

GENETIC TESTING FOR PLN-ASSOCIATED VARIANT GENES



UNDERSTANDING BREEDING COMBINATIONS: A BREEDERS' TOOL



October 2015

The purpose of this tool is to assist breeders in understanding what will be the results of particular breeding combinations. *This tool does **not** contain any recommendations about breeding nor explanations about the meaning of the results or the research behind the test.*

The final page is for those interested in understanding more about the difference between probabilities for individual puppies vs. the litter as a whole.

For those wanting to learn more about the test, the research, or the impact of a particular DNA status, please visit the SCWTCA DNA Testing page at <http://www.scwtca.org/health/dnatest.htm> for additional resources.



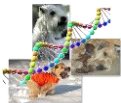
Understanding Breeding Combinations

Select your dog's status below to start.

- [My dog is a homozygous negative](#)
- [My dog is a heterozygote](#)
- [My dog is a homozygous positive](#)

A note about terminology – since introduction of the test, breeders have adopted different ways of describing results. While we will use the language above in this tool, below is a chart mapping out some of the different terms you may hear.

	Definition	Test Results from Penn	Other Common Terms
Homozygous Negative	A dog <u>without any</u> of the variant alleles	1/1	<ul style="list-style-type: none">• 0• 0,0• No copies• “Normal”• “Clear”
Heterozygote	A dog <u>with one copy</u> of the variant alleles	1/2	<ul style="list-style-type: none">• 1• 0,1• “Carrier”• 1 copy
Homozygous Positive	A dog <u>with two copies</u> of the variant alleles	2/2	<ul style="list-style-type: none">• 2• 1,1• 2 or both copies





My dog is a Homozygous Negative

Find the DNA status of the mate and read across to understand the results of breeding your Homozygous Negative to him/her:

The potential mate is a....	Each puppy....	Litter Composition
Homozygous Negative	Will be a Homozygous Negative	All puppies will be Homozygous Negative
Heterozygote	Has a <ul style="list-style-type: none">• 50% chance of being Heterozygote and• 50% chance of being Homozygous Negative	<ul style="list-style-type: none">• <i>The litter could be ANY combination</i> of Heterozygous and/or Homozygous Negative puppies. All puppies could be Heterozygote, all puppies could be Homozygous Negative, or the litter could be any combination of the two.• However, no puppies can be Homozygous Positive
Homozygous Positive	Will be a Heterozygote	All puppies will be Heterozygotes





My dog is a Heterozygote

Find the DNA status of the mate and read across to understand the results of breeding your Heterozygote to him/her:

The potential mate is a....	Each puppy has a....	Litter Composition
Homozygous Negative	<ul style="list-style-type: none">• 50% chance of being Heterozygote• 50% chance of being Homozygous Negative	<ul style="list-style-type: none">• <i>The litter could be ANY combination</i> of Heterozygous and/or Homozygous Negative puppies. All puppies could be Heterozygote, all puppies could be Homozygous Negative, or the litter could be any combination of the two.• However, no puppies can be Homozygous Positive
Heterozygote	<ul style="list-style-type: none">• 25% chance of being Homozygous Negative• 50% chance of being Heterozygote• 25% chance of being Homozygous Positive	<p><i>The litter could be ANY combination</i> of Homozygous Normal, Heterozygous and/or Homozygous Positive puppies. All puppies could be Heterozygote, all puppies could be Homozygous Positive, all puppies could be Homozygous Negative or the litter could be any combination of the three.</p>
Homozygous Positive	<ul style="list-style-type: none">• 50% chance of being Heterozygote• 50% chance of being Homozygous Positive	<ul style="list-style-type: none">• <i>The litter could be ANY combination</i> of Heterozygous and/or Homozygous Positive puppies. All puppies could be Heterozygote, all puppies could be Homozygous Positive, or the litter could be any combination of the two.• However, no puppies can be Homozygous Negative





My dog is a Homozygous Positive

Find the DNA status of the mate and read across to understand the results of breeding your Homozygous Positive to him/her:

The potential mate is a....	Each puppy....	Litter Composition
Homozygous Negative	Will be a Heterozygote	All puppies will be Heterozygotes
Heterozygote	Has a <ul style="list-style-type: none">• 50% chance of being Heterozygote• 50% chance of being Homozygous Positive	<ul style="list-style-type: none">• <i>The litter could be ANY combination of Heterozygous and/or Homozygous Positive puppies. All puppies could be Heterozygote, all puppies could be Homozygous Positive, or the litter could be any combination of the two.</i>• However, no puppies can be Homozygous Negative
Homozygous Positive	Will be a Homozygous Positive	All puppies will be Homozygous Positives





A word about probabilities

Sorting out the difference between a puppy's chance to have a specific DNA status and what will be in your litter can be confusing. Here's an easy demonstration you can do:

1. Take out a coin...it's got two sides, heads and tails. You know that if you flip that coin, there's a 50% chance it'll be heads and a 50% chance it'll be tails.
 2. Now, flip it 6 times. You probably didn't get 3 heads and 3 tails...you may have gotten 2 and 4 or 5 and 1 or all one or the other. (*Mathematically speaking, you had a 31.25% chance of getting 3 and 3*)*
- The reason for this result is that each coin toss is **an independent event**...the result of the second toss has nothing to do with the result of the first.
 - **Each puppy's** DNA is based on getting one gene from mom and one from dad...and that is **independent** of what happens to every other puppy in the litter. That means each puppy is like flipping the coin in step 1 above,
 - However, **a litter** is like flipping the coin 6 times in step 2. That is why we show two separate columns: one for each puppy's possible result and one for the litter as a whole.

*An explanation of the calculations can be found here: <http://www.dummies.com/how-to/content/how-to-determine-probable-outcomes-with-coins-and-.html>

