

Blood groups in cats in the city of Zagreb

Tugomir Karadjole¹, Irina Kovačević², Marko Samardžija¹,
Tomislav Babić³, Mario Kreszinger³, Berislav Radišić³, Ivica Harapin⁴,
and Ljiljana Bedrica^{4*}

¹*Clinic of Obstetrics and Reproduction, Faculty of Veterinary Medicine University of Zagreb, Zagreb, Croatia*

²*Veterinary practice, Zagreb*

³*Clinic of Surgery, Orthopaedics and Ophthalmology, Faculty of Veterinary Medicine University of Zagreb, Zagreb, Croatia*

⁴*Clinic for Internal Diseases, Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia*

KARADJOLE, T., I. KOVAČEVIĆ, M. SAMARDŽIJA, T. BABIĆ, M. KRESZINGER, B. RADIŠIĆ, I. HARAPIN, L.J. BEDRICA: Blood groups in cats in the city of Zagreb. Vet. arhiv 86, 209-216, 2016.

ABSTRACT

The frequency of blood groups was researched in domestic non-pedigree cats and some pedigree cats in the City of Zagreb. The research comprised 30 domestic non-pedigree cats and 15 pedigree cats, of which 10 were British shorthair cats and 5 Persian cats. Of the 30 domestic non-pedigree cats, 29 of them (96.66 %) had blood group A. Only one cat (3.33 %) had blood group AB. Blood group B is extremely rare, and was found in only one of the 10 British shorthair cats. The remaining British shorthair cats had blood group A. All five Persian cats tested had blood group A. The frequency of blood groups in domestic non-pedigree cats and in British shorthair and Persian cats is very similar to the frequency of these breeds in the rest of the world.

Key words: blood groups, domestic cats, British cats, Persian cats

Introduction

Apart from neonatal isoerythrolysis, prenatal loss of kittens is also mentioned as a specific problem. That is to say, according to some data, when a cat mates with a male with a mismatched blood group, miscarriage may occur in the 6th to 8th week of pregnancy and/or the foetuses are resorbed in early pregnancy (CASAL et al., 1996). This phenomenon has not been sufficiently researched as yet, but it is possible that in some

*Corresponding author:

Prof. dr. sc. Ljiljana Bedrica, Clinic for Internal Diseases, Faculty of Veterinary Medicine, University in Zagreb, Croatia, Heinzelova 55, 10000 Zagreb, Croatia Phone: + 385 1 2390 340; Fax: + 385 1 2441 390; E-mail: bedrica@vef.hr

cases the alloantibodies may pass through the placenta and cause the prenatal death of the kittens with a mismatched blood group. There are some ways to prevent neonatal erythrolysis. One is to avoid mismatched mating with a cat with blood group B. Another way is to separate the kittens from their mother for the first day after birth (GIGER and AKOL, 1990).

The blood groups of cats are divided into the so-called AB system. There are three blood groups: A, B and AB, and they are defined according to the presence of one of two antigens (A and B), that is, specific carbohydrates linked to the membrane lipids and proteins on the surface of the erythrocytes (ETTINGER and FELDMAN, 2000). Group A is absolutely dominant over group B (GIGER and BUCHELER, 1991). Blood group AB in cats is very rare and is not, as it is in people, the result of inheritance of factor A from one and factor B from the other parent. According to some research it is presumed that a special allele is responsible for the occurrence of blood group AB, located at the same gene site as the genes for blood groups A and B (GRIOT-WENK and GIGER, 1995). The frequency of individual blood groups differs between breeds, and differences have also been noticed within a breed, depending on the geographical origin of a breeding line. Of 4000 domestic short-hair and long-hair cats in the United States, almost all (98.2 %) had blood group A, 1.7 % blood group B and only 0.1 % blood group AB (AUGUST, 1994). It is well known that in the populations of some pedigree cats the frequency of blood group B varies between 10 and 50 % (for example in the population of Devon Rex cats, the frequency of blood group B is about 45 %, and all the Siamese, American short-hair, Oriental short-hair and Burmese cats tested so far have had group A) (AUGUST, 1994).

