Isolation of *Listeria monocytogenes* from Roof Rats (*Rattus rattus*) in Buildings in Tokyo

Satoshi INOUE, Takashi IIDA¹⁾, Tsutomu TANIKAWA²⁾, Tsutomu MARUYAMA¹⁾, and Chiharu MORITA

Department of Veterinary Science, National Institute of Health 2-10-35, Kamiyosaki, Shinagawa-ku, Tokyo 141, ¹⁾Department of Food Hygiene & Nutrition, Tokyo Metropolitan Research Laboratory of Public Health, 3-24-1, Hyakunin-cho, Shinjuku-ku, Tokyo 160, and

²⁾Technical Research Laboratory, Ikari Disinfection Corporation, 579 Chibadera-cho, Chiba-shi Chiba 280, Japan.

(Received 10 August 1990/Accepted 18 February 1991)

J. Vet. Med. Sci. 53(3): 521-522, 1991

KEY WORDS: building, listeria, roof rat.

Listeria monocytogenes is isolated from a variety of animals [8] and also from various foodstuffs [4]. In North America, foodborne outbreaks of human listeriosis have been reported, and coleslaw [7], pasteurized milk [2] and cheese [1] were identified as vehicles of these infections.

Wild rats have been known as the carrier of pathogenic agents. Roof rats (*Rattus rattus*) live in the buildings of big cities in Japan. This study was undertaken to know the role of roof rats for listerial food contamination in Tokyo.

Buildings A and B located in the center of Tokyo were investigated in August and November, 1989, respectively. Rats were trapped using a glue trap (IKARI Co., Japan). Captured rats were autopsied, and the contents of cecum and colon were collected about 1 g each. Samples were suspended in 3 ml of phosphate buffered saline and stored at 4°C for 3 wks. After the cold enrichment, samples were streaked by the inoculating loop on Oxford agar plates (*Listeria* selective agar base; Oxoid, Hampshire, UK) containing *Listeria* selective supplement (Oxoid). After incubation of the Oxford agar plates at 37°C for 48 hr, colonies with black halo were transplanted on tryptose agar plates (TA). Colonies of listeria on TA were characterized as round, translucent, slight, raised with a finely textured surface, bluish-grey by the illumination and 0.3 to 1.5 mm in diameter. The species and serovars of these isolates were identified according to Bergey's Manual of Systematic Bacteriology [9]. The mouse LD₅₀ values of the isolated listeria were determined using 4-week-old SPF female BALB/c mice. *Listeria* cultured in tryptose broth at 37°C for 24 hr was inoculated into mice intraperitoneally. LD₅₀ values were calculated by the method of Litchfield and Wilcoxon [3].

All trapped rats were *Rattus rattus*. Thirteen female and 14 male rats were captured in building A, 15 female and 11 male rats in building B, respectively. Most of these rats were under 3 months of age.

Listeria was isolated from 8 (15.1%) out of 53 rats, *L.*

monocytogenes and *L. innocua* were isolated from 6 (11.3%) and 2 (3.8%) rats, respectively. The incidence of listeria from rats was not so different between building A and B (Table 1). The serovar of *L. monocytogenes* from 4 rats of building A was only 4ab. On the other hand, *L. monocytogenes* from 2 rats of building B was identified as serovar 1/2b. Serovar of *L. innocua* from the other 2 rats of building B was 6a (Table 2).

The mouse LD₅₀ values (Table 2) of *L. monocytogenes* from 4 rats of building A ranged from 10^{5.01} to 10^{5.70} and that from 2 rats of building B from 10^{6.24} to 10^{5.42}. *L. innocua* from 2 rats of building B did not kill any mice even at an inoculum of 10⁸ organisms.

In 1961, *L. monocytogenes* was isolated from 0.02% of *Rattus norvegicus* captured in Moscow [6]. Isolation of listeria from wild rats was reported infrequently in Northern Brasil [5] and Czechoslovakia [8]. In our study, *L. monocytogenes* was rarely isolated from *R. norvegicus* captured in Kantou area (unpublished data).

In Tokyo, infestation of roof rats occurs in large buildings especially in the area of restaurants and food stores of the buildings. Interestingly, *L. monocytogenes* was frequently isolated from these rats. These results suggested that roof rats may serve as one of possible source of listerial food contamination.

REFERENCES

1. Anonymous. Listeriosis outbreak associated with Mexican style cheese—California. 1985. MMWR 34: 357-359.
2. Fleming, D. W., Kochi, S. L., Macdonald, K. L. Brondum, J., Hayes, P. S., Plikaytis, B. D., Holmes, M. B., Audurier, A., Broome, C. V., and Reingold, A. L. 1985. *New Engl. J. Med.* 312: 404-407.
3. Litchfield, J. T. and Wilcoxon, F. 1949. *M. Pharmacol. Exp. Ther.* 96: 99-113.
4. Lovett, J., Francis, D. W., and Hunt, J. M. 1987. *J. Food Prot.* 50: 188-192.
5. Macchiavello, A. 1942. *Arq. Hig.* 12: 105-108.
6. Ogneva, N. S. 1961. *Zh. Mikrobiol. Epidem. Immunobiol.*

Table 1. Incidence of *Listeria* from rats

Building	<i>L. monocytogenes</i>		<i>Listeria</i>		Total	
	No. of examined	No. of positive(%)	No. of examined	No. of positive(%)	No. of examined	No. of positive(%)
A	27	4(14.8)	27	0(0.0)	27	4(14.8)
B	26	2(7.7)	26	2(7.7)	26	4(15.4)

Table 2. Species, serovars and mouse LD₅₀ values of listeria strains from rats

Building	Strain	Species	Serovar	LD ₅₀
A	S1	<i>L. monocytogenes</i>	4ab	10 ^{5.41}
	S2	<i>L. monocytogenes</i>	4ab	10 ^{5.01}
	S3	<i>L. monocytogenes</i>	4ab	10 ^{5.70}
	S4	<i>L. monocytogenes</i>	4ab	10 ^{5.15}
B	I1	<i>L. innocua</i>	6a	a) —
	I2	<i>L. innocua</i>	6a	a) —
	I3	<i>L. monocytogenes</i>	1/2b	10 ^{6.24}
	I4	<i>L. monocytogenes</i>	1/2b	10 ^{6.42}

a) No dead mice with inoculum of 10⁸ organisms.

32: 69–74.

7. Schlech, W. F., Lavigne, P. M., Bortolussi, R. A., Allen, A. C., Haldane, E. V., Wort, A. J., Hightower, A. W., Johnson, S. E., King, S. H., Nicholls, E. S., and Broome, C. V. 1983. *New Engl. J. Med* 308: 203–206.
8. Seeliger, H. P. R. 1961. pp. 60–111. *In: Listeriosis*. Karger, Basel, New York.
9. Seeliger, H. P. R. and Jones, D. 1986. pp. 1235–1245. *In: Bergey's Manual of Systematic Bacteriology*, vol. 2 (Sneath P.H.A., Mair, N. S., Sharpe, M. E., and Holt, J. G., eds.), Williams & Wilkins, Baltimore.