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## *Leptospira interrogans* SEROTYPES *Ballum* AND *Grippotyphosa* ISOLATED FROM THE MUSKRAT

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**Abstract:** *Leptospira interrogans* serotypes *ballum* and *grippotyphosa* were isolated from muskrats (*Ondatra zibethicus*) taken in central Illinois. This represents the first reported isolation of *ballum* and the first United States record of *grippotyphosa* from this species.

### INTRODUCTION

Muskrats have seldom been found infected with *Leptospira*; however, a single isolation of *L. interrogans* serotype *icterohemorrhagiae* was made from several muskrats taken in southeastern Pennsylvania.<sup>7</sup> Serotype *grippotyphosa* was reported from Czechoslovakia,<sup>8</sup> Poland,<sup>9</sup> and Bohemia<sup>10</sup> and Russia.<sup>1</sup> Serotype *sejroe* isolates have been reported from Poland<sup>11,12</sup> and serotype *kazachstanica II* from Russia.<sup>7</sup> This report describes the isolation of serotypes *ballum* and *grippotyphosa* from muskrats taken in central Illinois.

### MATERIALS AND METHODS

The study was made on a private beef and swine feeding farm located approximately 11 km northwest of Springfield, Sangamon County, Illinois, during November, 1968. All animals reported here were taken from a pond of approximately 0.6 hectares surface area which was located near the upper limits of the drainage system of the farm properties. The muskrats were caught in steel traps which were checked daily in the early morning hours. Most animals were dead when removed from the traps.

Blood samples were taken from the heart using sterile disposable needles and

syringes. Sera were tested by the microscopic agglutination (MA) technique using live antigens of the following serotypes of *L. interrogans*: *autumnalis*, *ballum*, *canicola*, *grippotyphosa*, *hardjo*, *icterohemorrhagiae* and *pomona*.<sup>10</sup> A titer of 1:100 or greater was considered to indicate infection.

Approximately 1/2 a kidney was collected aseptically from each muskrat and expressed through a sterile disposable syringe into a tube containing 4 ml of Ellinghausen-McCullough medium<sup>3</sup> and 200 micrograms of 5 fluorouracil per ml.<sup>5</sup> The cultures were incubated at 20 C and examined weekly under darkfield for 2 months before being declared negative.

Isolates were identified by use of cross agglutination tests with known antisera. Sera were tested from 14 muskrats. The first seven animals were collected before medium was available; as a result, only seven were cultured.

### RESULTS

The results of serological and cultural tests are given in Table 1. Sera from six of the 14 animals reacted positively to *grippotyphosa* antigen. Muskrat SA 23, which was serologically negative, was culturally positive for *grippotyphosa*.

Muskrat SA 19 was serologically and culturally positive for *ballum*. Thus, 7 of the 14 sera and 2 of 7 kidney cultures were positive. The *grippotyphosa* isolate was confirmed by Dr. Aaron Alexander

of the Walter Reed Army Institute for Medical Research, Washington, D.C. The *ballum* isolate was not submitted for confirmation because of the laboratory's extensive experience with this serotype.

TABLE 1. Serologic and cultural results on fourteen Illinois muskrats tested for leptospires, November, 1968.

Number	Sex	Microscopic Agglutination Test	Kidney Cultures
SA 12	F	1:1000 <i>L. grippotyphosa</i>	Not cultured
SA 13	F	1:10,000 <i>L. grippotyphosa</i>	Not cultured
SA 14	M	Negative	Not cultured
SA 15	M	Negative	Not cultured
SA 16	F	Negative	Not cultured
SA 17	M	1:100 <i>L. grippotyphosa</i>	Not cultured
SA 18	F	Negative	Not cultured
SA 19	F	1:100 <i>L. ballum</i>	<i>L. ballum</i>
SA 20	M	1:1000 <i>L. grippotyphosa</i>	Negative
SA 21	M	Negative	Negative
SA 22	M	1:100 <i>L. grippotyphosa</i>	Negative
SA 23	M	Negative	<i>L. grippotyphosa</i>
SA 27	M	1:10,000 <i>L. grippotyphosa</i>	Negative
SA 28	M	Negative	Negative

## DISCUSSION

Although *L. interrogans* serotype *grippotyphosa* has been reported from muskrats collected at various European and Asian sites, there has been no previous record of this serotype from muskrats in the United States. The discovery of leptospiral serotype *ballum* represents the first reported isolation of this serotype from muskrats.

Gillespie and Ryno<sup>1</sup> examined 14 muskrats from stream waters known to be contaminated with leptospiral serotype *pomona* from infected cattle. They postulated that the muskrat would have been a suitable species to reflect the presence of pathogenic leptospires in such contaminated waters, but concluded that the muskrat was resistant to water-borne infection by leptospires. Although the source of the leptospires was not determined in the present study, a water-borne source would seem to be the most logical explanation. Domestic animals penned

upstream and various wildlife species having access to the stream could have served as a source of the organisms. Because of the nature of known leptospiral infection mechanisms, i.e., the shedding of infected urine, maintenance of the organism in wet sites, and high prevalence of infection in rodents, it seems logical that the muskrat would be an animal that could provide an indication of the presence of such organisms in its environment.

The isolation of serotype *grippotyphosa* is of interest because of the recent increase of reports of the importance of this serotype for domestic animals. It appears that more detailed examination of a greater number of wildlife species may reveal this type to be quite common in Illinois animals. The isolation of serotype *ballum* is important as a new host record. Antibody titers to this serotype are found occasionally in domestic animals.

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