SERODIAGNOSIS IN WILDLIFE MANAGEMENT

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Prior to the advent of modern serological methods, disease considerations were all but ignored in the management of wildlife populations. More recently, diseases have been identified as a cause of major die-offs. The management of disease-infected populations often depends on accurate diagnosis. However, the condition of carcasses presented at necropsy is often so poor that proper diagnosis is difficult. Serodiagnosis has facilitated the detection of disease in wildlife populations by enabling the investigator to identify specific antibody to disease agents indicating which animals have been exposed. The seroprevalence of disease in a population is the percentage of the animals that react positively when tested for antibody to a specific disease. The examples to follow illustrate the use of serology in preventing the translocation of disease-infected animals and in identifying species which may be reservoirs of disease.

Mycoplasma gallisepticum is an important disease of domestic and wild poultry. This agent is responsible for a debilitating respiratory disease, declines in egg production, skeletal abnormalities, and poor juvenile growth (Rocke et al. 1988). Obviously, *Mycoplasma* is of great economic concern to the poultry industry, but it also must be a consideration in the management of Rio Grande wild turkeys (*Meleagris gallopavo*) where it also causes decreases in poult numbers.

Free-ranging turkeys have been found to be seropositive for *Mycoplasma* in many states including California, Georgia, Colorado, Texas, Missouri, and Wisconsin (Rocke et al. 1985). Despite this finding, only a few states screen for the disease. Prior to the initiation of control programs in California and Wisconsin, infected wild turkeys were introduced from Texas (Davidson et al. 1981) and Missouri (Jessup et al. 1983). Currently, control programs exist in Wisconsin, Michigan, Wyoming, and California to prevent the translocation of infected turkeys. In these states, animals which are found to be seropositive for *Mycoplasma* antibody by the rapid plate agglutination test are either held in captivity for further study or are killed and necropsied (Rocke et al. 1985). In the case of *Mycoplasma gallisepticum* in Rio Grande wild turkeys, serological screening prevents the introduction of disease into previously healthy populations, eliminates the possibility of establishing diseased populations into new areas, and reduces the risk of transmitting disease to susceptible domestic populations.

Another important example of the use of serology in wildlife management is the identification of Lyme disease reservoirs. A reservoir host is an alternate host that harbors a pathogenic organism, without injury to itself, and acts as a source of infection for other susceptible individuals. Reservoirs of Lyme disease carry *Borrelia burgdorferi*, the causative agent of this devastating human disease. Borrelia is a spirochete which is transmitted by ticks. In the western states, the main culprit is *Ixodes pacificus*, a three host tick that parasitizes various species of mammals during different stages of its life cycle.

The white-footed mouse (*Peromyscus leucopus*) is a well identified reservoir of Lyme disease in the East (Bosler et al. 1984). It harbors the larval stage of the tick, which eventually drops off to find a larger host, such as the raccoon (*Procyon lotor*), in its nymphal stage. Finally, the adult tick usually chooses an even larger host on which to feed before completing its life cycle. The black-tailed jackrabbit (*Lepus californicus*) is a good sentinel for the surveillance of Lyme disease because it is widely distributed in the western states, occupies a variety of habitats, breeds throughout the year, serves as a host for ticks which harbor *B. burgdorferi*, and exhibits a high rate of seropositivity (Lane and Burgdorfer 1988, Lane and Regnery 1989). By examining sera samples from jackrabbits throughout the western states, the seroprevalence of Lyme disease can be monitored to determine endemicity and changes in reactivity which may possibly indicate the spread and severity of the problem in synergistic populations.

Another lagomorph which may act as a good sentinel for Lyme disease surveillance is the brush rabbit (*Sylvilagus bachmanii*) because it occurs in many of the same habitats as the jackrabbit and harbors the same ticks. In fact, serum collected in

California in 1965, has reacted positively for *Borrelia* indicating the presence of the Lyme disease agent or a similarly reacting agent for at least twenty years in the West (Lane and Regnery 1989). In this example, we have illustrated that serology can be useful in identifying possible sources of infection of a disease, as well as sentinels for monitoring that disease. In our final example, we combine the uses of serology illustrated in the previous examples, to prevent translocation of infected animals and to attempt to identify wildlife reservoirs of disease.

Brucella abortus is a disease of major economic importance in domestic cattle causing abortion in late gestation, sterility in the cow, decreased milk production, and genital tract changes in the bull. Eradication programs for this disease are often very concerned about the presence of a wildlife reservoir. The bison (*Bison bison*) has been targeted as a possible source of infection for domestic cattle. *Brucella* was first recognized in bison in Yellowstone National Park in 1917 (Mohler 1917). Since then bison have been shown to be highly reactive with a seroprevalence ranging up to sixty-two percent (Choquette et al. 1978). The lack of clinical signs in these animals strengthens the argument that bison may serve as a naturally occurring reservoir. However, the fact that areas of high prevalence for domestic cattle do not overlap with present bison ranges indicates that bison are probably of little epidemiological significance in the overall eradication of *Brucella* from the United States (McCorquodale and DiGiacomo 1985).

Most wild ungulates other than bison have a low seroreactivity for *Brucella*. Elk (*Cervus elaphus*) which share range with infected bison or cattle have a higher than expected seroprevalence (McCorquodale and DiGiacomo 1985). However, it appears unlikely that the elk are functioning as reservoirs since they exhibit severe clinical signs, consistent with a lack of exposure to the disease in their evolutionary history (McCorquodale and DiGiacomo 1985). As in the case of bison, free-ranging elk herds rarely overlap in range with the high prevalence areas of cattle *Brucella*, thus they are of little significance in eradication attempts. Moose (*Alces alces*) are rarely seropositive, and Hudson et al. (1980) found no evidence of *Brucella* in moose that overlapped in range with infected cattle. *Brucella* is even more rare in deer (*Odocoileus* sp.), and virtually all investigators have determined that deer are nonsignificant hosts (Merrell and Wright 1978, Boeer et al. 1980, McCorquodale and DiGiacomo 1985).

The detection of a rather high seroprevalence for *Brucella abortus* in bison and a very low prevalence for most wild cervids has resulted in reduced concern in translocation of wild cervids and close observation of bison/livestock interactions. Therefore, serology has been used to indicate a possible wildlife source of infection for domestic animals, to screen wildlife prior to translocation into nonendemic areas, and to make appropriate management decisions.

In order for serological screening to be used to its full potential, sera samples must be collected and stored in an organized manner. Collections can be done during disease studies, at check stations from hunter-killed animals, or during captures. Accompanied by an appropriate data base (species, sex, age, date and location of capture), the samples can be stored at management agencies or universities for further study. The benefits that coincide with this system include reduction in number of necessary captures and the associated stress, decreased difficulty and expense of wildlife disease studies, establishment of a history of the disease in question, and the potential for rescreening of sera samples as more accurate diagnostic tests become available.

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