

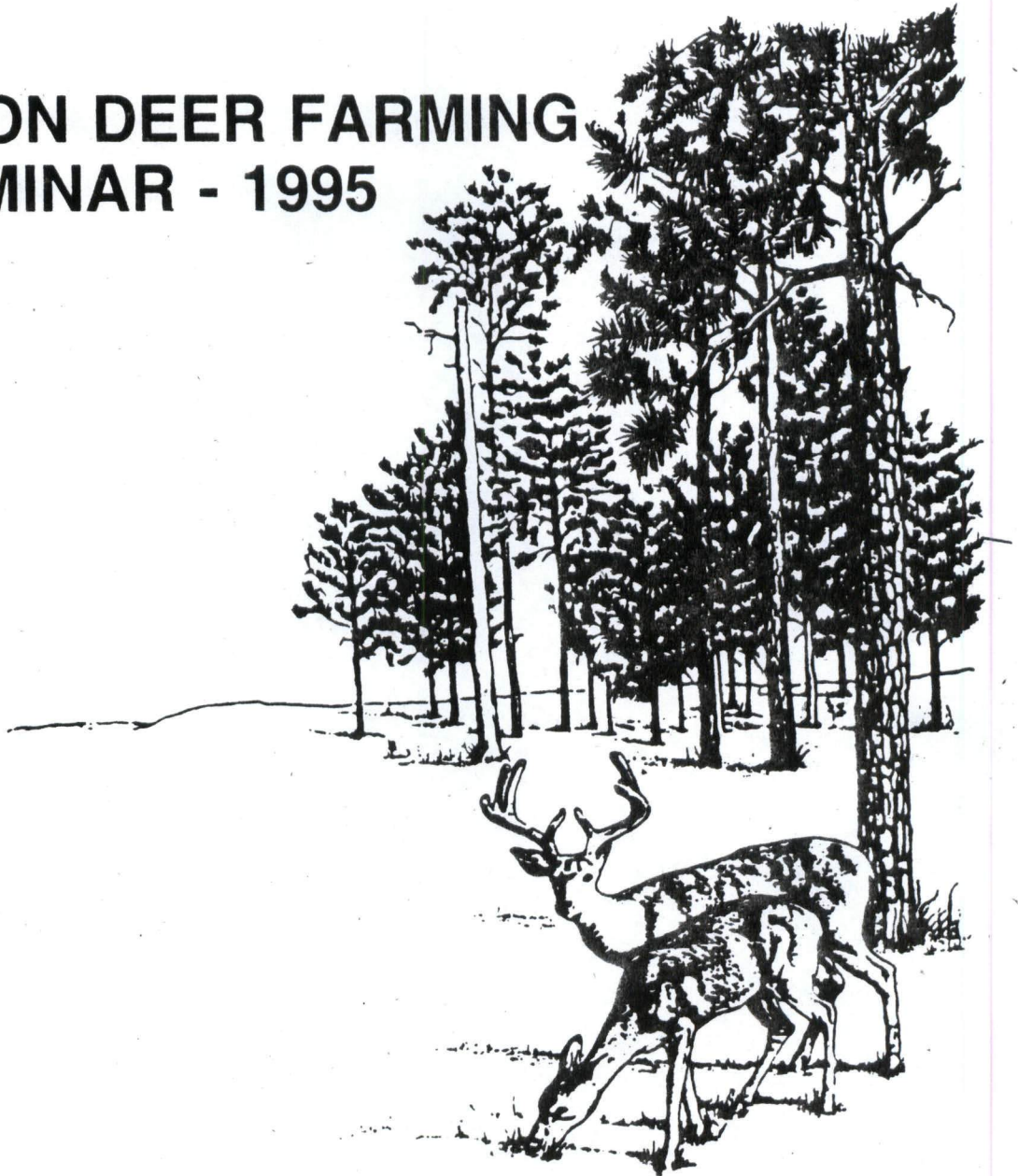
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## HEALTH ISSUES IN DEER FARMING

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Herd health management as it applies to deer farming is in many aspects very similar to that practiced with traditional livestock species. There are some logical reasons for this situation. Most of the history and experience of diseases in animals is based on the traditional livestock species, but more importantly almost the entire repertoire of chemotherapeutic agents and vaccines used to prevent, control, and combat diseases in animals was specifically designed and tested for cattle, sheep, goats, pigs and horses. In many, if not most cases, this foundation of veterinary medicine in diseases of traditional livestock is sufficiently transferable to most of the commonly farmed cervidae to adequately diagnose, treat and control infectious diseases. There are notable exceptions and the practicing veterinarian must always remember that deer are not sheep, goats, or cattle in "slightly different costumes". Deer have major physiological, seasonal, and behavioral differences from domestic ruminants, and this should not be forgotten or ignored when considering the effects of disease in cervidae.

