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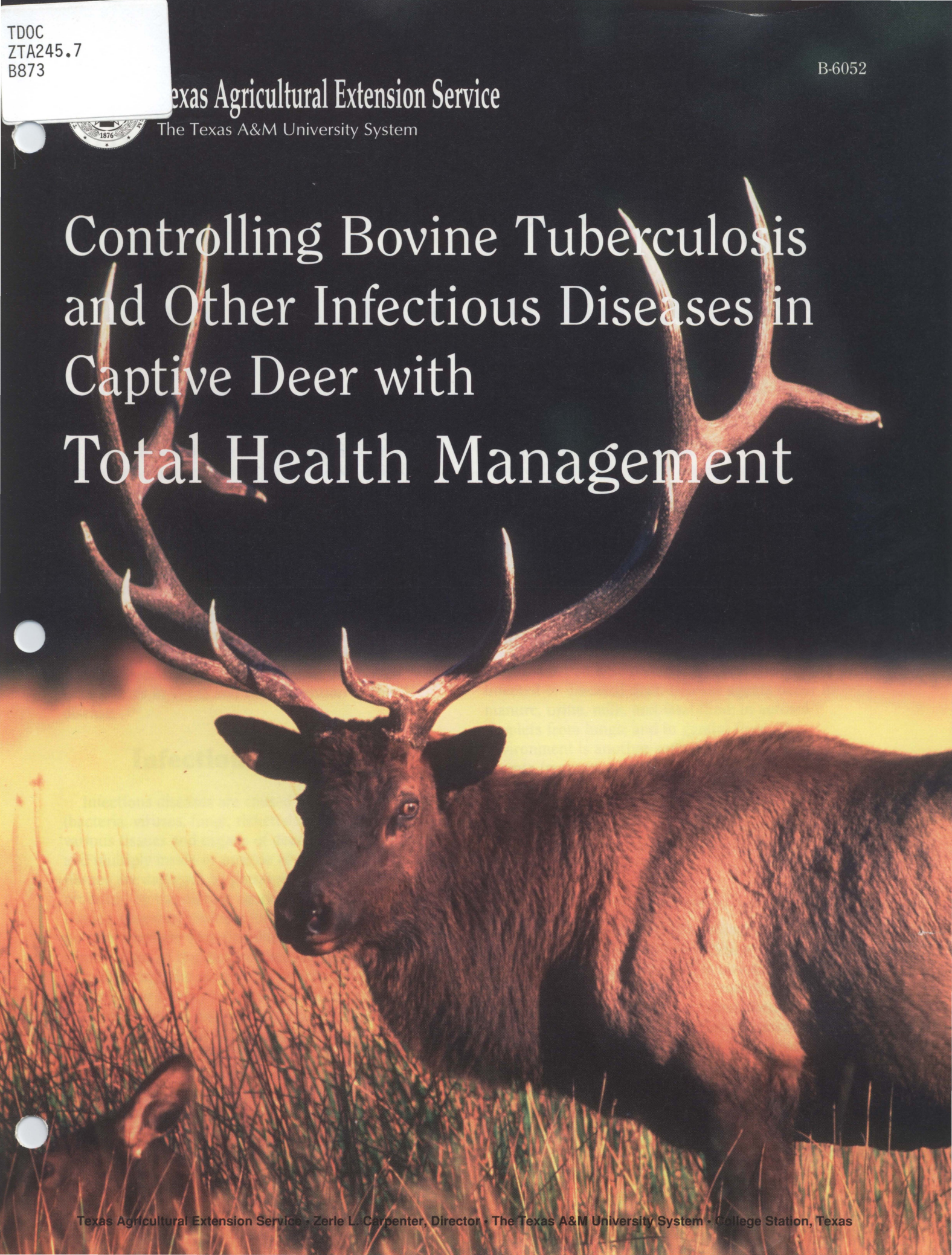
Controlling Bovine Tuberculosis and Other Infectious Diseases in Captive Deer with Total Health Management



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Controlling Bovine Tuberculosis and Other Infectious Diseases in Captive Deer with

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Total Health Management

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Bovine tuberculosis and other infectious diseases can cause serious economic losses to deer (cervid) operations as well as potential health risks to consumers. Total Health Management, consisting of a program of good management practices related to husbandry, nutrition, and biosecurity, can help to minimize disease losses and even prevent infection altogether.

