AMERICAN KENNEL CLUB®

Understanding Your AKC® Profile

Thank you for participating in the AKC DNA Profile Program. Enclosed is an AKC Letter of DNA Analysis containing the AKC Profile for the dog listed. The information below is intended to help you understand, interpret, and apply the results you have received. Please note - the genotype for your dog does not verify his/her parentage. Parentage is only verified by comparing the DNA profiles for the sire, dam and pup.

The enclosed DNA Profile shows the SuperPlex-G panel of DNA markers. A gender marker has been included to provide a quality assurance check on the results (GEN). This gender marker will show as XY for a male and XX for a female.

AKC DNA Profiles (**genotypes**) are generated using the same technology used by law enforcement agencies throughout the world. How does this work? In humans and dogs alike, each **gene** is present as two copies called **alleles** (displayed as letters below). Offspring receive one copy of each gene from each parent in a random process. This genotyping technology does not use actual genes, but other DNA sequences referred to as **markers**, that are also inherited one copy from each parent. Because markers are not functional genes, the AKC DNA Profile does not provide any information about the conformation of the dog, the presence/absence of genetic diseases, or any information about the breed of a dog. AKC DNA Profiles are used solely for genetic identity and parentage verification purposes.

Using Genotypes for Genetic Identification and Parentage Verification – An Example

Marker:	**PEZ 01**	**PEZ 03**	**PEZ 05**	**PEZ 06**	**PEZ 08**	**PEZ 12**	**PEZ 20**	**UCB 2010**	**UCB 2054**	**UCB 2079**	**PEZ 16**	**PEZ 17**	**PEZ 21**	**GEN**
Sire Genotype =	BE	FG	BC	HH	EE	HH	GI	BB	CD	AA	AG	CD	BK	XY
Dam Genotype =	BF	DG	BC	DG	EE	GG	II	BB	CD	AB	DE	AB	EF	XX
Pup 1 Genotype =	EF	DG	CC	DH	EE	GH	GI	BB	CD	AB	AE	AD	BF	XY
Pup 2 Genotype =	BF	DG	BB	DH	EE	GH	GI	BB	CD	AA	AE	BC	BE	XX
Pup 3 Genotype =	**CD**	**BE**	BB	**DD**	EE	**CH**	GI	BB	CD	AA	**CD**	AC	**AB**	XX

Glossary

Genotype: genetic constitution or makeup; **Gene**: the basic unit of heredity made of DNA; **Allele:** different forms of a gene. Each parent contributes one allele for each gene pair; **Marker**: a stretch of DNA that is not a gene, but is inherited the same way as a gene; Markers are labeled as PEZ01, PEZ03, etc., above and on the DNA Profile.

Unique identification: If we look at the genotype of the sire at PEZ01 (BE) and the dam at PEZ01 (BF), we see that they share the B allele, and the second allele of this marker is different (E for the sire, F for the dam). We can continue this to PEZ03, where the sire has FG, and the dam, DG. Again, they share the G allele, but the sire has an F, and the dam, a D. At PEZ05, they have the same alleles. Considering the remaining eleven pairs of markers, we see three more are the same (PEZ08, UCB2010, and UCB2054), but, the dogs have different genotypes. The genotype is unique like a fingerprint, and the chance of genotypes matching is less than one in a million.

An empty marker: Occasionally, the information at one marker on the profile will be empty. This means that the genotype at that marker could not be determined. It does not imply anything negative about your dog. The remaining markers provide enough information to establish identity and determine parentage for the vast majority of cases.

Gender: The last marker in the AKC DNA Profile (labeled GEN) tests for a gene on each sex chromosome. Males will show XY and females will show XX for these markers. These gender markers provide an added level of quality control to the DNA Profile process. The same principles of inheritance work with the gender marker exactly the way they do with the other tested markers. The dam contributes an X marker/chromosome to the offspring, and the sire contributes either an X or Y.

Parentage verification: At the first marker, the sire can contribute either a B or E to each pup, and the dam can contribute either a B or F. Pup 1 has EF (E from the sire, F from the dam). Pup 2 has BF (B from the sire, F from the dam). Pup 3 has CD, neither of which are present for the sire or the dam. When an allele from the sire or dam does not match with the pup, this is called an exclusion. If we continue this analysis across all fourteen markers, we see that the alleles for pups 1 and 2 are consistent with them being the offspring of the sire and dam (they are *included*). Pup 3, however, is *excluded* at six markers (underlined in the chart), showing that this pup cannot be the offspring of the sire and dam tested. In some instances, a pup will have an exclusion at only one marker. A single marker exclusion may be the result of a mutation event and, from a statistical standpoint, does not provide sufficient evidence to conclusively rule out parentage. Parentage of a sire/dam is considered excluded when the alleles at **two or more** markers are excluded.

Genotype Analysis Table

Use this table to compare the genotypes of your dogs. You will see that each dog is unique, and you will be able to analyze parentage. Simply write in the letters of your dog's genotype in the order in which they appear on the DNA Profile, as shown in the example below. Then compare the results for each pair of markers. At each marker for a pup, the sire contributes one allele (letter), and the dam contributes one allele (letter). Therefore, the pup should have one allele or the other from the sire and the dam.

Example

PEZ01	PEZ03	PEZ05	PEZ06	PEZ08	PEZ12	PEZ20	UCB2010	UCB2054	UCB2079	PEZ16	PEZ17	PEZ21	GEN
B C	**B J**	**B C**	**A C**	**F Z**	**C D**	**E E**	**N Q**	**I K**	**D F**	**A G**	**C E**	**B B**	**X Y**
Sire													
Dam													
Pup													
Pup													
Pup													
Pup													

If you would like the AKC to evaluate the parentage of a dog or litter for you, we offer a **Parentage Evaluation Service**. Based on AKC DNA Profiles, a DNA Analyst will examine the profiles of sire, dam and pups and issue an evaluation of the parentage. The cost is $40 per litter. This fee does not include the processing cost of DNA Profiles.

AKC DNA Operations
PO Box 900065, Raleigh, NC 27675-9065
e-mail: dna@akc.org • phone: (919) 816-3508 • fax: (919) 816-4255
www.akc.org

