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Reference Values and Limited Serological Survey for the Iriomote Cat in Japan

Seigo Fushuku,[1,8] Nobuhiro Yasuda,[2] Mitsuharu Matsumoto,[3] Masako Izawa,[5] Teruo Doi,[6] Noriaki Sakaguchi,[7] and Masao Akuzawa,[4] [1] Center for Laboratory Animal Science, National Defense Medical College, Saitama 359-8513, Japan; [2] Laboratory of Veterinary Pathology, [3] Veterinary Anatomy, [4] Veterinary Internal Medicine, Faculty of Agriculture, Kagoshima University, Kagoshima 890-0065, Japan; [5] Laboratory of Ecology and Systematics, Faculty of Science, University of the Ryukyus, Okinawa 903-0213, Japan; [6] Laboratory of Ecological Science, Faculty of Science, Kyushu University, Fukuoka 812-8581, Japan; [7] Okinawa National Park and Wildlife Office, Ishigaki 907-0011, Japan; [8] Corresponding author (e-mail: fushuku@cc.ndmc.ac.jp).

ABSTRACT: Clinical investigations and hematological, serum biochemical, and serological surveys were carried out on 11 male and 6 female Iriomote cats (*Felis iriomotensis*) in Japan. Examined Iriomote cats were considered clinically healthy by the inspection for the general physical conditions. However, urinalysis suggested the inflammation of the urinary tract in all the cats. Antibody for feline panleukopenia virus was positive in one of the examined Iriomote cats, which suggested a previous infection.

Key words: Domestic cat, feline immunodeficiency virus, feline infectious peritonitis virus, feline leukemia virus, feline panleukopenia virus, *Felis iriomotensis,* Iriomote cat, survey.

The Iriomote cat (*Felis iriomotensis*), a special natural monument of Japan, was first found in 1965 by Yukio Togawa on Iriomote Island (24°15–25′N, 123°40–55′E), one of the Yaeyama Islands in the Okinawa prefecture of Japan. It is estimated that only 80 to 100 Iriomote cats exist at present on the island (Izawa and Doi, 1991). Also, there are many domestic cats brought from the main lands of Japan or born on the island. There is a possibility of introduction into Iriomote cats of lethal infectious diseases brought into the island by domestic cats, because some parts of habitats in these two species overlap in lowlands of the island (Izawa and Doi, 1991). To prevent the introduction of lethal infectious diseases into Iriomote cats, periodical surveys have been carried out by Environmental Agency of Japan. In 1974, the first ecological, morphological and behavioral studies were carried out. In the second survey on Iriomote cats from 1983 to 1985, no serum antibody was detected against feline immunodeficiency virus (FIV), feline leukemia virus (FeLV), feline panleukopenia virus (FPLV) and feline infectious peritonitis virus (FIPV) (Mochizuki et al., 1990; Akuzawa et al., 1995). We report the results of the clinical investigations and the serological surveys on 16 of Iriomote cats captured from September 1996 to August 1998 for the ecological survey. Seven of the domestic cats in Iriomote Island also were examined for the virus infections.

Ten adult male and one young male Iriomote cats and 6 female adults were captured using a box-caged live trap (Akuzawa et al., 1987). Three of the males including the young cat and one of the females were captured twice at intervals of 3 to 18 mo. Immediately after the capture, Iriomote cats were carried into the Iriomote Wild Life Center of the Environmental Agency of Japan (Komi, Taketomi, Okinawa, Japan). Seven domestic cats in Iriomote Island, including five wild and two reared, also were used.

Animals were immobilized by premedication with intramuscular (im) atropine sulfate (0.1 mg/kg; Atropine Sulfate Injection Tanabe, Tanabe Pharmalogicals Ltd., Osaka, Japan) and anesthetization with an im injection of a combination of medetomidine hydrochloride (5 μg/kg; Domitor, Orion Corporation, Espoo, Finland) and ketamine hydrochloride (7.5 mg/kg; Veterinary Ketalar 50, Sankyo Ltd., Tokyo, Japan). After inspection for general physical condition and measurement of body size, a blood sample was obtained from the jugular vein for clinical pathological evaluation. A urine sample was obtained by

TABLE 1. Means ± standard deviations (ranges) of hematological and serum biochemical values in Iriomote cats from Japan.