This publication describes the transmission and management of infectious diseases in general, presents a proposed Total Health Management plan, and discusses the increasing frequency of bovine tuberculosis in Texas and the prevention of this disease.

Infectious Diseases

Infectious diseases are caused by agents or germs (bacteria, viruses, fungi, rickettsiae) that infect various tissues and organs of deer. The germs invade and multiply inside or outside of tissue cells. The tissues are damaged by pressure, reactions, or toxins produced by the disease agents. As germs infect tissues, they may multiply for a period of time when no symptoms are seen (incubation period), then clinical signs of the diseases become obvious. Instead of multiplying, the germs may go into a non-disease dormancy or latency and multiply later, extending the incubation period. Secondary tissue damage or physical stress in the animal triggers the dormancy or latency to break out (recrudescence) and the germs to multiply and produce disease. Many infectious diseases result from a combination of viral and bacterial infections and are brought on by stress.

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Economic losses due to the effects of diseases on captive deer health may be obvious and easily documented, or they may be hidden and difficult to measure. Obvious economic losses include deaths, clinical diseases, disabilities, and condemnations. The losses that are more difficult to measure are reductions in performance and production efficiency. These subtle effects are often mistakenly accepted as normal, because no obvious problems are recognized.

Sources of Diseases

The most common source of disease is contact with infected or diseased deer. Disease agents occur in manure, urine, milk, and fetal fluid; in aerosol droplets from lungs; and in genital fluid. The environment is another source of disease. Deer excreta (manure, urine, and fetal fluid) and decaying carcasses of diseased deer can contaminate the environment with disease agents. Contaminated vehicles (instruments, utensils, and equipment) and infected and contaminated vectors are other important sources of disease.

Transmission of Diseases

A disease spreads when the primary agent escapes from an infected host and travels to a new host. The place where the agent lives or is maintained before it is transmitted is known as the "reservoir." Reservoirs include carrier animals, ticks, human beings, and contaminated soil and water. Disease-causing agents can be transmitted from one host to another by direct or indirect means.

Direct disease transmission generally results from direct or close contact between the infected host and the susceptible host. When an animal is infected with a disease agent, is diseased, and is showing clinical signs, like fever, the animal may be shedding the

disease agent and is considered contagious. Infected captive deer that do not show signs of disease may not be contagious except at times of stress.

Infections of the skin, respiratory system, and reproductive system of diseased or stressed deer may be directly transmitted to susceptible deer through skin contact, ingestion of excreta from infected animals, inhalation of agents exhaled by infected animals, and venereal methods.

Indirect disease transmission requires vectors (flies, mosquitoes, gnats, ticks), vehicles (instruments, utensils, equipment), or fomites (food, water, soil, air) to transmit the disease-causing agents. Diseased, stressed, and infected captive deer may be contagious, but actual transmission may occur only through vectors, vehicles, and fomites.

When an agent infects and develops in the vector, the vector becomes a source of biological transmission. If no development occurs in a vector, or on a vehicle, the transmission is mechanical. Mechanical transmission normally must be completed within minutes or the agent will not survive. Biological transmission can occur over a period of days to months. Agents that infect ticks may develop and survive the life of the tick (1 to 5 years). Disease transmission to susceptible deer occurs by blood wound contact with vectors and by blood wound contact with and ingestion of agents on vehicles.

Contaminated fomites play a part in both mechanical and biological transmission of disease. Certain infectious agents can resist heat, sunlight, and drying to survive for months in the environment. Transmission usually occurs by ingestion or inhalation of the fomites.

