

パタスザルの群に発生したY.Pseudotuberculosis感染症について

誌名	日本獣医学雑誌 = The Japanese journal of veterinary science
ISSN	00215295
巻/号	364
掲載ページ	p. 351-355
発行年月	1974年8月

農林水産省 農林水産技術会議事務局筑波産学連携支援センター
Tsukuba Business-Academia Cooperation Support Center, Agriculture, Forestry and Fisheries Research Council
Secretariat



BRIEF NOTE

***Yersinia pseudotuberculosis* Infection Occurred Spontaneously
in a Group of Patas Monkeys (*Erythrocebus patas*)**

Katsuya HIRAI, Yoshitaka SUZUKI*, Naoki KATO, Kenichi YAGAMI,
Akiyoshi MIYOSHI and Yoshio MABUCHI*

Department of Veterinary Microbiology and Department of Veterinary Anatomy,
Faculty of Agriculture, Gifu University, Gifu-shi, Gifu 501*

Hideo NIGI and Haruhisa INAGAKI

*Department of Laboratory Primate Medicine, Japan Monkey Center,
Inuyama-shi, Aichi 484*

Koichi OTSUKI and Misao TSUBOKURA

*Department of Veterinary Microbiology, Faculty of Agriculture,
Tottori University, Tottori-shi, Tottori 680*

(Received for publication June 20, 1974)

Between 1964 and 1972, an acute necrotic enteritis has occurred spontaneously in a group of patas monkeys kept in an outdoor compound in the Japan Monkey Center. During the period, a total of 41 monkeys died, showing watery or hemorrhagic diarrhea. By pathological and bacteriological examinations, they were found to be suffering from pseudotuberculosis due to infection with *Yersinia pseudotuberculosis*. Many reports on pseudotuberculosis in rodents have been published. Although several outbreaks of the infection among non-human primates have been reported so far [1-3], little is known about the prevalence of the disease in them.

In this paper, the authors have described the results of clinical, pathological and bacteriological examinations on the disease.

Pathogenicity of an isolated strain of *Y. pseudotuberculosis* to patas monkeys and guinea-pigs was also investigated.

All the died animals were examined pathologically, and 3 of them were investigated bacteriologically. The organs obtained at necropsy were fixed with 10% formalin solution. The fixed materials were embedded in paraffin, and tissue sections were stained with hematoxylin and eosin. Some of them were also stained by the Gram-staining method.

Specimens (about 1g each) collected from the tissues showing gross lesions were cultured on MacConkey's agar plates. Intestinal contents or fecal materials suspended in a 1/15 M phosphate-buffered solution (pH 7.2) were incubated at 4°C for 21 days for enrichment [4, 5]. After the

短報: パタスザルの群に発生した *Y. pseudotuberculosis* 感染症について: 平井克哉・鈴木義孝・加藤直樹・八神健一・三好昭義・馬淵良生 (岐阜大学農学部家畜微生物学教室および家畜解剖学教室), 和 秀雄・稲垣晴久 (日本モンキーセンター), 大槻公一・坪倉 操 (鳥取大学農学部家畜微生物学教室)

Table 1. Distribution of deaths by year

Year	No. of deaths	Year	No. of deaths
1964	5	1969	7
1965	3	1970	4
1966	5	1971	6
1967	4	1972	3*
1968	4		

Remarks. *: *Y. pseudotuberculosis* was isolated from 3 monkeys.

Table 2. Distribution of macroscopic lesions in 41 monkeys necropsied

Small intestine	Large intestine	Liver	Spleen	Mesenteric lymph nodes
41*	41	22	30	25

Remarks. *: No. of monkeys with lesions.

enrichment, each culture was streaked on MacConkey's agar plate. All the plates were incubated at 37°C for 48 hours.

Isolated organisms were examined for their biological and biochemical properties. When *Y. pseudotuberculosis* was isolated, serotyping was done by the slide agglutination test with O-factor sera.

Virulence of an isolate to patas monkeys and guinea-pigs was examined. Two 8 month-old monkeys which were free from spontaneous infection with *Y. pseudotuberculosis* were orally administered 0.5 ml of 24 hours broth culture (10^6 cells) of the organisms. When the animals died, they were examined pathologically and bacteriologically.

All the monkeys (*E. patas*) had been maintained from birth in an outdoor compound in the Japan Monkey Center at Inuyama, Aichi. Table 1 shows the mortality over the past 9 years. It can be seen the most monkeys died in the winter, and the disease happened most frequently among monkeys, 1 to 12 months of age. The animals died within 1 to 2 days following the onset of anorexia and depression. The disease occurred only in the

colony of patas monkeys. No outbreak was observed in the other primate species kept in the same Center, though many of them were housed in cages near the colony.

