diagnosed in a grey fox (*Urocyon cinereoargenteus*) at the zoo. It was noted that the same caretaker took care of both the fox and the bear.

The source of the infection in the cubs in this report is unknown, but these cubs and the two timber wolf pups, with clinical signs suggestive of ICH infection, were attended by the same caretaker. The Oatland Island Educational Institute is a wildlife refuge for the preservation and study of wildlife in a natural habitat. Animals are obtained from the Department of Natural Resources, Georgia State Fish and Game Commission, other zoos and the general public. New entries are rarely isolated. Members of the staff play with and handle the young animals prior to their reaching sufficient age to be placed in the natural habitat.

Mammals are on an accepted vaccination program as recommended by Fowler and Theobald (1978, *In* Zoo and Wild Animal Medicine, Fowler (ed), W. B. Saunders Company, Philadelphia, Pennsylvania, pp. 613–617), however the bear cubs and wolf pups had not been vaccinated for ICH. Problems requiring treatment are dealt with by the improvisation and adaptation of known techniques used in domesticated species.

The diagnosis of ICH in bear cubs in this instance suggests that the vaccination of bear cubs housed in zoos and other exhibits should be considered. It must be pointed out however, that the only vaccines currently available are for use in dogs. Until data can be compiled on the use of these vaccines in other species only killed ICH vaccines are suggested for use in bears.

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# Serologic Testing of Wild Roe Deer (*Capreolus capreolus* L.) from the Trois Fontaines Forest Region of Eastern France

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With the continuing expansion of agriculture, the range of wild cervids is constantly overlapping with domestic ruminants and the transmission of infectious disease from the latter to the former in epizootic proportions is always a possibility. No surveys to determine the presence of pathogens of domestic animals in wild cervid populations have been made in France. During January and February of 1979 blood samples were obtained from a substantial portion of a wild roe deer population in the Trois Fontaines forest of eastern France. This opportunity was used to investigate the possible presence of antibodies in this cervid population for a number of pathogens of domestic ruminants in France. This paper reports the results of that study.

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The population is protected from contact with herbivores from outside by a fence. In addition to the roe deer, the population consists of one or two red deer (*Cervus elaphus*) and approximately 100 wild boar (*Sus scrofa*). The deer were captured in nets by the use of dogs which constituted the only other animal contact. A 40 ml blood sample from each animal was taken in a sterile Vacutainer. These samples were screened for antibodies to 19 pathogens commonly found in domestic cattle (Table 1). Antibody titers considered to be significant are as follows: *Aspergillus* > 1/320, *Babesia* > 1/16, *Chlamydia* > 1/8, *Coxiella* (Q Fever) > 1/16.

The results of this study are summarized in Table 1, which indicates that of the 19 pathogens tested for, evidence of only four occurred in this roe deer population, namely *Aspergillus fumigatus*, *Babesia capreoli*, *Chlamydia* sp. and *Coxiella* sp.

TABLE 1. Results of serological testing of roe deer in eastern France.

| Disease or pathogen | Technique | Results (no. pos./ no. examined) |
|---|---|---|
| Adenovirus serotype | Passive hemagglutination and immunodiffusion[a] | 0/123 |
| *Aspergillus fumigatus* | Passive hemagglutination[b] | 1/154 |
| Aujeszky | Seroneutralization (microplaque)[c] | 0/187 |
| *Babesia divergens* | Indirect immunofluorescence[d] | 40/75 |
| *Brucella abortus* | Sero-agglutination and complement fixation[e] | 0/188 |
| *Chlamydia* spp. | Complement fixation[f,g] | 5/155 |
| *Coxiella* (Q fever) | Complement fixation[g] | 3/175 |
| *Dermatophilus congolensis* | Passive hemagglutination[h,i] | 0/123 |
| Foot and mouth disease, serotype O, A and C | Seroneutralization (mice and cell culture)[j] | 0/187 |
| *Leptospira icterohemorragiae, L. grippotyphosa, L. australis, L. pomona, L. tarassovi, L. canicola, L. sejroe* | Agglutination-lysis[k] | 0/189 |
| Leucosis | Immunodiffusion[l] | 0/193 |
| Mucosal disease | Seroneutralization (microplaque)[m] | 0/123 |
| *Mycoplasma mycoides* var. *mycoides, M. capricolum, M. agalactiae, M. arginini* | Agglutination[n,o] and complement fixation[p] | 0/123 |
| Parainfluenza, serotype 3 | Inhibition of hemagglutination[a] | 0/123 |
| Paratuberculosis | Complement fixation[q] | 0/183 |
| *Pasteurella multocida*, type A, type B | Passive hemagglutination[r,s] | 0/123 |
| Rabies | Seroneutralization (mice)[j] | 0/183 |
| Infectious bovine rhinotracheitis | Passive hemagglutination[a] | 0/123 |
| Tuberculosis | Immunodiffusion[a] | 0/183 |