What is disease anyway? One formal definition is that disease is any interruption or cessation of normal bodily function or any normal bodily state. There are many kinds or types of disease other than the more commonly considered infectious and parasitic diseases caused by microorganisms and "worms". Perhaps the most common disease is nutritional. Every individual of every species has a precise but dynamically controlled requirement for protein, energy, vitamins, and minerals in the proper form and amounts over time. Anything more or less than that requirement is malnutrition. Animals under our control depend on us to provide that proper nutrition, and we do not always meet the requirements. The nutritional state of an individual also has effects on that individual's mechanisms of host disease resistance, so one can see that an interrelationship of diseases does exist. Another common disease is trauma which is physical injury due to handling, fighting, and other accidents. This is one of the most frequent diseases observed in farmed deer and can have major effects on production. Design of handling facilities, knowledge of deer behavior, experience, and animal husbandry can dramatically reduce losses due to trauma. Other types of diseases include genetic, neoplastic (tumors), toxic, climatic, and behavioral but these in most instances are infrequent or easily managed in routine deer farming.

The study of infectious and parasitic diseases of animals is just adequately covered in four years of veterinary school, so an hour or so will not make anyone an "expert" on diseases of deer. There are minimum basic concepts of disease that producers of deer or any livestock should



understand if nothing else but to protect their investment. One of the most important concepts deals with the transmission of diseases. Infectious disease agents must be transmitted from host to host to be spread. The mechanism of transmission is very important when disease prevention, treatment, and control are considered. The way the disease agent is passed from individual to individual has profound implications on how the disease may be combated. The most simple form of disease transmission is direct. The disease agent is passed directly from one individual to another. The common cold is an example in humans. Rabies is an example in animals. Direct transmission then requires close (a few inches or feet) or intimate contact. Directly transmitted diseases depend on the density of susceptible hosts and infected individuals. Space between individuals therefore alone can prevent directly transmitted diseases. A more complex form of disease transmission is indirect transmission. There are two types of indirect transmission. The first is vehicle born indirect transmission and this includes those disease agents that can be transmitted from an infected individual to a susceptible individual by a contaminated inanimate object such as food, water, surgical tools, needles, and trailers. The second type of indirect transmission is vector born and this includes diseases that are transmitted by insects or other animals. There are two types of indirect vector born transmission and these are mechanical and biological. The mechanical vector born type does not require any development of the disease agent in the vector. Anaplasmosis and bluetongue are examples of mechanically vectored indirectly transmitted diseases. Malaria in humans and babesiosis in cattle are biologically vectored indirectly transmitted diseases. The disease agent in biologically vectored diseases must undergo multiplication and/or life cycle changes in the vector before it can be transmitted to a new host. Again, the type of transmission determines the methods of control of the diseases. Vectored diseases can be prevented or controlled by control of the vector through sprays, dips, or by the environment (freezing weather). Direct contact is not required between hosts in vectored diseases so animal densities are not as important and vectored diseases will not stop at a fence. These concepts should be considered before and during problems with diseases to minimize losses from infectious diseases.

A comprehensive discussion of all diseases of deer is beyond the scope of this manuscript but tables of bacterial diseases, viral diseases, and important parasites of deer have been included at the end of this manuscript for your reference. The information in the tables is minimal and for general information purposes at best. At the first serious indication of the presence of a disease, one should contact an experienced veterinarian to minimize the losses that the disease can inflict on the animals and the owner's bank account.

Discussion of diseases generally promote an undercurrent of paranoia in those not fully educated in the entire disease process. These diseases of deer do exist and they do occur and they can severely impact your herds, but thank goodness they do not usually occur. There are good explanations why we and our animals are not constantly infected with one disease or another, even though we live in a system where we are constantly exposed to infectious agents. The major reason is host resistance. Every individual (human and animal) has a number of mechanisms to resist invasion of disease causing agents, and after invasion, resist infection, and disease and subsequent invasion. Most of these host barriers and mechanisms to prevent infections are under genetic control but are mediated by concurrent events such as other diseases, stress, and physiological state. The number and virulence of the disease causing agent is another factor, and the environment of the host and the disease agent is another interaction. Everything must be correct (or incorrect depending on your view) for a sufficient number of disease causing organisms to gain entrance into a suitable host, overcome all of the host's defenses and cause pathology. In most instances this sequence does not play all the way out and stops short of pathology. In other words, animals that are well fed, well cared for, and in normal environments are generally healthy. Overt disease in most situations is the exception rather than the rule, but one must keep the probability of disease in one's mind to do everything possible to prevent disease. Prevention of disease is by far more cost effective than treatment and control of disease.

