. novyi*, *Cl. tetani*, and *Cl. perfringens* types C and D.
- 2) Although *Cl. perfringens* type B is not a significant problem in the U.S.A., immunity may be provided against the beta and epsilon toxins elaborated by *Cl. perfringens* type B. The immunity is derived from the combination of type C (beta) and type D (epsilon) fractions.

### 2. Brain abscesses

- a. Brain abscesses are bacterial infections in the skull and brain. In white-tailed deer, brain abscesses most often occur in bucks (90 percent of cases) and are often seasonal, primarily due to the stages of antler development and fighting.
- b. During antler drop (casting) or severe fighting with other bucks, infections can develop on the skull near the pedicle, resulting in a brain abscess.
- c. Infection symptoms may include poor coordination, circling movements, blindness, lethargy (significant lack of energy) and emaciation.
- d. The meat of a deer with a brain abscess is not suitable for human consumption.

### 3. Chronic wasting disease (CWD)

- a. CWD belongs to a separate group of diseases known as transmissible spongiform encephalopathies (TSEs). TSEs cause brain degeneration in deer, elk and moose.
- b. The symptoms of CWD-infected deer include a change in the animal's natural behavior, emaciation, excessive salivation, lethargy, stumbling and tremors.
- c. The disease is always fatal to the infected animal, but symptoms can take months or years to appear.
- d. Diagnosis can only be confirmed by laboratory examination of brain or lymph node tissue of an animal.
- e. Chronic wasting disease is not seen as a human-health issue, the Centers for Disease Control and Prevention (CDC) have determined there is no evidence CWD can infect people.

## 2. SEMI-ANNUAL VACCINATION PROGRAM

- A. The purpose of the vaccination program is to improve the herd's productivity through general husbandry and to reduce, monitor and/or prevent herd health disease.
- B. Animals will be taken to holding pens in the barn before vaccination.
- C. Supplies
  - a. 1" x 18-gauge needles
  - b. ½" x 18-gauge needles
  - c. Sharps disposal container
  - d. Exam gloves sampling
  - e. Appropriate vaccine
- D. Restraining the deer
  - a. Each animal will be held in place in the chute by one or two assistants for the duration of the procedure.
- E. Injection
  - a. Subcutaneous injections (under the skin):
    - i. This will involve pulling up a pinch of skin forming a tent.
    - ii. Insert the needle into the tent, taking care not to pierce the other side of the other side of the skin.
    - iii. Extrude the content while pointing down to the ground.
    - iv. Briefly massage the injection site.
  - b. Intramuscular injections:
    - i. Insert needle into a muscle and extrude no more than 3 mL per site.
    - ii. After inserting needle, check by pulling back on the plunger to make sure no blood is in the syringe and administer the medication slowly.
- F. Vaccines
  - a. Vaccinations shall include, but may not be limited to the viral and bacterial components of shipping fever pneumonia, and diseases caused by *Clostridium chauvoei*, *Cl. septicum*, *Cl. haemolyticum* (known elsewhere as *Cl. novyi* type D), *Cl. novyi*, *Cl. tetani*, and *Cl. perfringens* types C and D.

### 3. DEWORMING

It is a good practice to deworm 3 times a year, unless parasite load (determined by fecal egg counts) indicates more or less often

#### A. Products

1. Avermectins (Ivomec, Dectomax, etc.)
  - a. When handling/processing deer, injectable avermectins should be used.
2. Safeguard does not treat all worms associated with whitetail deer, it also will not address bacteriologic problems or protozoan parasites
  - a. Use 1.5 lb of the Safe-guard pellets each day for 3 days in a row, for 1000 lbs of animal weight; if you have 5 deer in a pen that average 200 lbs each that is 1000 lbs.
  - b. It is recommended to use double the dose for deer that it says for cattle.