[a] Dannacher et al., 1979, Recl. Méd. Vét. Ec. Alfort. 155: 633–637. [b] Baradel, 1981, D.Sc. Thesis, Nancy, France, 270 pp. [c] Ursache et al., 1977, Rev. Méd. Vét. (Toulouse) 128: 1317–1333. [d] Perie, 1975, Trop. Geogr. Med. 27: 443. [e] Renoux and Gaumont, 1966, Ann. Nutr. Aliment. 20: 1–51. [f] Giauffret and Russo, 1976, Recl. Méd. Vét. Ec. Alfort. 152: 535–541. [g] Saint-Aubert et al., 1975, Rev. Méd. Vét. (Toulouse) 126: 787–800. [h] Perreau and Chambron, 1966, Rev. Elev. Méd. Vet. Pays Trop. 19: 263–274. [i] Pulliam et al., 1967, Am. J. Vet. Res. 28: 447–455. [j] Sullivan and Rosenbaum, 1967, Am. J. Epidemiol. 13: 424. [k] Gaumont and Toma, 1973, Recl. Méd. Vét. Ec. Alfort. 149: 573–574. [l] Miller and Olson, 1972, J. Nat. Cancer Inst. 49: 1459–1462. [m] Dannacher and Martell, 1978, Recl. Méd. Vét. Ec. Alfort. 154: 31–37. [n] Adler and Etheridge, 1964, Aust. Vet. J. 40: 38–43. [o] Provost and Queval, 1957, Rev. Elev. Méd. Vét. Pays Trop. 10: 357–360. [p] Perreau et al., 1976, Bull. Acad. Vét. Fr. 49: 185–192. [q] Konst and Smith, 1958, Can. J. Comp. Med. 22: 249–254. [r] Carter, 1963, Br. Vet. J. 119: 73–77. [s] Perreau, 1967, Bull. Assoc. Microbiol. Immunol. Fr. 7: 25–37. [t] Kaplan and Koprowski, 1974, La Rage (3rd Ed.), Geneva, Switzerland, 379 pp. [u] Blancou, 1972, Rev. Elev. Méd. Vét. Pays Trop. 25: 25–35.

The roe deer in this population apparently harbor few of the pathogens which are recorded from domestic ruminants in France. This favorable situation is undoubtedly enhanced by the physical isolation of the population from adjacent animals. However, it is noteworthy that air, water and insect-borne diseases have made little apparent impact on this herd. The annual increase of 35% in numbers of the herd, which corresponds to the reproductive rate in a stable population of this species, tends to confirm the absence of morbid or reproductive disorders.

The results of this study are comparable to those of Weber et al. (1978, Prakt. Tieraerztl. 59: 353–357), who also found antibodies to both *Chlamydia* and *Coxiella* and the absence of antibodies to *Brucella* sp. and leucosis virus in deer in Germany. On the other hand, the presence of antibodies to *Mycobacterium paratuberculosis*, *Brucella* sp., *Leptospira* sp., infectious bovine rhinotracheitis virus and mucosal disease virus has been recorded in European deer (Stoll, 1972, Fortschr. Veterinaermed. 17: 55–59; Twigg et al., 1973, Vet. Rec. 93: 98–100; Sebek et al., 1976, Folia Parasitol. (Prague) 23: 25–31; Schellner, 1977, Tieraerztl. Umsch. 32: 225–228; Corrigall, 1978, Vet. Rec. 103: 75–76). Pulmonary aspergillosis has been reported in roe deer (McDiarmid, 1969, Diseases in Free-living Wild Animals, Academic Press, London, England, 332 pp.) as has Q fever (Schmatz et al., 1977, Berl. Muench. Tieraerztl. Wochenschr. 90: 74–76) and *Babesia* sp. (Adam et al., 1977, Res. Vet. Sci. 23: 133–138). Although roe deer are reported to be sensitive to gastrointestinal infections (Weber et al., 1978, op. cit.) the Trois Fontaines herd seems to be free of serious pathogenic diseases. Inasmuch as this herd is isolated physically from other deer and domestic ruminants, there is little reason to ex-

pect that they would reflect the serologic profile of the domestic ruminant population. The high reproductive rate of this population confirms its good health and indicates the benefits to be derived from isolating such herds from domestic livestock. Fenced enclosures should be considered to protect other herds of deer from the introduction of disease, thus providing larger populations of animals for re-stocking purposes. This is particularly needed in regions such as France where natural habitat is rapidly diminishing and contact between domestic and wild ruminants is constantly increasing.

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