	Unit	Males (n = 15)		Females (n = 6)	
Red blood cells	$\times 10^6/\mu l$	6.85 ± 0.66	(6.01–7.94)	6.84 ± 1.18	(5.86–9.09)
White blood cells	$\times 10^3/\mu l$	17.0 ± 7.7	(5.0–32.0)	14.8 ± 5.6	(8.8–23.0)
Packed cell volume	%	37.3 ± 3.8	(31.0–42.0)	37.7 ± 5.5	(32.0–48.0)
Hemoglobin	mg/dl	12.4 ± 1.4	(10.3–14.4)	12.2 ± 1.9	(9.2–13.4)
Basophils	%	0 ± 0	(0–0)	0 ± 0	(0–0)
Eosinophils	%	2 ± 2	(0–6)	4 ± 5	(0–13)
Neutrophils	%	71 ± 15	(45–85)	56 ± 20	(32–79)
Lymphocytes	%	24 ± 14	(9–45)	31 ± 19	(15–62)
Monocytes	%	5 ± 2	(1–7)	5 ± 3	(2–8)
Total protein	g/dl	8.8 ± 1.0	(6.7–10.0)	9.1 ± 0.5	(8.6–10.0)
Albumin	g/dl	2.88 ± 0.51	(2.20–3.07)	3.07 ± 0.18	(2.94–3.37)
Globulin α1	g/dl	0.42 ± 0.11	(0.26–0.62)	0.40 ± 0.15	(0.10–0.50)
α2	g/dl	0.89 ± 0.24	(0.46–1.19)	1.01 ± 0.08	(0.94–1.15)
β	g/dl	0.78 ± 0.16	(0.57–1.10)	0.95 ± 0.20	(0.72–1.24)
γ	g/dl	3.33 ± 0.99	(1.21–4.64)	3.30 ± 0.49	(2.61–3.94)
Albumin : globulin ratio		0.57 ± 0.26	(0.34–1.25)	0.55 ± 0.07	(0.48–0.65)
Glucose	mg/dl	159.2 ± 77.7	(72.0–290.0)	167.7 ± 43.7	(110.0–241.0)
Total cholesterol	mg/dl	130.1 ± 12.7	(108.0–149.0)	154.2 ± 28.3	(123.0–200.0)
Urea nitrogen	mg/dl	26.8 ± 3.1	(22.0–31.0)	33.2 ± 6.1	(26.0–41.0)
Total bilirubin	mg/dl	0.4 ± 0.2	(0.2–0.8)	0.4 ± 0.2	(0.2–0.8)
Asparate aminotransferase	IU/L	106.0 ± 122.9	(22.0–439.0)	43.5 ± 23.5	(32.0–88.0)
Alanine aminotransferase	IU/L	55.4 ± 20.5	(18.0–86.0)	47.0 ± 25.5	(20.0–87.0)

transabdominal compression of the bladder. Atipamezole hydrochloride (25 μg/kg; Antisedan, Orion Corporation Farmos, Turku, Finland) was injected subcutaneously for recovery from anesthesia. After complete recovery, cats were released at the capture site.

