

Distribution of Feline Blood Types Detected in the Copenhagen Area of Denmark

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Jensen, A. L., A. B. Olesen and J. Arnbjerg: Distribution of feline blood types detected in the Copenhagen area of Denmark. Acta vet. scand., 1994, 35, 121-124. – The purpose of the present study was to make the first survey of the distribution of feline AB blood types in the Copenhagen area of Denmark. A total of 244 cats (139 purebred cats and 105 Domestic Shorthair cats) were tested. 93% of all tested cats had blood type A. Neither an AB nor an O type cat was detected and thus, the frequency of blood type B among all tested cats was 7%. Most type B cats were purebred cats (Birman, British Shorthair and Persian cats). No association between sex and blood type could be demonstrated among British Shorthair and Persian cats. Thus, the present study indicates that cats in Denmark predominantly have blood type A, and that blood type B cats are rare, except for certain breeds such as Birman and British Shorthair cats.

blood groups; cat; transfusion; neonatal isoerythrolysis; fading kitten syndrome.

Introduction

In the feline AB Blood Group System, 3 blood types (i.e., A, B, and AB) have currently been recognized (Bell 1983, Giger, 1992). Also, it has been proposed that the feline blood types A and B are due to the action of 2 alleles at the same gene locus and that A is completely dominant over B (Giger *et al.* 1991). Accordingly, cats with blood type B are homozygous for the B allele (genotype B/B), while cats with blood type A are either homozygous for the A allele (genotype A/A) or heterozygous (genotype A/B). The appearance of cats with the extremely rare blood type phenotypically expressed as AB has not yet been fully explained (Giger *et al.* 1991, Giger 1992), though they were experimentally produced by matings of type AB to other type AB cats or to cats with blood type B (Bell 1983).

In cats, alloantibodies against the other blood type are naturally occurring in their plasma, most pronounced in cats with blood type B (Auer & Bell 1983, Giger 1992, Haarer & Grünbaum 1993). Because of this, cats with blood type B are more likely to suffer haemolytic incompatibility reactions during transfusion of blood with the other blood type than cats with blood type A, even if the cat has not received any blood transfusion previously (Auer & Bell 1983, Giger *et al.* 1989, Haarer & Grünbaum 1993). In addition, feline neonatal isoerythrolysis due to AB incompatibility, a situation comparable to the Rhesus factor-induced haemolytic disease of the newborn in humans, is now considered an important cause of the fading kitten syndrome (Giger *et al.* 1989, Cain & Suzuki 1985, Giger *et al.* 1991, Giger 1992, Haarer & Grünbaum 1993). Hence, the distribution and frequency of the

feline blood types (Auer & Bell 1981, Giger et al. 1989, Giger et al. 1991, Giger 1992, Haarer & Grünbaum 1993) and the biochemical nature of the antigens that determine the feline AB blood group system (Griot-Wenk et al. 1993) have been investigated with increasing interest.

In Denmark, information on the feline blood types were not available and thus, the purpose of this study was to make the first survey of the distribution of feline AB blood types in Denmark.

Materials and methods

Sample collection and testing

A total of 244 cats living in the Copenhagen area were included in the study. Approximately half of the cats were Domestic Shorthair cats (43%) (Table 1), while the other half consisted of purebred cats of various breeds, mostly Persian, British Shorthair, and Abyssinian cats. The domestic shorthair cats were all selected from patients presented at the Small Animal Hospital, Department of Clinical Studies. The pure-breed cats were presented by owners who had volunteered to have their cats tested.

0.3-2.0 ml of blood was collected by venepuncture into Vacutainers® (Beckton-Dickinson) containing 0.12 ml of 0.34 mol/L tripotassium ethylene diaminetetraacetate (EDTA). The blood samples were kept at +4°C for a maximum of 3 days. Blood typing was performed essentially as described by Auer & Bell (1981) and Giger et al. (1989) using antisera (anti-A and anti-B) kindly provided by Dr. U. Giger, University of Pennsylvania, Pennsylvania, U.S.A. Briefly, 0.1 ml of whole blood was suspended in 0.9 ml of polyphosphate buffered physiologic saline (0.9% NaCl). Subsequently, 25 µl of the erythrocyte suspension was added to 50 µl of either anti-A or anti-B sera and the mixture was gently shaken and

incubated at room temperature for 15 min. Then, the mixture was centrifuged (1000×g for 15 sec) and agglutination was recorded as either positive or negative by visual inspection.

Results

The blood type could be determined in all of the 244 cats included in the survey. The results of the blood typing are given in Table 1. Neither cats with blood type 0 (i.e. no agglutination when incubated with either anti-A or anti-B sera) nor cats with blood type AB (i.e. agglutination with both anti-A and anti-B sera) were detected. Among the purebred cats, blood type B was detected only in Birman, British Shorthair and Persian cats. In Birman cats, 3 out of 5 tested cats had blood type B, while the frequency of blood type B in British Shorthair and Persian cats was 33.3% and 3.6%, respectively. Of the British Shorthair cats, 8 females and 2 males had blood type B, while blood type A was encountered in 11 females and 9 males. In the Persian cats, 18 males and 36 females had blood type A, while blood type B was detected only in 2 females. A significant association between sex and blood type could not be detected by the use of the Fisher exact test and a significance level of 0.05, neither among British Shorthair cats nor among Persian cats.