## BASIC CONCEPTS OF DISEASE

### DEFINITIONS:

- 1) Disease - any interruption or cessation of normal bodily function or any normal physiological state.
- 2) Types of Disease
  - a) Infectious - bacterial, viral, fungal, rickettsial, etc.
  - b) Parasitic - protozoa, nematodes, cestodes, trematodes; external, internal
  - c) Nutritional - protein, energy, vitamins, trace minerals
  - d) Toxic - chemical, industrial, plant, vertebrate, invertebrate, etc.
  - e) Genetic - structural, functional, physiologic, immunologic, etc.
  - f) Neoplastic - tumors, "cancer"
  - g) Behavioral - physiological
  - h) Traumatic - physical injuries, handling, fighting, accidents
- 3) Infectious Disease Transmission
  - a) Direct - individual to individual, close or intimate contact
  - b) Indirect
    1. Vehicle born
    2. Vector born
      - a. Mechanical
      - b. Biological
- 4) Life Cycles and Hosts of Parasites
  - a) Simple - primary hosts
  - b) Complex - primary hosts and/or alternative hosts with/without transport, secondary, intermediate hosts
- 5) Infectious Disease Diagnosis
  - a) Clinical signs and symptoms
  - b) Gross lesions - external and internal
  - c) Laboratory
    - 1) Physiological
    - 2) Serological
    - 3) Histological
    - 4) Culture - the isolation and identification - The definite diagnosis.
- 6) Host Resistance
  - a) Innate (species, genetic) resistance
    - 1) structural/functional
    - 2) circulatory - fibrin, white blood cells, humoral antibodies
    - 3) cellular immunity
  - b) Passive and acquired immunity
    - 1) colostrum
    - 2) gamma globulin from hyperimmune individual
    - 3) vaccines or prior infections



## BACTERIAL DISEASES WHICH MAY INFECT DEER

<u>DISEASE</u>	<u>AGENT</u>	<u>SIGNS/SYMPTOMS</u>	<u>PREVENTION/CONTROL</u>
1. ANTHRAX (woolsorters disease) malignant carbuncle	<i>Bacillus anthracis</i> (ZOOONOTIC)	sudden death, convulsions, staggering, tarry blood from body orifices	Annual vaccine; burn/bury antibiotics; CAUTION
2. BRUCELLOSIS (Bangs, Contagious Abortion, Bovine Brucellosis)	<i>Brucella abortus</i> (ZOOONOTIC)	Abortion, weak neonates, orchitis, retained placenta infertility	Strain 19, Vaccine ? test and remove; CAUTION
3. CLOSTRIDIAL DISEASES	<i>Clostridium spp.</i> some are dangerous to humans		
BLACKLEG	<i>Cl. chauvoei</i>	Lameness, depression, localized swelling of musculature; death in young animals	Vaccine early & later Penicillin
MALIGNANT EDEMA	<i>Cl. septicum</i>	Depression, high fever; spreading edema, death	Vaccinate; Antibiotics
BLACK DISEASE (Infectious Necrotic Hepatitis)	<i>Cl. novyi</i>	Sudden death, depression often associated with liver flukes	Vaccinate twice; Eliminate intermediate host; and snail habitat
ENTEROTOXEMIA	<i>Cl. perfringens</i> (6 types B,C,D are common)	acute diarrhea; toxemia; enteritis	Vaccinate; do not alter rumen pH due to change of diet
RED WATER DISEASE (Bacillary hemoglobinuria)	<i>Cl. hemolyticum</i>	red stained urine; anemia; diarrhea with blood; often associated with fluke infections	Vaccinate; prevent infection of flukes; Control other hosts
TETANUS (Lock jaw)	<i>Cl. tetani</i>	localized stiffness of muscles; progressing spasms	Vaccinate; antitoxin