Blood samples were separated into two parts, one for hematological evaluation (anticoagulated in an EDTA-2K-containing sample tube; Venoject® II-DK, Terumo, Tokyo, Japan) and the other for serum biochemical evaluation. Serum was obtained by centrifugation (3500 rpm, 15 min) of blood samples. The red blood cell count and white blood cell count were determined by light microscopy using a Thoma's haemocytometer (Benjamin, 1978; Nitirin, Tokyo, Japan). Hemoglobin concentration was estimated by an automatic cell counter (F-300, Sysmex, Kobe, Japan). The differential leukocyte count was determined by counting more than 200 white blood cells in blood smear samples stained with May-Grünwald's (May-Grünwald's Stain Solution, Nacalai Tesque, Kyoto, Japan) and Giemsa's (Giemsa's Stain Solution, Nacalai Tesque, Kyoto, Japan) solution. Packed cell volume (PCV) was determined by the microhematocrit method (Coles, 1967). Serum biochemical examination including glucose, total cholesterol, urea nitrogen, total bilirubin, aspartate aminotransferase (AST) and alanine aminotransferase (ALT) were determined by an auto analyzer (SP-4410, Kyoto Daiichi Kagaku, Kyoto, Japan). Serum protein concentration was evaluated by a refractometer, was fractionated by cellulose acetate electrophoresis, and analyzed by a densitometer (Densitron CR-20, Jookoo, Tokyo, Japan). Urinalysis was performed by a urine dipstick (BM TEST, Roche Diagnostics, Tokyo, Japan). For detection of antibody against FIV and FeLV antigen, a commercial detection kit (snap FIV/FeLV combo, IDEXX, Maine, USA) was used. Detection of antibodies against FIPV and

TABLE 2. Chemical properties of urine determined using a dipstick in Iriomote cats from Japan.

Urine parameter	Number of cats	
	Males	Females
White blood cell		
−	0	0
+	6	4
Bacteria		
−	9	4
+	0	0
pH		
5	0	0
6	6	2
7	3	2
8	0	0
9	0	0
Protein (mg/dl)		
—	0	0
30	3	2
100	5	1
500	1	1
Glucose (mg/dl)		
Normal	8	3
50	1	1
100	0	0
300	0	0
1,000	0	0
Ketone bodies		
−	6	3
+	3	1
++	0	0
+++	0	0
Urobilinogen (mg/dl)		
Normal	9	4
1	0	0
4	0	0
8	0	0
12	0	0
Bilirubin		
−	9	4
+	0	0
++	0	0
+++	0	0
Red blood cell (/μl)		
−	1	1
5–10	4	1
50	3	0
250	1	2

FPLV by hemagglutination inhibition reaction was performed by a commercial laboratory (Marupi Lifetech Co. Ltd., Osaka, Japan).

All of the captured Iriomote cats were considered clinically healthy by physical examination. Means ± standard deviations and ranges of body weight (kg) in adult males and females were 3.89 ± 0.33 (3.46–4.63) and 3.11 ± 0.10 (3.00–3.25), respectively.

Means ± standard deviations and ranges of the hematological and serum biochemical values are listed in Table 1. Absolute lymphocyte count was increased and consequently white blood cell count in each sex was increased and differential count of leukocytes was different than those in the previous report on Iriomote cat (Akuzawa et al., 1987). The range of white blood cell count was rather wide. The albumin: globulin ratio in each sex was decreased because of an absolute increase of γ-globulin compared with the previous report (Akuzawa et al., 1987). Increased values were seen in total cholesterol (200 mg/dl) and AST (439 IU/L) in a female and a male cat, respectively.

In the urinalysis (Table 2), white blood cells and protein were present, while bacteria were absent in all of Iriomote cats examined.

Serum from one of the captured Iriomote cats was FPLV antibody positive without any clinical signs of FPLV. In domestic cats, no evidence for infection with any of the four viral diseases was found.

With urinalysis, there was white blood cells, protein, and red blood cells in the urine of some Iriomote cats, despite urinary bacteria being negative. Probably those cats suffered from nonbacterial inflammation of the urinary tract. *Capillaria felis-cati*, a parasite that infects the urinary bladder of domestic cats, has been reported in Iriomote cats (Yasuda et al., 1994; Akuzawa et al., 1995, 1996) and may cause vasodilatation or blood extravasation (Wilson-Hansen and Prescott, 1982).

Antibody against FPLV was found in

one of the Iriomote cats. The FPLV antibody positive cat was assumed to represent recovery from the previous infection because characteristic signs of FPLV infection such as diarrhea or leukopenia was not seen. The FPLV was assumed to have been introduced into Iriomote Island by infected domestic cats because antibody to FPLV was not detected in Iriomote cats in investigations from 1983 to 1985 (Mochizuki et al., 1990). However, lethal viral disease is still a possibility in Iriomote cats and continuous monitoring is essential to prevent this.

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