Discussion

The present study estimates the distribution of blood types in various cat breeds in the Copenhagen area of Denmark. Thus, it is not known whether the observed distribution also reflects the general distribution of feline blood types in Denmark.

The distribution of feline blood types varies in different countries, the lowest frequency of blood type A (73%) being found in Australia (Auer & Bell 1981). However, the distribution

Table 1. Distribution of blood types in various cat breeds as obtained in the Copenhagen area of Denmark.

Breed	Total number of cats	Blood type A number	(%)	Blood type B number	(%)
Abyssinian	20	20	(100)	0	(0)
Birman	5	2	(40)	3	(60)
British Shorthair	30	20	(66.7)	10	(33.3)
Burmese	9	9	(100)	0	(0)
Europée	1	1	(100)	0	(0)
Exotic Shorthair	1	1	(100)	0	(0)
Maine Coon	3	3	(100)	0	(0)
Norwegian Forest	2	2	(100)	0	(0)
Persian	56	54	(96.4)	2	(3.6)
Siamese	3	3	(100)	0	(0)
Somali	9	9	(100)	0	(0)
All purebred cats	139	124	(89.2)	15	(10.8)
Domestic shorthair	105	103	(98.1)	2	(1.9)
All tested cats	244	227	(93.0)	17	(7.0)

of blood types among the various cat breeds as determined in this study is largely comparable to the distribution of blood types found in other countries (*Giger et al.* 1989, *Giger et al.* 1991, *Giger* 1992, *Haarer & Grünbaum* 1993). The main discrepancy is the frequency of blood type B in Birman cats, which is 60.0% in this study and 17.6% in the study of *Giger et al.* (1991). The reason for this discrepancy is most likely the low number of Birman cats in this study. The present study demonstrates that blood type B is commonly occurring in British Shorthair cats. This is in accordance with previous reports, which, beside the British Shorthair cats, also indicate that blood type B is frequently occurring in other breeds such as Cornish Rex and Devon Rex cats (*Giger et al.* 1991, *Giger* 1992, *Haarer & Grünbaum* 1993). Thus, British Shorthair, Cornish Rex and Devon Rex cats may have a higher risk of haemolytic incompatibility reactions and neonatal isoerythrolysis compared to other cat breeds. Besides the associ-

ation between breed and blood type, a significant association between sex and blood type has been reported by *Haarer & Grünbaum* (1993), who found that blood type A was more common in male cats than in female cats. This was, however, not detected in the present study, perhaps because of the limited number of animals available for such a comparison.

To conclude, the present study indicates that cats in Denmark predominantly have blood type A, and that blood type B cats are rare, except for certain breeds such as Birman and British Shorthair cats.

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References

- Auer L, Bell K*: The AB blood group system of cats. *Anim. Blood Groups Biochem. Genet.* 1981, *12*, 287-297.

- Auer L, Bell K*: Transfusion reactions in cats due to AB blood group incompatibility. *Res. Vet. Sci.* 1983, 35, 145-152.
- Bell K*: The blood groups of domestic animals. In: Agar N S, Board P G. (Eds): *Red blood cells of domestic animals*, Elsevier, Amsterdam 1983, p. 133-164.
- Cann GR, Suzuki Y*: Presumptive neonatal isoerythrolysis in cats. *JAVMA* 1985, 187, 46-48.
- Giger U, Kulran CG, Filippich LJ, Bell K*: Frequencies of feline blood groups in the United States. *JAVMA* 1989, 195, 1230-1232.
- Giger U, Bucheler J, Patterson DF*: Frequency and inheritance of A and B blood types in feline breeds of the United States. *J. Heredity* 1991, 82, 15-20.
- Giger U*: The feline AB blood group system and incompatibility reactions. In: Kirk R W, Bonagura J D. (Eds): *Kirk's Current Veterinary Therapy XI, Small Animal Practice*, W.B. Saunders Company, Philadelphia 1992, p. 470-474.
- Grot-Wenk M, Pahlsson P, Chusholm-Chau A, Spitalnik PF, Spitalnik SL, Giger U*: Biochemical characterization of the feline AB blood group system. *Animal Genetics* 1993, 24, 401-407.
- Haarer M, Grunbaum EG*: Blutgruppenserologische Untersuchungen bei Katzen in Deutschland.

(Serological investigations of blood groups in cats in Germany). *Kleintierpraxis* 1993, 38, 195-204.

Sammendrag

Blodtyper hos katte i Københavnsområdet

Denne undersøgelse beskriver for første gang forekomsten af blodtyperne A og B blandt forskellige katteracer i Hovedstadsområdet i Danmark. 139 racekatte og 105 almindelige huskatte, alle fra Københavns området, inkluderedes i undersøgelsen. Der fandtes ingen katte med blodtype AB eller blodtype O. Blodtype A var den hyppigst forekommende (93% blandt alle 244 undersøgte katte). Blodtype B forekom især hos racekatte og især hos Birma, British Shorthair og Perserkatte. Hos almindelige huskatte var hyppigheden af blodtype B 1,9%. Der kunne ikke påvises nogen sammenhæng mellem køn og blodtype hos hverken British Shorthair eller Perserkatte. Undersøgelsen indikerer således, at blodtype A er den hyppigst forekommende blodtype hos katte i Hovedstadsområdet i Danmark, medens katte med blodtype B, bortset fra Birma og British Shorthair katte, er sjældne.

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