Blood group AB occurs very rarely, but it has so far been found in domestic short-hair, Abyssinian, Norwegian Forest, Persian, British short-hair, Scottish and Somali cats (AUER and BELL, 1981; GRIOT-WENK and GIGER, 1991). It is interesting that in Bengal cats the frequency of blood group AB is significantly higher. According to some authors, this may be explained by cross-breeding with Asian wild cats (GIGER and AKOL, 1990). In 100 Bengal cats in the UK, GUNN-MOORE et al. (2009) found blood group A in 98 cats, and group B in one and group AB in one cat. ARIKAN and AKKAN (2004) tested the blood groups of 78 cats of the Turkish Van breed and found blood group B in as many as 57.7 %, whilst 42.3 % had blood group A. No cats had blood group AB. GURKAN et al. (2005) tested 312 domestic cats in Turkey and found that 227 had blood group A, 78 group B and seven group AB. ARIKAN et al. (2006) also tested for blood groups in 301 non-pedigree domestic cats in Turkey. They found a high percentage of blood group B in domestic cats. The frequency differed greatly between the cats who lived in the west and those in the east of Turkey. FORCADA et al. (2007) tested the blood groups of 51 pedigree and 105 non-pedigree cats in the UK. Of the 51 pedigree cats, 42 of them had blood group A, seven blood group B and two group AB. Of the 105 non-pedigree cats, 71 of

them had blood group A, 32 blood group B and two group AB. JENSEN et al. (1994) were the first to determine the blood groups of cats in the area of Copenhagen in Denmark. They tested a total of 244 cats, 139 pedigree and 105 domestic short-hair cats. A total of 93 % of the cats had blood group A, 7 % blood group B. No cats had blood group AB. Group B was found in pedigree cats: British short-hair, Burmese and Persian cats. There was no connection found between sex and blood groups in British shorthair and Persian cats. This study established that most cats in Denmark had blood group A and that blood group B was extremely rare, except in some breeds of pedigree cats, such as Burmese and British shorhair cats. The frequency of blood groups in 100 cats in Hungary was determined by BAGDI et al. (2001). Apart from domestic shorthair cats, which are most numerous in Hungary, research was undertaken on crossbred Persian, Abyssinian, Siamese, and British short-hair cats. All European domestic short-hair cats, and crossed Persian, Abyssinian, Siamese and British shorthair cats had blood group A (100 %).

No one has determined the blood groups in cats in Croatia but blood groups in Croatian indigenous breeds of dogs have been determined (ŽIVČIĆ et al., 2013; GRAČNER et al., 2011; ŽUBČIĆ et al., 2008; GRAČNER et al., 2007)

Materials and methods

The research included 45 cats. Thirty of them were domestic cats from the wider area of the City of Zagreb. At the same time, blood groups were established in 10 British shorthair and 5 Persian cats at the request of owners for mating purposes.

All the cats had blood samples taken from their *v. cephalica antibrachii* using «vacutainer» equipment, with a test tube with EDTA anticoagulant. The blood samples, on the same day they were taken, were subjected to definition of blood group by means of the serological test Rapidvet®-H (Feline, dms/agrolabo products ag Neuhausen - am - Rheinfall, Switzerland).

On the test cards (Fig. 1) three different blood groups are visible. On the first card, blood group A was established, on the second blood group B and on the third blood group AB.

Results

The research comprised 30 domestic non-pedigree cats and 15 pedigree cats, of which 10 were British shorthair and 5 Persian cats, from the wider Zagreb area. Blood was taken from all the cats to establish their blood group using Rapidvet®-H (Feline) test cards (Fig. 1).