3. Amprolium (Corid 20%) Coccidia treatment.
  - a. 1 oz to 5 gallons of water for 10 days is treatment and 0.5 oz for 5 gallons water for prevention.
  - b. Deworming in the water.
    - 1) If you can control the water in the pen, then you can use the dewormers in a pail or two of drinking water. (adults drink between 1 and 2 gallons of water per day during the summer months)

## B. Parasites

1. Arterial worms
  - a. Arterial worms live in the arteries of white-tailed deer. Deer contract arterial worms when bitten by infected horseflies.
  - b. Infections can result in food being impacted under the tongue causing facial swelling, with occasional tooth loss and jawbone degeneration. However, deer infected with a small number of worms will not exhibit symptoms.
  - c. Arterial worms pose no threat to humans, and the venison of infected deer is safe for consumption.
2. Lungworms
  - a. As their name implies, lungworms infect the lungs. Only deer with severe lungworm infections exhibit symptoms, which include emaciation, respiratory distress (trouble breathing) and lethargy.
  - b. Lungworm infections commonly occur in fawns in high deer density areas. The presence of this parasite provides additional motivation for maintaining deer population densities below an area's biological carrying capacity.
  - c. Lungworms pose no health threat to humans, and the venison of infected deer is safe for consumption.
3. Coccidiosis
  - a. Is a disease commonly found, but is generally a clinical problem only in younger animals (under one year old). It can damage the lower small intestines, cecum, and the colon of deer. Animals can die from dehydration, severe weight loss, and pneumonia from becoming weak.
  - b. Coccidiosis is very common during wetter weather but is also common when animals are confined to a smaller area.
  - c. It causes diarrhea with watery feces, and in severe infections the diarrhea may contain streaks of blood.
  - d. Most incubation periods are from 8 to 20 days.
4. Before weaning, offspring are dewormed from maternal transfer.

## **BREEDING HERD HEALTH AND MAINTAINACE PROGRAM**

### 1. HANDLING

#### A. Facilities

1. A well-designed handling facility, that minimizes stress and risk of injury to the animals, as well as the human workers, should include:
    - a. Solid, darkly painted, constructed walls
    - b. Similarly constructed pens to isolate deer for sorting or observation individually or in small groups.
    - c. Have an alley way that allows for separation of deer to advance animals individually.
    - d. Have a restraint device (chute) that suspends animals in a position that keeps their feet from coming in contact with the ground. It should additionally, allow for safe access by animal handlers to the animal for processing, regulatory, or experimental procedures.
  2. Processing, treating and conducting experiments with deer, in a dedicated facility, would be the preferred method of handling.
- B. Immobilizing Agents
1. Immobilizing agents may be needed for injured, fractious or stressed animals that are not amenable to processing through a handling facility
    - a. TX with a targeted dose of Telazol (3.0 mg/kg), and xylazine hydrochloride (1.5 mg/kg). Dose at ~ 1 ml per 125 lbs (may vary depending on level of excitement) of the resulting mixture of 2.5 mls xylazine HCL (100 mg/ml) with 500 mg telazol powder (5 ml bottle).
    - b. MK with a targeted dose of medetomidine (0.05 mg/kg) and ketamine hydrochloride (1.5 mg/kg). Dose at ~ 1 ml per 100 lbs of the resulting mixture of 5 mg/ml medetomidine with 150 mg/ml ketamine.
    - c. BAM at a concentration of Butorphanol Tartrate (27.3 mg/ml), Azaperone Tartrate (9.1 mg/ml), and Medetomidine hydrochloride (10.9 mg/ml). Dosed as 0.5 mls for Fawns, 1.0 – 2.0 mls for Small bucks and mature does, and 2.5 mls for Large bucks.
    - d. Reversal agents:
      - a. For every 1.0 mls of Xylazine, give 1.0 mls (up to 5 mls) of Atipamezole.
      - b. For every 1.0 mls of Medetomidine, give 1.0 mls (up to 5 mls) of Atipamezole.
      - c. For every 1.0 mls of BAM, give 2.0 mls Atipamezole and 0.5 mls Naltrexone in separate syringes

## 2. Blood Sampling

- A. The purpose of the blood collection procedure is to improve the herd's health and productivity through general husbandry and to evaluate physiological and or biomarker endpoints.
- B. Animals will be taken to holding pens in the barn before taking blood samples
- C. Supplies
  1. 10mL Vacutainer® blood tubes
  2. 2" x 18-gauge Vacutainer® needles
  3. Vacutainer® holder
  4. Sharps container
  5. Markers
  6. Cooler with ice packs and tube rack
  7. Cup for holding Monovette lids

8. Exam gloves
- D. Restraining the deer
  1. Each animal will be held in the chute with assistance from one or two assistants for the duration of the procedure.
  2. Deer may be anesthetized for blood collection (see anesthesia details above).
- E. Taking the blood sample
  1. Blood samples from each animal will be taken with a 10mL Monovette syringe and an appropriately sized needle.
  2. The needle will be inserted the jugular vein.
  3. During insertion the syringe plunger will be withdrawn to create a vacuum in the syringe.
  4. As soon as blood is seen in the syringe, advancing will be stopped and an approximately 40 mL blood sample will be taken, following Policy 07 Acceptable Methods of Blood Collection.
- F. The Blood Sample
  1. Blood sample tube or syringe will be labeled with the animal ID #.
  2. Blood samples will be placed in a rack in a cooler for storage and transport.
  3. After a period of 30 minutes the sample will be centrifuged.
  4. Whole blood samples will be left in a cooler with ice for transport and long-term storage at TTU.

