

**Final Report**  
**Determining anthelmintic resistance**  
**on sheep farms in the southeastern US**

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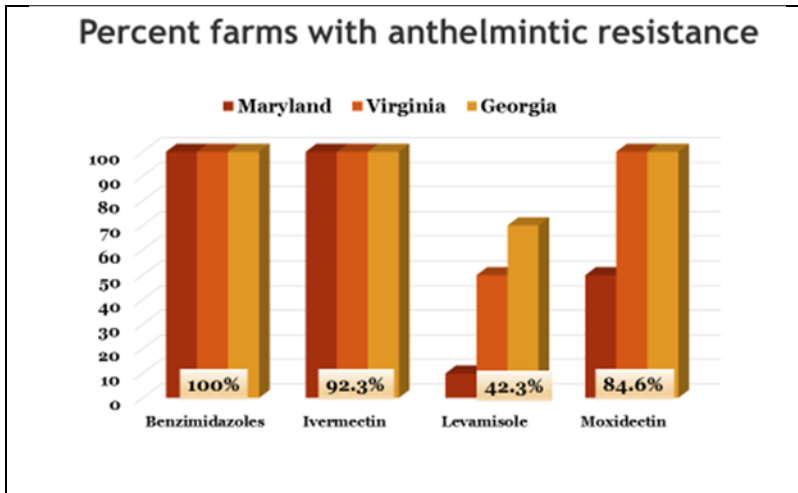
Funding was received to cost-share testing for anthelmintic (dewormer) resistance on thirty commercial sheep farms in Maryland, Virginia, and Georgia. The project coordinators identified suitable farms and visited each to facilitate the collection, preparation, and shipment of pooled fecal samples. The samples were submitted to Dr. Ray Kaplan's lab at the University of Georgia for DrenchRite® analysis. The cost of each test was \$450. Let's Grow paid for half of the testing. Participating farms paid the other half. Results, interpretation and recommendations were given to participating farms.

In 2016, samples from twenty-six farms were submitted: Maryland (and Pennsylvania), 10; Virginia, 6; and Georgia, 10. Results were received and are included in this report. Samples are in the process of being collected and analyzed for the remaining four farms in Virginia. Results have been received from one farm. Results from two additional farms are pending. A tenth farm is still being attempted, as samples from several Virginia farms have lacked sufficient egg counts (minimum is 500 epg) to perform the DrenchRite® analysis.