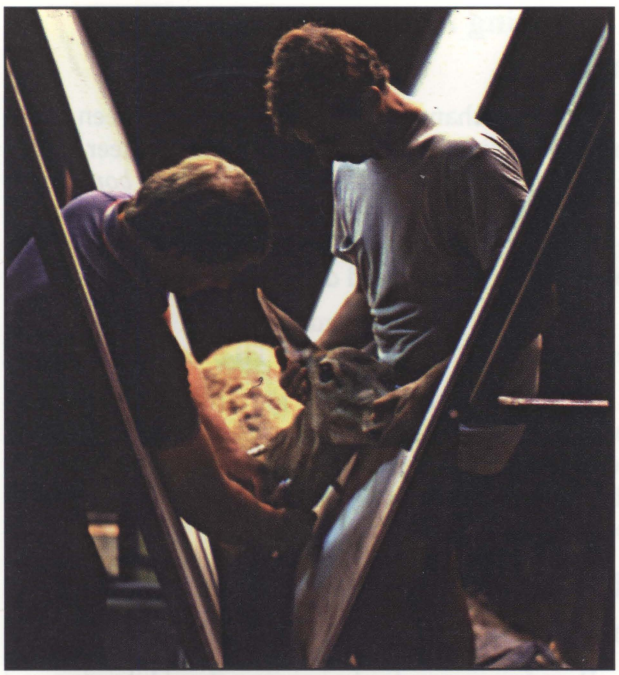
Total Health Management

Proper management practices can help prevent disease. In addition, a good management program fosters optimal health and welfare of the animals; enhances productivity and economic efficiency; and ensures abundant, safe, and wholesome food products.

Total Health Management, including management practices in husbandry, nutrition, and biosecurity, will minimize or totally prevent diseases. Examples are listed in the table below. Nutritional and husbandry practices address the general care of the animals, while biosecurity practices target the sources and transmission of diseases and the immunity of the captive deer.

Nutritional Management Practices	Husbandry Management Practices
■ Provide sufficient clean water.	■ Provide adequate space.
■ Provide adequate protein, carbohydrates, minerals, vitamins, fats, and oils.	■ Provide shelter if necessary to protect against hot and cold weather conditions.
■ Provide adequate forage.	■ Clean and disinfect feeding and watering devices.
■ Prevent overcrowding and overgrazing of pastures.	■ Provide sanitary environment for birthing.
■ Assure that newborn deer receive enough good-quality colostrum during the first 6 hours after birth.	■ Provide safe and humane handling facilities designed for the species.

Biosecurity Management Practices	
■ Raise replacement animals.	■ Have a veterinarian submit laboratory tests on a diseased live or dead animal.
■ Purchase clean replacement animals.	■ Vaccinate sexually mature deer against venereal and abortion diseases before breeding.
■ Test replacement animals.	■ Vaccinate pregnant deer before birthing to provide colostral immunity against neonatal and postnatal diseases.
■ Isolate replacement animals for 6 weeks.	■ Vaccinate nursing young deer against diseases.
■ Prevent direct contact between groups of animals.	■ Vaccinate adult deer against diseases to provide protection and to reduce shedding of infectious microorganisms during birthing and breeding seasons.
■ Isolate diseased deer.	■ Provide annual booster vaccinations.
■ Prevent direct contact with diseased deer.	
■ Use sterile syringes and needles.	
■ Disinfect tattoo and ear tag instruments.	
■ Properly dispose of diseased dead animals by burning or burying the carcasses.	



Proper restraint is necessary for safe handling and testing of deer.

Daily administration of antibiotics and antibacterials in the feed or water of confined deer can help prevent diseases for which no vaccines are available.

In addition to these management practices, a vital part of Total Health Management is observing the captive deer daily for signs of diseases, dysfunctions, and inadequacies. Close observations of the deer's appetite, body condition, attitude, behavior, mucous membranes, and body discharges are necessary to ensure their health.

Bovine Tuberculosis

Bovine tuberculosis (TB) is caused by the bacterium *Mycobacterium bovis*. This bacterium is infectious to all warm-blooded animals, including people. But bovine TB is rarely diagnosed in human beings. Human TB is caused by a different species of *Mycobacterium*.

All species and age groups of animals are susceptible to *M. bovis*, with cattle, goats, and pigs most susceptible and sheep and horses showing a high natural resistance. Bovine TB may also be encountered in wild deer, elk, bison, and birds, and these animals may act as a source of infection for captive deer. The bacteria are excreted in the exhaled air, sputum, feces, milk, urine, and vaginal and uterine discharges of infected animals.