BOTULISM	<i>Cl. botulinum</i>	Progressive muscle paralysis Death from cardiac paralysis	Toxoid; antitoxin
4. BOVINE TUBERCULOSIS	<i>Mycobacterium bovis</i> (ZOOONOTIC)	Chronic disease; signs vary with location of lesions	Test and remove; no treatment allowed
5. JOHNES DISEASE (Paratuberculosis)	<i>M. paratuberculosis</i>	Chronic, persistent diarrhea Progressive weight loss; death	Test and remove; Sanitation
6. FOOT ROT/CALF (Calf diphtheria)	<i>Fusobacterium necrophorum</i>	Lameness; may go systemic; In young - necrotic stomatitis; toxemia, pneumonia, death	Vaccine; Vit A; Antibiotics; isolation; Sanitation
7. SHIPPING FEVER (Pneumonic pasteurellosis)	<i>Pasteurella hemolyticum</i> (often Parainfluenza virus 3)	Fever; anorexia; cough; rales serious nasal discharge; death	Vaccination before movement; antibiotics
8. LEPTOSPIROSIS	<i>Leptospira spp.</i>	Fever, anemia, jaundice, anorexia hemoglobinuria; abortion	Vaccines, antibiotics sanitation
9. ANAPLASMOSIS	<i>Anaplasma spp.</i> (by biting ticks and flies)	Fever, anorexia, marked anemia; icterus; weight loss; hypoxia	tetracyclines; vector control



## VIRAL DISEASES OF DEER

<u>DISEASE</u>	<u>PRIMARY HOSTS</u>	<u>SIGNS/SYMPTOMS</u>	<u>PREVENTION &amp; CONTROL</u>
BLUETONGUE (BTV)	Domestic and Wild Ruminants (biting flies and gnats) Vectors	Swelling of tissue & ulcers in the oral cavity, teats; coronitis and laminitis; enteritis; death	Vector Control; Movement cautions; Isolation
EPIZOOTIC HEMORRHAGIC DISEASE (EHD)	Primarily cervidae (insect vectors)	High fever; localized muscular swelling; respiratory distress; anorexia; death	Supportive therapy; Isolation; vector control
MALIGNANT CATARRHAL FEVER (MCF)	Domestic and Wild Ruminants (Sheep form and African form)	High Fever, profuse nasal discharge; encrusted muzzle; necrosis of buccal cavity; enteritis	Isolation from sheep and exotic ruminants High mortality
BOVINE VIRAL DIARRHEA (BVD)	Bovines - wild and domestic (primarily young animals)	Fever; anorexia; rapid respiration; profuse watery diarrhea with blood and mucous	Vaccine; supportive therapy - dehydration
INFECTIOUS BOVINE RABIES	Domestic cattle; wild ruminants are not known to be infected Primary carnivores	Fever, reddened mucous membranes; Difficulty breathing; abortions Depression to hyperactivity; central nervous system affected	Vaccine; supportive therapy; isolation Vaccines for animals and humans

## PARASITIC DISEASES IN DEER

### PROTOZOA

COCCIDIOSIS - Many species; "bloody scours" particularly in young; transmitted from fecal contamination; prevention/control many coccidiostats (amprolium, sulfaquinoxaline, decoquinate, monesium) in food or water during periods of exposure.

THEILERIOSIS - Caused by *Theileria cervi*; vectored by ticks; infects red blood cells; signs and symptoms of anemia.

BABESIOSIS - Caused by species of *Babesia* vectored by ticks; infects red blood cells; signs and symptoms of anemia.

### TREMATODES

#### LIVER FLUKES

*Fasciola hepatica* and *Fascioloides magna* both can infect deer; the intermediate hosts are fresh water snails; flukes can cause internal damage or unthriftiness; treatment and control by albendazole and habitat management.

### NEMATODES

SHARED WITH CATTLE, SHEEP, AND GOATS - Deer are susceptible to many of the same internal nematode parasites that are common to cattle and sheep in the same geographic area; consult your neighbors and the local veterinarian about the parasite problems within an area.

*Parelaphostrongylus tenuis* (meningeal worm) - asymptotic normal host is the white-tailed deer, in nearly all other cervidae the worm is highly pathogenic and kills the host before shedding (with the possible exception of elk). Diagnosis a problem because of confusion with infections of *P. andersoni* and *P. odocoilei*. Snails and slugs are the intermediate hosts.

*Eleophora schneideri* (carotid artery worm) - also normally carried by the white-tailed deer and vectored by flies. May be associated with food impactions in white-tailed deer. In other cervidae, the parasite may reside in other tissues, and may result in blindness, muzzle and ear necrosis, antler deformation generally unilateral. Causes "poll evil" in sheep.

*Dictyocaulus viviparus* (lungworm) - is the large lungworm of deer; heavily infected individuals may show signs of respiratory distress. Secondary pneumonia is common; larvae are shed in feces, molt twice to 3rd stage infective larvae which is consumed by other grazing animals.