## 2. HUSBANDRY PRACTICES

1. Breeding Procedures: One adult male is paired with 5-10 adult females at the beginning of the breeding season. The male is removed at weaning and separation of fawns
2. Weaning procedures: Weaning requires taking fawns into the barn and separating them into a separate room at approximately six months to one year of age. The parents are returned to the pen adjoining the fawns. Pen mates are kept in the same group with feed and water.
3. Male deer will be de-antlered using a saw each year to prevent injury to other deer from fighting.
4. Disposition of Male Offspring
  - a. Due to the dangers that male offspring can pose to other deer and personnel, most of the male offspring will be removed from the breeding herd before they reach sexual maturity at approximately 1 year of age.
  - b. Male offspring will be transferred to a research protocol, kept for use in the breeding herd, or euthanized.

## 3. CHRONIC WASTING DISEASE (CWD) TESTING

Regulatory agencies require that all deer suspected of having come into contact with CWD positive deer, be tested for the disease. There has been advancement in technologies that now allow for live animal testing.

1. Palatine Tonsil Biopsy

- A. The deer is anesthetized, with a targeted dose of (DMK) dexmedetomidine (0.04 mg/kg) and ketamine hydrochloride (2.9 mg/kg).
- B. The deer is blindfolded and placed in sternal recumbency.
- C. A metal mouth gag is used to hold the mouth open.
- D. The palatine tonsil is visualized using a laryngoscope with a 30-cm blade.
- E. The biopsy is collected using a 6-mm biopsy forcep.
- F. The first bite with the biopsy forceps is taken at the rostral rim of the tonsillar sinus with the biopsy forceps then rotated to take subsequent bites which include the sinus.
- G. Bleeding, if it occurs, is controlled using a gauze pad and placing mild pressure on the biopsy site.
- H. Prophylactic antibiotics and analgesics are given.
- I. The mouth gag and the blade of the laryngoscope are wiped with 20% bleach solution and rinsed with water.
- J. The biopsy forceps are cleaned, soaked in 20% bleach solution for 30 minutes and then rinsed with water.

## 2. Rectal Biopsy

- A. Rectal biopsies can be performed in white-tailed deer under restraint conditions currently used for artificial insemination, and the procedure can be done with disposable instrumentation.
- B. Deer are anaesthetized with xylazine (50–100 mg) and ketamine (40–100 mg) and applied a topical analgesic cream (2.5% lidocaine and prilocaine) to the distal rectal mucosa.
- C. About 10 min after applying the local anesthetic cream, the rectal mucosal border is exposed (the mucocutaneous junction of the anus) by manually exteriorizing the anal mucosa or isolating it using a speculum.
- D. Using Brown–Adson forceps, the mucosa is lifted from a depression between the rectal columns in the 0.8–1 cm immediately rostral to the transition between the anal orifice and the mucosa (muco-cutaneous junction).
- E. A small piece (5–6 mm diameter) of the elevated mucosa is cut with fine-point scissors or rectal biopsy forceps.
- F. Bleeding is controlled with direct pressure and Gel Foam (Pharmacia & Upjohn Company) as needed.
- G. Additional topical analgesic cream may be applied directly to the biopsy sites.

## 4. EUTHANASIA

Little published information is available regarding appropriate methods for euthanasia of specific species of free-ranging wildlife. Many conventional euthanasia techniques and methods can be applied to free-ranging wildlife, if the animals are sufficiently under the control of personnel. However, because of the variety of conditions under which euthanasia of free-ranging wildlife may need to be conducted, choice of the most humane method will vary by species, situation, and individual animal.