Transmission of Bovine TB

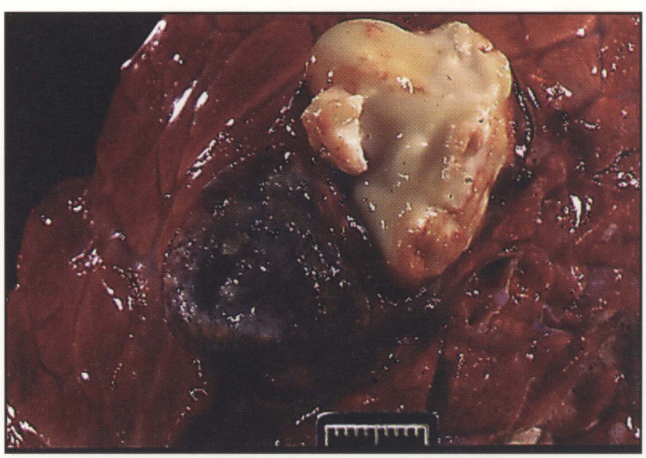
The most common route of transmission between captive deer is aerosol inhalation. Transmission may also occur by ingestion of water or feed contaminated by feces, or as a result of young deer nursing infected dams. Under natural conditions, stagnant drinking water may cause infection up to 18 days after its last use by a TB-carrier animal, but a running stream does not represent an important source of infection to captive deer in downstream fields. Viable organisms can be isolated from the feces of infected deer and from the ground in contact with the feces for 6 to 8 weeks after the feces are dropped. The period may be as short as 1 week if the weather is dry but will be much longer in wet weather. Separating infected and susceptible animals with a fence provides practical protection against the spread of the disease.

Effects of the Disease

Bovine TB is characterized by the progressive development of tubercles in any internal organ of the infected animal. Bovine TB can affect the animal's lungs, liver, lymph nodes, spleen, and udder. The tubercles (granulomas) or tumor-like masses form as a result of the body's defense mechanisms to localize, or wall off, the invasion of the bacteria. As the disease progresses, captive deer often begin coughing and develop a nasal discharge. They progressively lose weight, with symptoms of varying degrees of emaciation and weakness. TB in livestock is not considered curable. Infected animals are destroyed.

Bovine Tuberculosis Eradication Program

The Bovine Tuberculosis Eradication Program began in the United States in 1917. The program reduced the prevalence of disease in the national cattle population from 5% in 1917 to 0.015% in 1990. The current program relies on two methods of



Bovine tuberculosis causes granulomas (tubercles).

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Tubercles destroy the tissue of internal organs.

detecting bovine tuberculosis. One is skin (cervical) testing of captive deer for TB to meet the requirements for interstate movement and herd accreditation. The other method is through slaughter surveillance. Captive deer slaughtered at state and federally inspected slaughter plants are examined for tubercles. Carcasses that have TB lesions detected by meat inspectors on slaughter are condemned and destroyed. When herds are found to be infected by either method, exposed deer are quarantined to determine the presence or absence of TB by skin testing and slaughter methods. An infected herd is quarantined, until all infected deer are removed to slaughter and the herd is negative after a series of tests.

Increasing Frequency of Bovine TB in Texas

For more than a decade, bovine TB has been more frequently diagnosed in cattle and farmed deer and elk. The number of cattle infected with *M. bovis* in Texas has unfortunately increased since 1990. The re-emergence of the disease in Texas poses economic problems for the farmed deer industry.

Exotic cervids from herds without a TB status may enter Texas after two negative TB tests prior to entry.

To minimize the potential for introduction of bovine TB into captive deer herds, post-entry TB testing must be conducted on all purchased farmed deer and elk before they come in contact with a herd of captive deer.

Total Health Management for Control of Bovine TB

Deer farmers and veterinarians should develop and implement total health programs as described earlier in this publication. Total health management minimizes the potential for introduction of infectious diseases, including bovine TB.

These management practices include:

1. hunter-harvest postmortem exams for visceral tubercles.
2. annual herd tests.
3. replacement animal tests.
4. tests of emaciated and chronic coughing deer.
5. individual animal identification and record keeping.

The TB test performed by the veterinarian is the cervical skin test. A disadvantage of the skin testing includes failure to detect cases of minimal sensitivity, such as may occur in early or late stages of the disease, in old deer, and in deer which have recently calved. Any positive results must be reported to USDA, Animal and Plant Health Inspection Service.

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