

Dermatomyositis (DMS) Learning Exercises

Many questions contain links where one can try to find the answers before viewing the answer document which can be found at: <https://www.americanshetlandsheepdogassociation.org/wp-content/uploads/2019/02/DMS-Learning-Exercise-Answers-w-new-OFA-website.pdf>

Exercise #1:

You have a bitch with the following genotype, *DLA-DRB1 002:01/002:01 aabb*. You don't have to worry about knowing the genotype of any stud you might consider for her because all of her pups will have low risk genotypes no matter the genotype of the stud. TRUE or FALSE?

Go to the following webpage, <http://americanshetlandsheepdogassociation.org/dermatomyositis/>, to find the answer either by using the "Genotype Calculator" or by clicking on the Punnett square link.

Exercise # 2:

You have a beautiful bitch with the following genotype, *002:01/023:01 AaBb*. Which of the following statement(s) is/are true? You can find answers by going to: <http://americanshetlandsheepdogassociation.org/dermatomyositis/>.

- a. *DLA-DRB1*002:01*, A, and B are risk alleles for DMS.
- b. Since this is a moderate risk genotype, you should not breed her!
- c. This is a low risk genotype and you can breed her to any stud with a low risk genotype and not be concerned about producing pups with dermatomyositis.
- d. She has the *DLA-DRB1*023:01* allele which is desirable!

Exercise # 3:

You have a bitch with *002:01/002:01 Aabb* genotype (low risk) and would like to breed her to a male with *002:01/023:01 AaBb* (also low risk). What are the possible genotypes of the offspring and associated risk assessments?

Go to <http://americanshetlandsheepdogassociation.org/dermatomyositis/>, to find the answer either by using the "Genotype Calculator" or by clicking on the Punnett square link.

Exercise #4:

You have a bitch that has had several previous litters with no DMS affected pups. Unfortunately, in her most recent litter of 4, 2 of the pups were affected with DMS. Which of the following are TRUE?

- a) Obviously, this is the fault of the stud. Never touch him or any of his offspring again!
- b) Not only should the DMS affected pups be spayed/castrated, the normal appearing littermates should be sterilized also.
- c) Your bitch, like most Shelties, has some risk alleles for DMS. It is likely that the studs used in the earlier breedings had genotypes that when combined with that of your bitch resulted in each pup inheriting a low risk genotype.
- d) You should have your bitch tested and urge the stud dog owner to do the same. Both the sire and dam had risk alleles and crossing those two genotypes resulted in each pup having the chance of inheriting low, moderate, or high risk genotypes.

DMS Exercise # 5:

This exercise may not be as much “fun” as the others, but it is intended to encourage you to try to understand how risk assessments were developed. Below is a portion of Table 3 from the scientific article by the Evans et.al. [1] You can access a larger version at:

<http://americanshetlandsheepdogassociation.org/dermatomyositis/> . DO NOT BE INTIMIDATED!

In the table, C = *DLA-DRB1*002:01*, lower-case letter “c” represents any alternate allele of *DLA-DRB1* such as *DRB1*023:01* or *DRB1*015:01*. Cases = dogs with confirmed dermatomyositis. Controls = normal dogs. Penetrance = % of dogs with a particular genotype that were affected.

Using the Table below:

- a. How many Shelties had the genotype aabbCC (which is seen on individual dog reports as 002:01/002:01 aabb) and how many of those developed DMS?
- b. For Shelties, which was the most common genotype in which NO cases of DMS were reported?
- c. What percent of Shelties with AABBCc or AABBCc genotypes developed DMS?
- d. What was the risk assessment for dogs with the aabbcc genotype?
Remember, cc = 023:01/023:01, 015:01/015:01, or 015:01/023:01.

I'll admit that my eyes glazed over the 1st time I looked at this table and had to "whip" my brain into submission. ☺

The results for Collies and Shelties were pooled together to develop risk assessments.

