Agriculture

EXTENSION
UtahStateUniversity

extension.usu.edu

May 2016 AG/Sheep/2016-01pr

DNA Testing of Junior Livestock Show Lambs

Kevin Heaton, Extension Faculty, ***Joshua Dallin,*** Extension Faculty**,** and ***Kelby Howard,*** Extension Intern

Junior livestock projects provide excellent opportunities for youth to gain education and new experiences. Recent advancements in genetic testing have allowed for commercialization and widespread use of genetic testing for production traits and diseases. Youth livestock programs can benefit from the knowledge and application of genetic testing. Genetic testing is beneficial to both producers and youth because it provides them with accurate knowledge of their animals' potential on an individual basis, as well as, for breeding and future generations.

Figure 1. Tissue Sampling Applicator.

Genetic Evaluation

Tissue samples were collected from 77 individual lambs that were entered into junior livestock shows in Garfield and Kane Counties. These lambs represented a subsample of approximate 50% of lambs in the Garfield and Kane County Shows. An Allflex tissue sampling applicator (Figure 1) was used to extract DNA samples from the ear of animals being tested (Figure 2). The Allflex tissue sampler is an effective method of extracting tissue samples from the animals with low risk of cross contamination. The tissue samples were refrigerated until they were sent to Geneseek Laboratories to be tested for Ovine Progressive Pneumonia Virus Susceptibility, Spider Lamb, and Ovine Scrapie Susceptibility. A total of $3,234 ($42/lamb) was spent on DNA testing. By understanding the effects of sheep genetic diseases, youth can relate to the importance of genetic analysis.

Figure 2. Extracting Tissue Sample from a Lamb.

Genetic Mutation: Ovine Progressive Pneumonia Susceptibility

Ovine Progressive Pneumonia (OPP) is a viral disease common to sheep in North America. The virus may cause any of the following signs: severe and progressive weight loss, pneumonia, paralysis, swollen joints, and palpably hard, unproductive udders (Wolf, 1). OPP susceptibility is determined by the TMEM154 gene which contains different forms of haplotypes, the most common of which are haplotypes 1, 2 and 3. A lamb inherits one haplotype from each parent which creates a diplotype. Research at the U.S. Meat Animal Research Center (USMARC) has shown that sheep with diplotypes 1,2 - 1,3 - 2,2 - 2,3 - 3,3 are almost three times more likely to be infected with the OPP virus than sheep with diplotype 1,1. Therefore, any sheep that have diplotypes with a "2" or a "3" are at the greatest risk for infection" (Geneseek). Some other haplotypes exist, such as haplotype 4, but they are less common and therefore require further research to determine whether

the haplotype 4 is recommended for OPP resistance. Sheep with diplotypes “4,4” have, however, remained free of OPP even with a lifetime of exposure, according to USMARC studies.

Genetic Mutations: Spider Lamb Syndrome

Spider Lamb is a genetically inherited disorder which causes skeletal deformities in young sheep. It has been proven to be a semi lethal disease. Structural phenotypical abnormalities include facial defects, humped or twisted spines, abnormally long legs, bent or splayed legs, etc. “The problem, which seemed to have been first observed in the early 1970s, became a topic of serious concern to breeders in the early and middle 1980s. Many of the most popular bloodlines in the Suffolk and Hampshire breeds seemingly carried this damaging gene (Moore, Limesand, & Berg, 1998).

Genetic Mutation: Scrapie Susceptibility

Similar to Mad-Cow disease, scrapie is a fatal degenerative disease found in sheep and affects the central nervous system. Symptoms of the disease may include behavioral changes, tremors, scratching and rubbing against fixed objects, pruritus, loss of coordination that leads to recumbency and death. Susceptibility to scrapie is determined by the codon 171. Each parent contributes one allele to the codon 171. There are only two possible alleles which are R (dominant) and Q (recessive). Lambs that contain at least one R allele are resistant to scrapie; however, if a lamb contains two Q alleles it can be susceptible to scrapie if exposed. When selecting breeding animals, youth should select animals that are resistant to scrapie, thus reducing the chances of being infected and eliminating the genetic defect from passing to future offspring.

Results

Genetic testing of show lambs in southern Utah identified genetic mutations that individual producers should be concerned with. Ovine Progressive Pneumonia was the most prevalent genetic mutation with 36 of the 77 lambs having the diplotypes 1,2 or 2,2 (Table 1) which makes them susceptible to OPP.

Table 1. The number of lambs susceptible to Ovine Progressive Pneumonia virus in southern Utah show lambs.

Diplotype	Garfield	Kane
1,1 – Low risk	19	13
1,2 – High risk	18	9
1,4 – Low risk	2	3
2,2 – High risk	8	2
2,4 – High risk	2	0
4,4 – Extremely low risk	0	1

At one time Spider Lamb Syndrome was a very prevalent mutation. Today, it lingers on due to its recessive nature. Of the 77 lambs tested only one was a carrier for Spider Lamb Syndrome and none were affected (Table 2).

Table 2. The number of lambs carrying the Spider Lamb genetic mutation in southern Utah show lambs.

Spider Lamb Mutation	Garfield	Kane
Free	49	27
Carriers	0	1

The last decade, the sheep industry has focused on eliminating scrapies and scrapie susceptible animals. Surprisingly, scrapies was more prevalent than believed and should continue to be a focus in future years. Of the 77 lambs, four lambs tested susceptible to scrapie, while the remaining 73 tested resistant (Table 3).

Table 3. The number of lambs susceptible to scrapie in southern Utah show lambs.		
Gene Code	Garfield	Kane
RR -- Free	33	10
RQ -- Carrier	15	15
QQ – Susceptible	1	3

Conclusion

Producers should know which animals in a flock are carriers of the disease so that they can avoid using them as breeding stock and subsequently reduce the number of affected lambs. Youth participating in livestock programs should know if their animal(s) has a genetic defect which potentially could affect its breeding potential. Youth should also understand that a recessive carrier market lamb will have the same consumer value as a non-carrier.

References

Heaton, M., & Leymaster, K. (2012). *USDA Agriculture Research Service*. Retrieved from Research on genetic susceptibility to ovine progressve pneumonia at the USDA Meat Animal Research Center (USMARC), Clay Center, Nebraska: http://www.ars.usda.gov/SP2UserFiles/Place/30400000/OPP%20Handout.pdf

Moore, B., Limesand, W., & Berg, P. (1998). *The test for spider lamb syndrome gene in sheep.* North Dakota State University.

Spider Lamb Syndrome. (2016). Retrieved from UC Davis Veterinary Medicine: https://www.vgl.ucdavis.edu/services/SpiderLamb.php

Wolf, C. (2010). *OPP Concerned Sheep Breeders Society.* Retrieved from http://www.oppsociety.org/About_OPP_files/OPP_General_Fact_Sheet.pdf