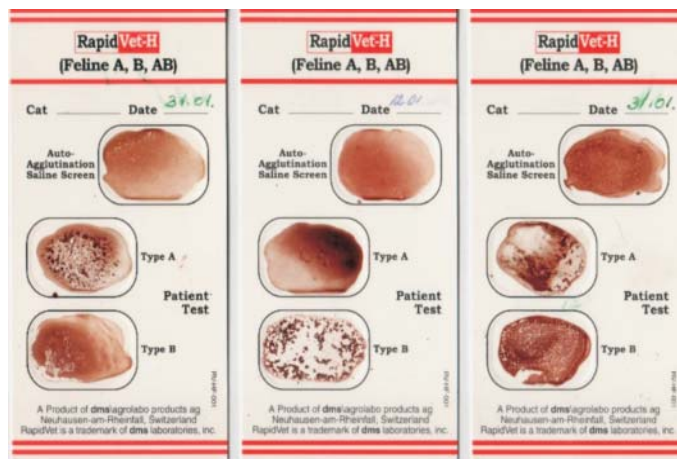


Fig. 1. Test Card with blood groups established in our study (A, B and AB)

Of the 30 domestic cats, 15 were male and 15 female. The cats were of various ages, from 1 to 15 years. Of the 30 domestic cats, 29 of them (96.66 %) had blood group A. Only one cat (3.33 %) had blood group AB (Table 1).

Table 1. Gender, age and blood groups of investigated cats

Domestic non-pedigree cats	Male	Female
n	14	16
Gender (year)	1.5-9.8	2-15
Blood group A	14	15
Blood group B	0	0
Blood group AB	0	1
British shorthair		
n	1	9
Gender (year)	3.3	1.3-10
Blood group A	0	9
Blood group B	1	0
Blood group AB	0	0
Persian		
n	0	5
Gender (year)	-	2.3-6.5
Blood group A	-	5

Of the British shorthair cats in the research, 9 were female and 1 was a male. Nine cats (90 %) had blood group A. Only one cat (10 %) had blood group AB (Table 1).

Of five Persian cats in the study, all were females aged from 2.3 to 6.5 years. All the cats (100 %) had blood group A (Table 1)

Discussion

Our results are very similar to the results of most other authors who have researched the frequency of blood groups in domestic cats in different geographical areas. So for instance, AUGUST (1994) established that of 4000 domestic short-hair and long-hair cats in the United States, almost all (98.2 %) have blood group A, 1.7 % blood group B and only 0.1 % blood group AB.

Blood group AB occurs very rarely (AUER and BELL, 1981; GRIOT-WENK and GIGER, 1995) but it has so far been found in domestic short-hair, Abyssinian, Norwegian Forest, Persian, British short-hair, Scottish and Somali cats. GRIOT-WENK and GIGER (1991) also established that blood group AB is exceptionally rare in cats in the United States of America and Canada. It was found in only 0.14 % cats.

MEDEIROS et al. (2008) established the frequency of blood groups in cats in the area of Rio de Janeiro. Most of the cats (94.8 %) had blood group A. They concluded that a large percentage of domestic cats in Rio de Janeiro, as in other countries, have blood group A.

MALIK et al. (2005) determined blood groups over 12 years in 187 domestic cats in the area of Sydney. In 62 % of cats they found blood group A, in 36 % group B and in only 1.6 % group AB.

In Switzerland, HUBLER et al. (1993) found blood group A in 99.6 % of cats and group B in 0.4 % cats. No cats had blood group AB. ARIKAN et al. (2006) tested for blood groups in non-pedigree domestic cats in Turkey. They found a high percentage of blood group B in domestic cats. The frequency differed greatly between the cats who lived in the west and those living in the east of Turkey.

The frequency of blood groups in domestic non-pedigree cats in Hungary was determined by BAGDI et al. (2001). Apart from domestic non-pedigree cats, which are most numerous in Hungary, research was undertaken on cross bred Persian, Abyssinian, Siamese, and British short-hair cats. All European domestic short-hair cats, and crossed Persian, Abyssinian, Siamese and British cats had blood group A (100 %). Blood group B is very rare and was found in 1/3 of pedigree Persian cats, whilst blood group AB was not found in a single cat. This is very similar to our results, since in our research blood group B was only found in one British shorthair cat.

GIGER et al. (1991) suggest that the frequency of blood group B is a sign of “old” breeds and the influence of breeders in selecting desirable characteristics.

