

1. USU Extension Grant -- Final Report 2015-2016

2. Title:

Integrating a Traditional 4-H Youth Program with Science, Technology, Engineering and Mathematics (STEM) Programming

3. Project Leader:

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4. Project Duration:

Project will begin June 1, 2015 and will finish by March 30, 2016

5. Amount Requested/Amount Used:

\$10,000.00/\$9,624.75

6. Project Objectives:

This project objectives were to evaluate production traits and/or diseases through genetic analysis on junior livestock projects in Garfield /Kane Counties, to develop life skills and knowledge in 4-H youth about genetic diseases and analysis, and to provide outreach via the internet, fact sheets and presentations of the project results.

7. Project Results:

Junior livestock projects provide excellent opportunities for education and positive agricultural experiences for youth. As genetic testing advances become widely available to livestock producers, youth benefit by learning about the benefits and applications of genetic testing. This project evaluated the DNA of 77 lambs, 35 hogs and 29 steers.

Lamb results:

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 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 \$3,234.00 (\$42.00/lamb) was spent on DNA testing. By understanding the effects of sheep genetic diseases, youth can relate to the importance of genetic analysis. 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

Within 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 of livestock selection. 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

Hog results:

Tissue samples were collected from 35 hogs that were entered into the Garfield and Kane county junior livestock shows. The tissue samples were collected from the ear of each animal using an Allflex tissue sampling applicator (Figures 1, 2 and 3). The samples collected were sent to Geneseek to be tested for Porcine Stress Syndrome, Rendement Napole (RN), and Seek-Gain Total: Litter Size, Meat Quality, Growth and Feed Efficiency. A total of \$2,975.00 (\$85.00/hog)

was spent on testing. After the results were received from Geneseek, each individual that participated in the show received a copy of the results for their individual animals.

Porcine Stress Syndrome

Porcine stress syndrome (PSS) is an inherited neuromuscular disorder in pigs that is triggered by stressful situations, such as exercise, fighting, marketing, vaccination, castration, parturition, hot weather, etc. The symptoms exhibited by pigs experiencing PSS include muscle and tail tremors, labored and irregular breathing, blanching and reddening of the skin, rapid rise in body temperature, collapse, muscle rigidity and eventual death. (Stradler & Conaster) Three of the 38 hogs (5.7%) are carriers of PSS (Table 1), which means that if they were to be bred with another carrier their offspring would potentially be affected by PSS.

Rendement Napole

Rendement Napole (RN) gene is found to cause low ultimate pH and water holding capacity (WHC) in pork, and occurs mainly in Hampshire purebred and Hampshire cross populations. Low water holding capacity results in poor quality meat which is referred to as Pale Soft Exudative (PSE) grade meat, which causes dry meat with low palatability when cooked. Twenty-one of the 35 hogs (60%) tested are susceptible to low ultimate pH and water holding capacity, which raises a concern for market hog participants (Table 1.). Consumers purchase 4-H and FFA market hog projects at a premium and expect a high quality product in return. If 60% of market hogs are susceptible to PSS, youth, parents, junior livestock show committees should be aware of this issue and that the quality of the end product may be compromised.

PSS	Garfield (%)	Kane (%)	RN	Garfield (%)	Kane (%)
Normal	100	85	rn+/rn+ Normal	33	45
Carrier	0	15	RN-/rn+ Heterozygous	40	40
			RN-/RN- Homozygous	27	15

Steer Results:

Tissue samples were collected from 29 steers entered into the Garfield and Kane county junior livestock shows. The tissue samples were extracted from the ear of the animals using an Allflex Tissue Applicator (figures 1 and 2). The samples collected were sent to igenity labs to be tested for DNA profile which includes: residual feed intake, average daily gain, tenderness, marbling, percent choice, yield grade, back fat thickness, ribeye area, heifer pregnancy rate, stayability,

maternal calving ease, docility, Y chromosome reduced fertility test and curly calf syndrome. See table 1 for Igenity profile results, (results are given on a scale of 1 to 10). A total of 29 steers were tested with a total cost of \$2030.00 for testing (\$70.00/steer).

Producers can also benefit from this knowledge by selecting breeding stock with superior genetic profiles.