Genotype	Collies		Shetland sheepdogs		Penetrance (%)	Risk*
	Cases (n = 40)	Controls (n = 185)	Cases (n = 92)	Controls (n = 205)		
<i>aabbcc</i>	0	1	0	1	-	-
<i>aabbCc</i>	0	5	0	18	-	low
<i>aabbCC</i>	1	43	1	17	-	low
<i>Aabbcc</i>	0	0	0	3	-	-
<i>AabbCc</i>	0	3	1	15	-	low
<i>AabbCC</i>	2	71	2	23	-	low
<i>aaBbcc</i>	0	0	0	5	-	low
<i>aaBbCc</i>	0	1	0	21	-	low
<i>aaBbCC</i>	0	10	0	32	-	low
<i>AaBbcc</i>	0	0	0	1	-	-
<i>AaBbCc</i>	0	0	0	14	-	low
<i>AaBbCC</i>	0	13	2	23	-	low
<i>AAbbcc</i>	1	0	0	0	-	-
<i>AAbbCc</i>	4	6	1	1	42	moderate
<i>AAbbCC</i>	15	31	7	3	39	moderate
<i>aaBBcc</i>	0	0	0	1	-	-
<i>aaBBCc</i>	0	0	0	6	-	low
<i>aaBBCC</i>	0	0	6	7	46	moderate
<i>AaBBcc</i>	0	0	2	1	-	-
<i>AaBBCc</i>	0	0	5	5	50	moderate
<i>AaBBCC</i>	3	0	23	3	90	high
<i>AABbcc</i>	0	0	3	0	-	-
<i>AABbCc</i>	0	0	2	4	33	moderate
<i>AABbCC</i>	11	1	11	1	92	high
<i>AABBcc</i>	0	0	0	0	-	-
<i>AABBcC</i>	0	0	7	0	100	high
<i>AABBCC</i>	3	0	19	0	100	high

Significant values in bold.

*Risk interpretations were only made for three-locus genotypes observed at least five times.

DMS Exercise # 6:

You have a gorgeous stud dog with the following genotype: *DLA-DRB1 002:01/015:01* aaBB. He was bred several times before you knew his genotype. So far, no puppies have shown any signs of DMS, and several have championship points! Now, how do you handle future requests for stud service?

- a. Inform bitch owners of your dog's genotype and let them decide whether or not to use your dog. After all, his genotype is low risk.
- b. Inform the bitch owners of your dog's genotype and point out that the *DLA-DRB1 015:01** is quite uncommon in the breed, and it is important to maintain that allele and increase its frequency within the breed.
- c. Insist that all bitches bred to your stud be genotyped for DMS and that only bitches with low risk genotypes be bred to him.
- d. To ensure that only puppies with low risk genotypes be sired by your dog, you will insist that only bitches with the following genotypes be bred to him: aabb, Aabb, AAbb. (Hint: check the Punnett squares for aaBB genotype at:
<http://americanshetlandsheepdogassociation.org/dermatomyositis-dna-test/> .

* The *DLA-DRB1 015:01** allele was found primarily in Shelties from Europe, not the USA.

DMS Exercise # 7: This is a series of questions.

- a) I have always used the acronym DM when talking about dermatomyositis, but I now see DMS being used. What's the difference?
- b) My dog's certificate from Clemson for dermatomyositis lists the DLA as 003:01/009:01; however, these numbers are not mentioned in previous test questions nor in the ASSA website. Why?
- c) I submitted dermatomyositis test results to OFA, but they were not accepted. Why?
- d) In the "risk interpretation" section of the DMS section of the ASSA website, what is meant by homozygous or heterozygous *DLA-DRB1*002:01*?

DMS Exercise # 8:

Why do some DMS-affected dogs develop lesions as young dogs while others may not develop lesions until later? (Hint: The likely answer can be found in the Summary document at <http://americanshetlandsheepdogassociation.org/wp-content/uploads/2016/07/DMS-article-summary.pdf>).

DMS Exercise #9:

You have a beautiful, young dog with the following genotype: *DLA-DRB1*002:01/002:01* AaBB. This dog is exactly what you have been trying to get for years. He has won multiple specialties and finished quickly. Quite simply, he is exceptional. He had a bit of hair loss below one eye that you thought was the result of a scuffle with a kennel mate, but the hair has grown back. What is his risk for developing DMS? How can this dog be used in a breeding program?

DMS Exercise #10:

How many Shetland Sheepdog DMS test results have been entered into the OFA database?

This exercise is for those who have never used the search functions of the OFA website. Go to the OFA homepage: <http://www.ofa.org/>. In the upper right corner is an orange box as shown in Figure 1. Click on the “Advanced Search” button. On the next page that appears, select “Shetland Sheepdog” from the breed list (Figure 2) then scroll down to the “Report Type” section (Figure 3) and scroll down until you find “Dermatomyositis” and highlight that. A list of all possible genotypes will appear below. To see the total number of Sheltie DMS test results, do not click on any genotype. Just hit the “Begin Search” button at the bottom of the page.