JENSEN et al. (1994) were the first to find the blood groups of cats in the area of Copenhagen in Denmark. A total of 93 % of the cats had blood group A, 7 % blood group B. No cats had blood group AB. Group B was found in pedigree cats - the British shorthair, Burmese and Persian cats. There was no connection found between the sex and the blood group in British shorthair and Persian cats. This study established that most cats in Denmark had blood group A and that blood group B was extremely rare, except in some breeds of pedigree cats, such as Burmese and British shorhair cats.

In our research we did not find a link between sex and blood group in domestic non-pedigree, British shorthair and Persian cats. This research shows the low level of domestic non-pedigree cats with blood group B in Croatia. Most (96.66 %) of the investigated domestic cats in Croatia have blood group A. Only 3.33 % of the cats had blood group AB. Blood group B in our examination was found in only one of 10 British cats. Of the five Persian cats tested, none had blood group B, all had blood group A. The frequency of blood groups in domestic cats and in British and Persian cats in the City of Zagreb was very similar to the frequency of these breeds in the rest of the world.

Since the research was undertaken on a small number of cats (30), we cannot, like HUBLER et al (1993) conclude that the risk of reaction from incompatibility during blood transfusions is minimal in our domestic cats. In the U.S.A, Australia and most European countries, domestic non-pedigree cats have the significantly more common blood type A, as in our study. Despite the fact that it is a small sample, we can say that the blood group A is the most common in domestic cats in all countries of the world.

References

- ARIKAN, S., H. A. AKKAN (2004): Titres of naturally occurring alloantibodies against feline blood group antigens in Turkish Van cats. *J. Small Anim. Pract.* 45, 289-292.
- ARIKAN, S., M. GURKAN, E. OZAYTEKIN, T. DODURKA, U. GIGER (2006): Frequencies of blood type A, B and AB in non-pedigree domestic cats in Turkey. *J. Small Anim. Pract.* 47, 10-13.
- AUER, L., K. BELL (1981): The AB blood groups in cats. *Anim. Genetics* 12, 287-297.
- AUGUST, J. R. (1994): Consultations in Feline Internal Medicine, W. B. Saunders Company, pp. 525-532.
- BAGDI, N., M. MAGDUS, E. LEIDINGER, J. LEIDINGER, K. VOROS (2001): Frequencies of feline blood types in Hungary. *Acta Vet. Hung.* 49, 369-375.
- CASAL, M. L., P. F. JEZYK, U. GIGER (1996): Transfer of colostral antibodies from the queen to the kitten. *Am. J. Vet. Res.* 57, 1653-1658.