1. Chemical Methods
  - a. Injected with barbiturates (e.g. pentobarbital 1 -2 mL per 10 lb).
  - b. Includes overdoses of injectable anesthetic agents followed by exsanguination or other physical method.
2. Physical Methods
  - a. Gunshot is acceptable with conditions for euthanasia of free-ranging, captured, or confined wildlife, provided that bullet placement is to the head (targeted to destroy the brain).
  - b. Gunshot targeted to the heart (chest) or to the neck (vertebrae, with the intent of severing the spinal cord) presents challenges for accurate placement but may be the best option for free-ranging or other settings where close approach is not possible or where the head must be preserved for disease testing (rabies, Chronic Wasting, or other suspected neurologic diseases). Based on domestic animal models, gunshot to the chest or neck may not result in rapid death and may be considered humane killing, rather than euthanasia. (Exsanguination—Bleeding may be used as an adjunctive method to ensure the death of animals that are otherwise unconscious).
  - c. Penetrating captive bolt is acceptable with conditions followed by exsanguination to ensure death.

## NUTRITION

Whitetails are browsers, which mean they eat a variety of forages, including woody browse; forbs, or broad-leaved plants; masts, including hard mast such as acorns and soft mast such as persimmon; and grasses. Therefore, they may be maintained on marginal land unsuitable for cattle, sheep and horses. They require little more than natural cover, browse, graze and nutritional supplements along with adequate water supply.

- A. Whitetail deer need hay, grain, vitamins and minerals during the winter to meet nutritional requirements.
- B. Supplemental feeding is also necessary during hot weather when pastures are growing slowly and during late summer in preparation for the rut.
  1. A deer must obtain at least 6 to 7 percent crude protein diet just to maintain rumen function. A diet of less than 10 percent protein will result in inferior animals and poor antler development. Deer need a daily diet of 12 to 16 percent protein for optimum development of bone and muscle.
    - a. Corn is low in protein (approximately seven to ten percent) and high in carbohydrates. Corn does not provide adequate protein levels needed for development of bone and muscle; however, corn may be used as an energy supplement during very cold period of the winter.
- C. When feeding pellets, only commercial feeds containing natural protein and not urea should be used. Urea should not be used because it has been found to be very unpalatable to deer.

RECOMMENDED NUTRIENT LEVEL IN DEER DIETS by: Larry W. Varner, Ph.D.

Nutrients	Deer Needs		Content in Grains		
	Adults	Fawns	Corn	Milo	Wheat

Crude Protein, %	13-14	16	9.90	10.10	13.10
TDN, %	60-68 <sup>a</sup>	65	80.00	76.00	77.00
Calcium, %	0.4-0.75 <sup>b</sup>	0.6	0.03	0.04	0.05
Phosphorus, %	0.3-0.45 <sup>b</sup>	0.4	0.28	0.30	0.35
Magnesium, %	0.25	0.25	0.10	0.13	0.14
Potassium, %	0.6	0.75	0.33	0.31	0.41
Selenium, ppm	0.25	0.25	0.13	0.20	0.25
Cobalt, ppm	0.3	0.3	0.38	0.50	0.40
Copper, ppm	15	18	3.50	4.30	5.80
Iron, ppm	250	290	40.00	50.00	60.00
Manganese, ppm	100	110	5.70	15.80	41.50
Iodine, ppm	1	1	>0.01	>0.01	0.25
Zinc, ppm	75	100	20.00	17.00	31.00
Vitamin A, 1U/1b	2000	3000	4000.00	180.00	0.00
Vitamin D, 1U/1b	500	550	0.00	0.00	0.00
Vitamin E, 1U/1b	40	60	9.00	5.50	7.10

<sup>a</sup> Feed higher energy levels during periods of climatic or physiological stress.

<sup>b</sup> Feed higher mineral levels during lactation or active antler growth.

## EMERGENCY CARE

- A. Everyone with access to the animal facility is responsible for informing the University Veterinarian when an animal becomes ill or a change in behavior is noted. Seriously ill animals should be reported IMMEDIATELY to the veterinarian. When an investigator, technician, or animal care personnel requires veterinary assistance, they should:
- B. Complete the "Animal Treatment Record" in the Notebook. Indicate the date, animal number/cage ID, and problem observed, and ensure that the name (or initials) of the person making the report is recorded.
- C. Contact the University Veterinarian at:

Dr. Tiffanie Brooks, ACS Attending Veterinarian  
806-834-8588 Office  
806-239-2120 Cell

Dr. Paul Stonum, ACS Clinical Veterinarian  
806-834-7373 Office  
660-562-4425 Cell

Felix Klein, Facility Manager  
806-385-4222 ext. 251

- D. Provide all the above information to the individual contacted above, who will give advice and authorization for the action(s) that should be taken.