BRIEF NOTE

**Individual Difference Within the Cat Blood Group
Detected by Isohemagglutinin**

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Immunological and biochemical studies on genetic markers of antigen on the red cell membrane and glucose-6-phosphate dehydrogenase in the red cell enzymes of cats have already been reported by many researchers [3-5]. This report deals with isohemagglutinin and isoantigen observed in the serum and on the red cell membrane of cats bred and reared in Japan. The rate at which isohemagglutinin and isoantigen were detected was lower in this experiment than those reported by other researchers [2, 4]. The results obtained are summarized as follows.

Immunological tests were carried out by the methods described by Campbell et al. [1]. Venous blood samples were collected from 207 cats. Serum was separated by centrifugation at 3,000 rpm for 10 minutes and stored in 0.1% (w/v) sodium azide at 5°C. Red cells were washed three times and made to a 2% suspension in physiological saline solution.

Isohemagglutinin: The cross-hemagglutination test was performed by the saline

method. Isohemagglutinin was detected in 2 (0.97%) of 207 cat sera tested. The antibody concerned was tentatively designated anti-Ca. The titer of isohemagglutinin against isoantigen was 1:2. In the absorption test, isohemagglutinin was readily absorbed by red cells of positive (Ca) type, but not at all by red cells of negative (ca) type. The agglutinin activity was reduced after treatment by heating and with 2-mercaptoethanol. By gel-filtration chromatography on DEAE cellulose column, the isohemagglutinin activity was detected in the IgM fraction. These results indicated that isohemagglutinin was contained in IgM globulin. Handa et al. [2] and Yamakawa et al. [6] found that N-glycolylneuraminic acid (NGN) was the N-terminal residue (NeuNGc-8NeuNGc-2-3Gal 1-4Glc-Cer) of carbohydrate released from the cat red blood cell membrane. Therefore, the inhibition test was performed with NGN hematoside. As a results, the isohemagglutinin activity was fairly inhibited by 4 µg/ml of NGN hematoside.

Table 1. Phenotype and gene frequencies of Ca blood group on red blood cell of cats

Phenotype	Number		Gene frequency
	observed	expected	
Ca type	20 (9.7%)	20.18	Ca : 0.05
ca type	187 (90.3%)	186.82	ca : 0.95
Total	207 (100.0%)	207.00	1.00

On the basis of Hardy-Weinberg equilibrium with gene frequencies.
 Ca : 0.05 and ca : 0.95, $X^2=0.00893$, $0.95>P>0.90$.

Isoantigen: The phenotype and gene frequencies estimated are shown in Table 1. Isoantigen was observed on red cells from 20 (9.7%) of the 207 cats tested; that is, 20 blood samples of the 207 were positive (agglutinated) and designated Ca type tentatively. The other 187 (90.3%) blood samples were negative (not agglutinated) and designated ca type tentatively. In this manner the were classified into two blood types. If the gene controlling Ca antigen is an autosomal dominant one, the gene frequencies of *Ca* and *ca* in the cats may be estimated at 0.05 and 0.95, respectively. There is a good agreement between the observed and expected numbers of cats with the two phenotypes, on the assumption that there is a Hardy-Weinberg equilibrium ($X^2=0.00893$, $0.95>P>0.90$). This isoantigen was a genetic marker and also found in the red blood cells of infants.

In conclusion, the existence of isohemagglutinin in the serum of the suggested that

the compatibility test might be necessary in the evaluation of blood transfusion or transplantation in veterinary clinical and medical experiments.

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References

- [1] Campbell, D. H., Gremer, V. E., and Sussdorf, D. H. (1964). *In* Method in Immunology. W.A. Benjamin, New York, 65-165.
- [2] Handa, N., and Handa, S. (1964). *Jpn. J. Exp. Med.* 35, 331.
- [3] Holmes, R. (1950). *J. Physiol.* 111, 61.
- [4] Ikemoto, S., Maekawa, H., Matsumoto, A., Hamana, T., Mukoyama, H., and Watanabe, Y. (1966). *J. Vet. Med. (Tokyo)* 428, 849-851.
- [5] Thuline, H. C., Morrow, C., Norby, D. S., and Motulsky, A. G. (1967). *Science* 3787, 431-432.
- [6] Yamakawa, T. (1978). *Gakujutsu Geppo* 31, 431-418.

要 約

同種血球凝集素によって検出される猫の血液型抗原について（短報）：池本卯典・桜井幸男（自治医科大学法医学教室，東京農業大学総合研究所），福井正信（筑波大学医学専門群基礎医学系）——日本産の猫の血清と赤血球との交差試験により，IgM クラスの同種血球凝集素（抗 Ca）を見出した．この血液型系を仮に Ca 式血液型と呼称することにし，凝集される血球を Ca 型，凝集されない血球を ca 型とした．207 例の主として日本産雑種猫について調査した抗 Ca 凝集素の検出頻度は 5.80%（12例）であった．また，表現型の出現頻度は，Ca 型 9.7%（20 例），ca 型 90.3%（187 例）であった．なお，常染色体性優性遺伝子に支配されると仮定して求めた遺伝子頻度は，Ca が 0.05，ca が 0.95 であった．