- ETTINGER, S. J., E. C. FELDMAN (2000): *Veterinary Internal Medicine*. W. B. Saunders Company, pp. 348-356.
- FORCADA, Y., J. GUITIAN, G. GIBSON (2007): Frequencies of feline blood types at a referral hospital in the south east of England. *J. Small Anim. Pract.* 48, 570-573.
- GIGER, U., K. G. AKOL (1990): Acute transfusion hemolytic reaction in an Abyssinian cat with blood type B. *J. Vet. Intern. Med.* 4., 315-316.
- GIGER, U., J. BUCHELER, D. F. PATERSON (1991): Frequency and inheritance of A and B blood types in feline breeds of the United States. *J. Hered.* 82, 15 -20.
- GIGER, U., J. BUCHELER (1991): Transfusion of type A and type B blood to cats. *J. Am. Vet. Med. Assoc.* 198, 411-418.
- GRAČNER, D., LJ. BEDRICA, D. POTOČNJAK, D. SAKAR, M. SAMARDŽIJA, H. CAPAK, G. GREGURIĆ GRAČNER (2011): Blood groups and haematology indicators in Croatian indigenous breeds of dog. II Dalmatian dog. *Vet. arhiv* 81, 111-117.
- GRAČNER, D., LJ. BEDRICA, Č. LABURA, D. MATIČIĆ, G. GREGURIĆ GRAČNER, M. SAMARDŽIJA (2007): Blood groups and haematology in Istrian pointers. *Vet. arhiv* 77, 95-102.
- GRIOT-WENK, M. E., U. GIGER (1991): Cats with type AB blood in United States. *J. Vet. Intern. Med.* 2, p. 139.
- GRIOT-WENK, M. E., U. GIGER (1995): Feline transfusion medicine. Blood types and their clinical importance. *Vet. Clin. North. Am. Small Anim. Pract.* 25, 1305-1322.
- GUNN-MOORE, D. A., K. E. SIMPSON, M. J. DAY (2009): Blood types in Bengal cats in the UK. *J. Feline Med. Surg.* 11, 826-828.
- GURKAN, M., S. ARIKAN, S. OZAYTEKIN, T. DODURKA (2005): Titres of alloantibodies against A and B blood types in non-pedigree domestic cats in Turkey: assessing the trasfusion reaction risk. *J. Feline Med. Surg.* 75, 301-305.
- HUBLER, M., S. ARNOLD, M. CASAL, A. FAIRBURN, M. NUSSBAUMER, P. RUSCH (1993): The blood group distribution in domestic cats in Switzerland, Schweiz. Arch. Tierheilk. 135, 231-235.
- JENSEN, A. L., A. B. OLESEN, J. ARNBJERG (1994): Distribution of feline blood types detected in the Copenhagen area of Denmark. *Acta Vet. Scand.* 35, 121-124.
- MALIK, R., D. L. GRIFFIN, J. D. WHITE, M. ROZMANEC, P. L. TISDALL, S. F. FOSTER, K. BELL, F. W. NICHOLAS (2005): The prevalence of feline A/B blood types in the Sydney region. *Aust. Vet. J.* 83, 38-44.
- MEDEIROS, M. A., A. M. SOARES, D. S. ALVIANO, R. EJZEMBERF, M. H. Da SILVA, N. R. ALMOSNY (2008): Frequencies of feline blood types in the Rio de Janeiro area of Brazil. *Vet. Clin. Pathol.* 37, 272-276.
- ŽIVČIĆ, V., LJ. BEDRICA, M. ŠPERANDA, D. GRAČNER, I. BOŠKOVIĆ, T. FLORIJAČIĆ, M. ĐIDARA (2013): Prevalence of DEA 1.1. blood group in Croatian indigenous breeds of dog: Posavaz Hound and Tornjak Hound. *Vet. arhiv* 83, 633-638.

T. Karadjole et al.: Blood groups in cats

ŽUBČIĆ, D., LJ. BEDRICA, D. GRAČNER, I. HARAPIN, M. FURY, J. JEREMIĆ (2008): Blood groups, haematology and clinicochemical indicators in indigenous breeds of dog. I. Croatian sheepdog. *Vet. arhiv* 78, 141-147.

Received: 10 October 2014

Accepted: 10 December 2015

KARADJOLE, T., I. KOVAČEVIĆ, M. SAMARDŽIJA, T. BABIĆ, M. KRESZINGER, B. RADIŠIĆ, I. HARAPIN, LJ. BEDRICA: Krvne grupe mačaka na području grada Zagreba. *Vet. arhiv* 86, 209-216, 2016.

SAŽETAK

Istraživane su krvne grupe u domaćih i nekih čistokrvnih mačaka na području grada Zagreba. U istraživanje je bilo uključeno 30 domaćih i 15 čistokrvnih mačaka, 10 britanskih i 5 perzijskih. Od 30 domaćih mačaka, njih 29 (96,66 %) imalo je krvnu grupu A. Samo jedna domaća mačka (3,33 %) imala je krvnu grupu AB. Krvna grupa B je izuzetno rijetka, nađena je samo u jedne od 10 britanskih mačaka. Preostale britanske mačke imale su krvnu grupu A. Svih 5 pretraženih perzijskih mačaka imale su krvnu grupu A. Učestalost krvnih grupa u domaćih mačaka te britanskih i perzijskih vrlo je slična učestalosti krvnih grupa u ovih pasmina mačaka drugdje u svijetu.

Ključne riječi: krvne grupe, domaće mačke, britanske mačke, perzijske mačke