Figure 1

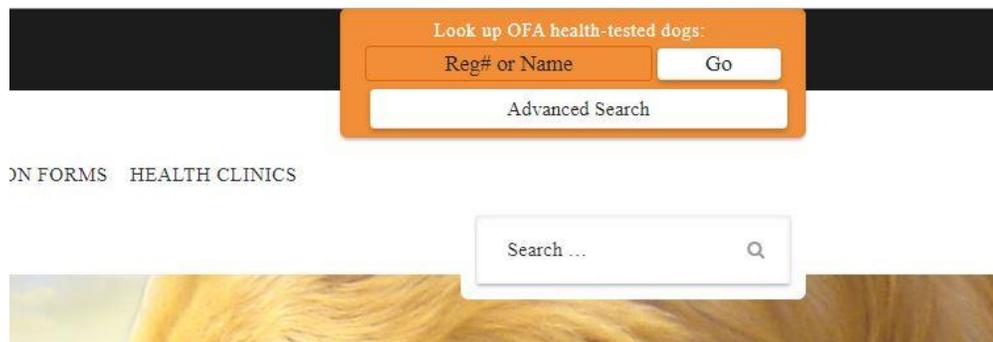


Figure 2

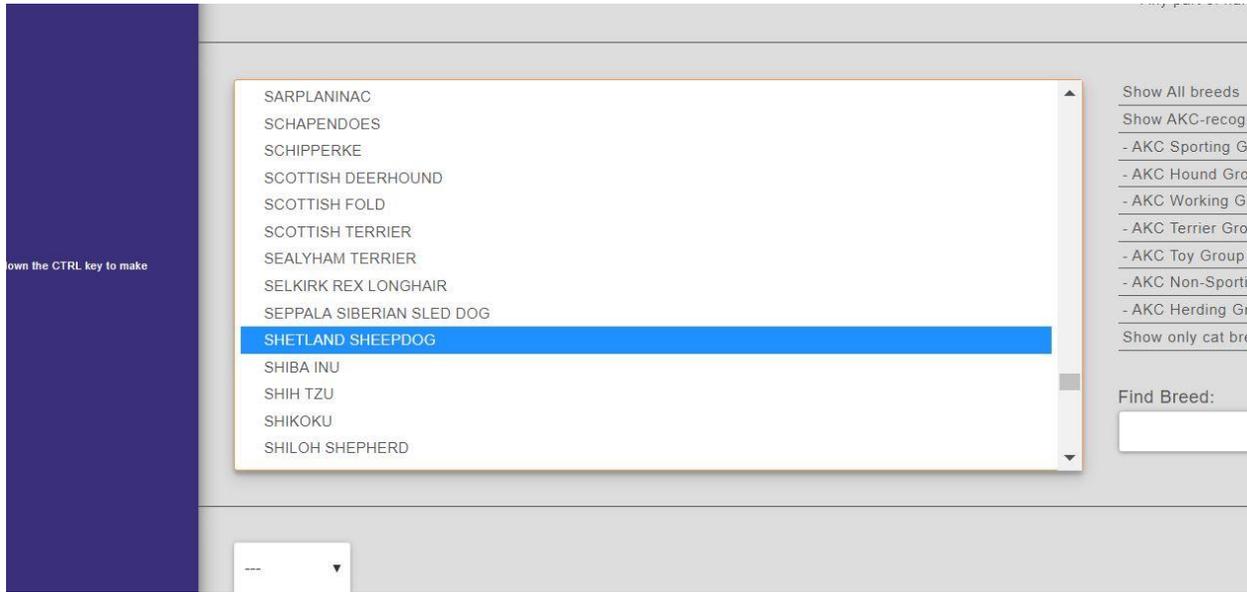
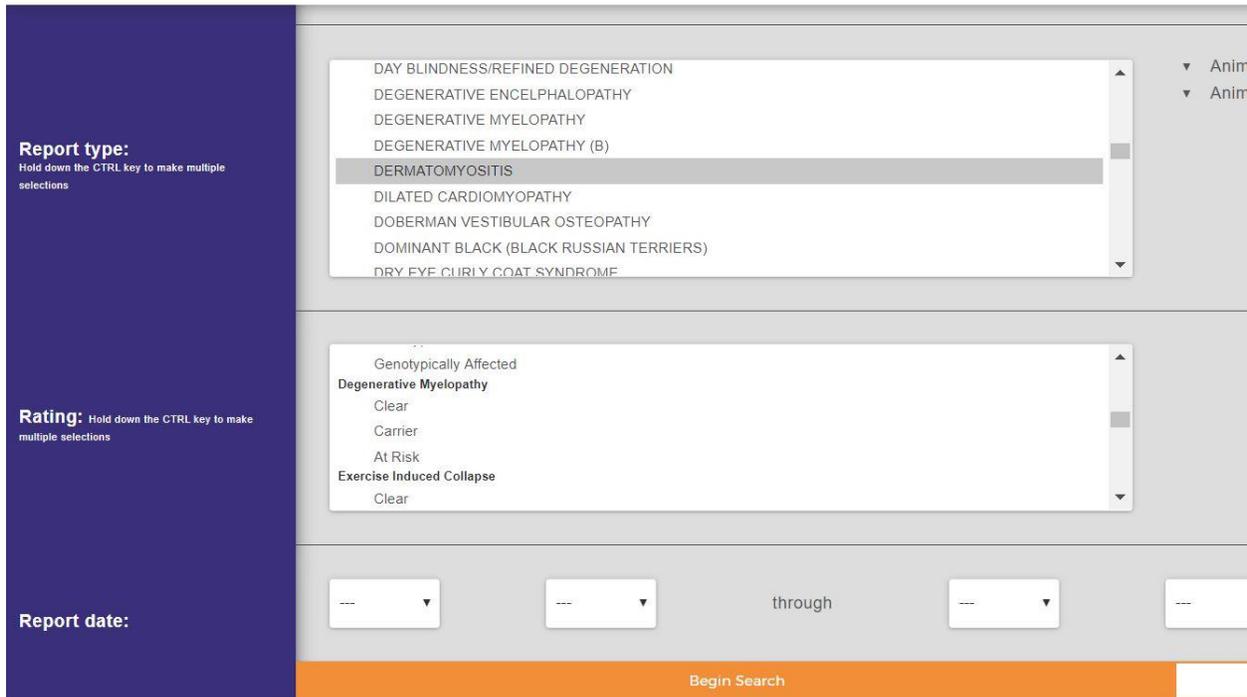