Macroscopic lesions at necropsy differed from case to case, varying from extensive involvement of many organs to minimal lesions in the small and large intestines (Table 2). The lesions consisted of mucosal hyperemia, exudation of fibrin, coagulation necrosis, formation of pseudomembrane, and erosions or ulcerations of the mucosa. Microscopically, numerous masses of coccobacilli were found in or around the necrotic area (Fig. 1). In most cases, milary grayish-white patches were observed in the liver and spleen. In the liver, multiple intralobular necrotic foci were found to consist of cellular debris, emigration of variable numbers of polymorphonuclear cells, swollen endothelial cells, fibrin exudation and usually bacillary masses (Fig. 2). No granulation reaction surrounding the foci was evident. Apart from these necrotic lesions, free ovoid bacillary masses were often found in the sinusoids and interlobular tissues. In the spleen, patches were revealed as acute necrosis micro-

scopically. With almost all, a large number of coccobacillary masses were found within the foci. The lymphatic tissues differed from case to case, varying from edematous to slightly enlarged due to an increase in lymphocytes. In the mesenteric lymph nodes, moderate swelling and blood resorption were observed. They were diagnosed as simplex and purulent lymphadenitis. Necrotic foci composed of polymorphonuclear and lymphatic leucocytes, activated reticuloendothelial cells and masses of coccobacilli were common in the marginal sinus. In many cases, the lymphoid follicles appeared hyperplastic.

Yersinia organisms were isolated from intestinal contents, mesenteric lymph nodes, spleen and liver materials of 3 monkeys necropsied in November, 1972. The organisms grew rather slowly on MacConkey's agar, and formed convex, colorless, translucent and small colonies. The organisms were Gram-negative coccobacillus and showed bipolar staining and pleomorphism.

The isolates were negative in cytochrome oxidation and indol production, gas production from glucose, and positive in nitrate reduction and urease production. They displayed negative results in Voges-Proskauer (VP) reaction at 25 and 37°C. The same isolates were differentiated from *Y. enterocolitica* by the VP reaction, ornithine decarboxylation, acid formation from rhamnose, melibiose, salicin and aesculin, and the failure to form acid from sucrose, cellobiose and sorbitol. From these results, the isolates were identified as *Y. pseudotuberculosis*, and serologically, all of them were typed in serotype I-B.

To determine the virulence of the isolated strain, 2 monkeys and 3 guinea-pigs were inoculated with a strain. The

monkeys died 8 days after oral injection, showing typical hemorrhagic diarrhea as found in the spontaneous cases. At necropsy, lesions characterized by diphtheroid and necrotic enteritis, miliary grayish-white spots in the liver and spleen, slight increase of ascites, and moderate swelling and blood resorption in the mesenteric lymph nodes were observed. By histopathological examination, lesions similar to those of the spontaneous cases were observed. The guinea-pigs died 10 and 14 days after intraperitoneal injection. The circumscribed grayish-white foci, 1-5 mm in diameter, were found in the liver, spleen and lung. Histopathologically, they were purulent and necrotic nodules surrounded by granulation tissues (Fig. 3). The lesions of guinea-pigs were essentially the same as found in spontaneous infection with *Y. pseudotuberculosis* in the monkeys.

In February 1973, a total of 154 feces was collected randomly from the ground of the compound, and examined for detection of carrier-animals. *Y. pseudotuberculosis* was isolated from 8 feces of these samples. The isolates belonged to serotype I-B.

Y. pseudotuberculosis was isolated from 3 monkeys necropsied. In 38 other cases, it was assumed, on the basis of clinical, macroscopic and microscopic findings, that the organism was present. It is suggested that the disease may be disseminated among the group of monkeys via fecal-oral transmission.

Y. pseudotuberculosis is well known to affect a wide variety of avian and mammalian species, including man. From the viewpoint of public health, it is of great interest to note that typical pseudotuberculosis was spontaneously or experimentally recognized in monkeys.

Acknowledgements: We are grateful to Dr. T. Tanaka of the Department of Laboratory Primate Medicine, Japan Monkey Center, for helpful advice. We wish to thank to Dr. S. Shimakura of the Department of Veterinary Microbiology, Faculty of Agriculture, Gifu University, and to Dr. Keizaburo Itagaki of the Department of Veterinary Microbiology, Faculty of Agriculture, Tottori University, for valuable advice during the course of this work.

References

- [1] Ikegaki, R. (1936). *Saikingaku-Zasshi*, No. 483, 341-356. (in Japanese).
- [2] Katayama, N., Kishi, H., Okazaki, Y., and Ueda, T. (1969). *J. Jap. Assoc. Zool. Gard. Aqua.*, **11**, 1-4. (in Japanese).
- [3] Kawashima, K. (1934). *Gunidan-Zasshi*, No. 252, 751-816. (in Japanese).
- [4] Patterson, J. S., and Cook, R. (1963). *J. Path. Bact.*, **85**, 241-242.
- [5] Tsubokura, M., Itagaki, K., and Kiyotani, K. (1973). *Jap. J. vet. Sci.*, **35**, 33-40.

Explanation of Figures

All microphotographs are of specimens stained with hematoxylin and eosin.

Fig. 1. The small intestine of a spontaneous case. Mucosal necrosis with acute inflammatory response. A large number of bacterial masses (arrows) are seen near the surface or deep within the necrotic area. $\times 70$.

Fig. 2. The liver of a spontaneous case. An intra-lobular focus of necrosis. Masses of bacteria (arrow) are present in the upper part of the lesion. $\times 180$.

Fig. 3. The liver of a guinea-pig infected experimentally. A focus with well-grown granulation tissue around a necrotic area. $\times 100$.