Table 1 Garfield County Igenity® Results

Garfield County													
Animal ID	Igenity Production Index	Residual feed Intake	Average Daily Gain	Tenderness	Marbling Score	Percent Choice	Yield Grade	Fat Thickness	Ribeye Area	Heifer Pre Rate	Stayability	Maternal Calving Ease	Docility
2	6.1	5	6	4	7	7	7	4	5	5	4	7	4
1	5.95	7	7	7	7	7	7	7	3	4	3	6	4
3	5.85	7	7	7	6	6	6	6	4	5	4	6	5
4	5.6	6	5	6	6	6	6	5	7	5	7	6	5
5	4.9	7	6	1	6	6	6	6	7	4	5	5	6
AVERAGES	5.68	6.4	6.2	5	6.4	6.4	5.6	5.2	4.6	4.6	6	4.8	5.4

Table 2 Kane County Igenity Results

Kane County													
Animal ID	Igenity Production Index	Residual feed Intake	Average Daily Gain	Tenderness	Marbling Score	Percent Choice	Yield Grade	Fat Thickness	Ribeye Area	Heifer Pre Rate	Stayability	Maternal Calving Ease	Docility
83	6.7	6	7	9	7	7	7	6	7	5	4	7	5
46	6.3	6	7	8	7	7	7	6	5	4	5	6	5
49	6.15	5	7	4	7	7	7	5	5	6	6	6	7
82	6.15	6	6	9	6	6	6	6	7	5	6	6	6
94	6.15	7	7	8	7	7	7	6	6	5	5	6	7
95	6.15	6	6	10	6	6	6	6	6	4	6	6	5
92	6.1	6	5	7	6	6	6	5	5	6	7	6	6
45	6.05	6	6	7	6	6	6	6	6	3	6	7	4
67	6.05	4	6	4	6	6	6	6	5	3	5	6	7
84	5.95	7	5	7	6	6	6	6	6	6	6	7	6
85	5.85	6	6	4	7	7	7	6	6	5	6	6	7
88	5.75	4	4	4	6	6	6	6	6	5	6	6	7
79	5.7	5	6	5	4	7	7	6	6	4	6	5	5
75	5.6	6	5	6	5	5	5	5	5	5	5	7	4
86	5.6	8	5	7	6	6	6	6	6	5	6	6	7
97	5.55	6	4	4	7	7	7	7	6	5	6	7	3
78	5.5	6	5	7	6	6	7	7	4	4	4	6	3
96	5.45	6	6	4	6	6	6	5	5	6	5	6	4
66	5.3	5	4	3	6	6	6	6	6	4	6	6	5
87	5.25	6	4	6	5	5	5	5	5	5	6	6	5
93	5.25	7	5	5	6	6	6	6	7	4	5	6	4
64	5.05	5	5	4	5	5	5	6	5	7	8	5	5
65	5.05	5	5	3	5	5	5	5	5	4	5	5	6
49	4.5	6	5	1	6	6	6	5	5	7	7	4	5
AVERAGES	5.714583333	5.833333333	5.458333333	5.66666667	6	6.125	5.791667	5.625	4.875	5.708333	6	5.166666667	6.458333

The "Igenity Production Index" is based on the following traits and their weightings:

- Residual Feed Intake (Lower number favored) 15%
- Average Daily Gain 15%
- Tenderness 10%
- Percent Choice 20%
- Stayability 30%
- Maternal Calving Ease 10%

Educational Workshops and Peer Reviewed Fact Sheets:

Garfield and Kane County 4-H in cooperation with the Kane and Garfield County Junior Livestock Show Committees hosted two informational meetings about the results of this project. The workshop agenda consisted of teaching the attendees about the genetic evaluation and genetic diseases. In addition, the workshop included a hands on DNA extraction demonstration. Approximately 30 people attended the workshops. One hundred percent of the participants rated the workshop as excellent or better. Participants improved their knowledge of genetic testing and evaluation from attending the workshop. Forty-four percent of the participants indicated that they were interested in genetics as part of their future career.

This effort produced three fact sheets entitled: Genetic testing for defects and performance measures in junior livestock show hogs, DNA testing of junior livestock show lambs, and DNA testing of junior livestock show steers. The hog and lamb fact sheet have been peer reviewed, accepted for publication and are pending publication on the USU Extension website. The beef fact sheet will be submitted as soon as we receive the final curly calf syndrome test results.

The results of the hog genetic analysis will be presented at the Best Practices Sessions at Region Staff Meeting on May 11, 2016.

Conclusion:

Genetic evaluation of junior livestock projects is a new avenue to bring STEM to the forefront in a traditional "STEM-based" 4-H program. The participants appreciated the individual genetic evaluation of their projects, learned the importance of genetic evaluation and are now considering genetics as a future career. This project also identified several concerns with junior livestock projects in Kane and Garfield County. The first concern is with pork quality due to the presence of porcine stress syndrome and rendement napole gene. The second concern is the presence of spider lamb syndrome, scrapies, and the genetic mutations causing ovine progressive pneumonia in lambs. It is important to note that most of these genetic mutations were in the minority of the projects. Thus, this project also identified youth (and breeders) who are doing an excellent job at producing genetically superior livestock.