Figure 3



There are several ways to use the search functions of the OFA database. If you know the registered name or number of a particular dog you are interested in, just enter that information in the orange box

on the home page and click "Go". If you want to find Shelties that have had certain tests done, you can go to the "Advanced Search" page and enter the breed, sex (if you only want to see males or females) and select the desired tests. If you want to view tests done on dogs with a certain kennel name, you can enter the kennel name in the "Part of Name" section toward the top of the page.

As DMS testing becomes more commonplace and results are reported to OFA, a person looking for a stud with a particular genotype could find a list of such dogs there. For instance, if you have a bitch with AaBb genotype and want to breed her to a male with aabb, so all pups would have low risk genotypes, you could find males with that genotype by using the search function by limiting the search to males and selecting each of the possible aabb genotype (002:01/002:01 aabb. 002:01/006:01 aabb, etc.).

There are 80+ possible genotypes that can be searched.

DMS Exercise #11:

You have a dog with the following genotype, *DLA-DRB1* 002:01/002:01 AaBB*. Neither the sire nor dam of this dog have been DNA tested for DMS. What, if anything, can you surmise about the genotype of the parents?

DMS Exercise #12:

You test your new puppy that you hope to use as a stud. His genotype is *002:01/023:01 AAbb*, a moderate risk genotype. (42% of the dogs in the study with this genotype developed DMS.) Which of the following is/are true?

- a) This result tells you little about his likelihood for developing DMS. He may, or may not, develop DMS.
- b) You should find a pet home for this puppy and not use it in your breeding program.
- c) You now know that you should select mates that do not carry A in their genotype.

DMS Exercise #13:

Which of the following have been reported as preceding the initial outbreak of DMS and so are likely "triggers" for disease development?

- a) Parvovirus infection.
- b) Being returned to the breeder by the adoptive family after several years.
- c) Rattlesnake vaccinations.
- d) Cross-country road trip to a dog show.
- e) Severe owner neglect (i.e., long hours in a crate; unsanitary conditions).
- f) Bee stings.