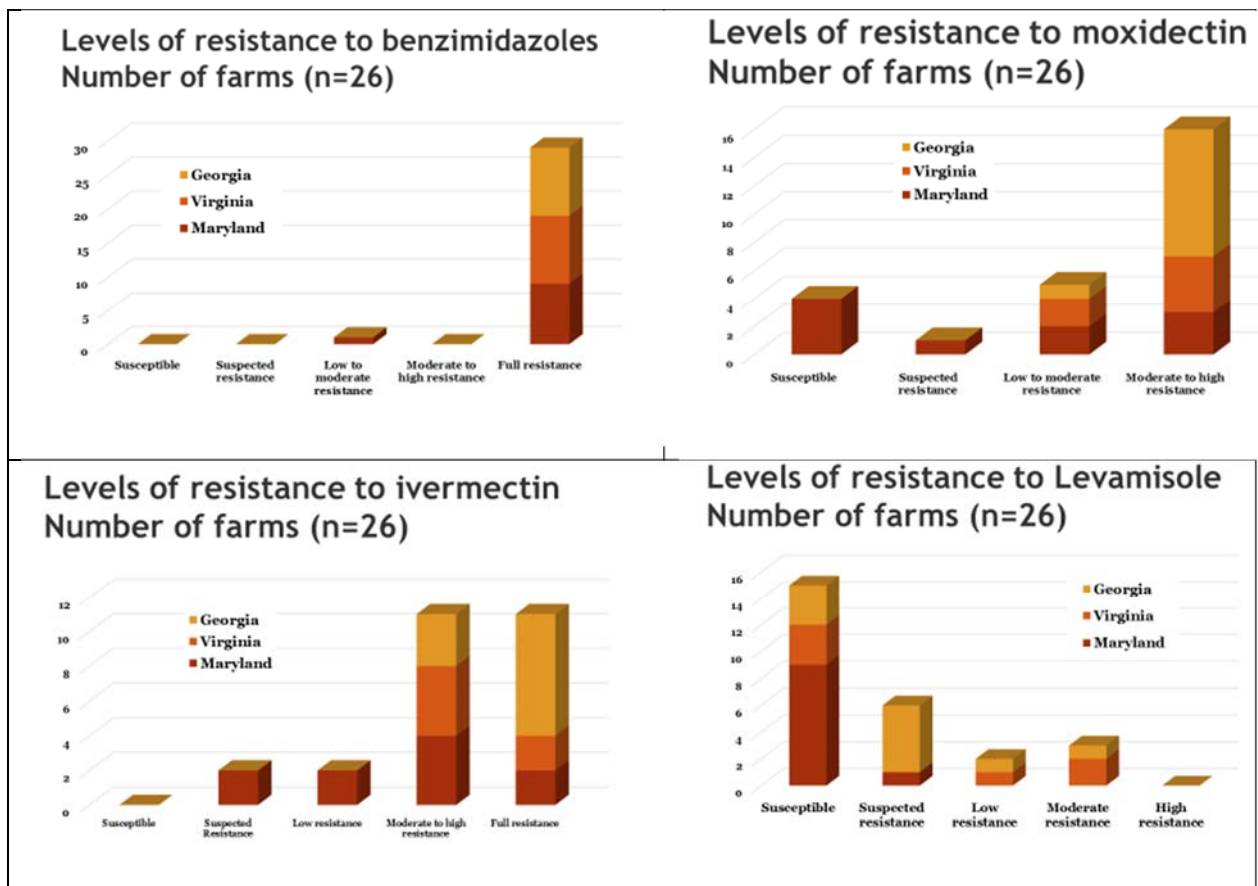
Project coordinators have shared the results of the study via meetings, workshops, newsletters, social media, and web sites. Results were shared with the memberships of the NCERA-214 (Improving the Efficiency of Sheep Production) and SCC-81 (Sustainable Small Ruminant Production) committees. An oral presentation was given at the Annual Meeting and Professional Improvement Conference of the National Association of County Agricultural Agents (NACAA). Results have been incorporated into teaching materials for FAMACHA© trainings and other presentations pertaining to internal parasite control in sheep (and goats).

All of the farms tested had resistance to the benzimidazole (BZ) group of dewormers (fenbendazole and albendazole); all but one had "full" resistance. All of the farms had resistance to the avermectins (ivermectin, doramectin, and eprinomectin). Most had moderate to high resistance. Moxidectin was still effective on some farms. More than half the farms still had susceptibility to levamisole, including 9/10 farms in MD/PA. On one Virginia farm, Dr. O'Brien is now working with Dr. Anne Zajac at Virginia Tech to do a larval replacement study, as this farm had resistance to all dewormers and classes.

The results of this study confirm the widespread existence of anthelmintic resistance. Differences among geographic areas (states) and farms emphasizes the need for individual testing of farms.



The project coordinators worked with the lab at the University of Georgia to fine-tune the results of the DrenchRite® analyses. In the past, reports only classified drug resistance as R (resistant), SR (suspected resistance), and S (susceptible). Since efficacy can range from 0 to 95% on farms with documented resistance (R), it is important to narrow down the level of resistance, in order to predict the effectiveness of single or combination drenching.



## Pictures of from field



Katahdin, Dorper (Pennsylvania)



Hair sheep, mixed (Maryland)



Dorset, Blueface Leicester (Maryland)



Mixed wool (Maryland)



Katahdin, Dorper (Maryland)



Katahdin, Dorper (Maryland)





East Friesian, Lacaune (Maryland)



North Country Cheviot (Pennsylvania)



Hair sheep (Virginia)



Hair sheep (Georgia)



Collecting samples in Georgia



Collecting samples in Georgia

## Examples of giving credit to ASI's Let's Grow Program

### PowerPoint presentation slides

#### Worms have developed varying degrees of resistance to all dewormers and classes.

Dewormer Class	Maryland	Virginia	Georgia
Benzimidazoles	100%	100%	100%
Ivermectin	92.3%	92.3%	92.3%
Levamisole	42.3%	42.3%	42.3%
Moxidectin	84.6%	84.6%	84.6%

Source: Determining anthelmintic resistance on sheep farms in the southeastern US (2016). This study was made possible by funding from the Let's Grow committee of the American Sheep Industry Association (ASI).

LET'S GROW

This study was made possible by funding from the Let's Grow committee of the American Sheep Industry Association (ASI).

### 2017 Station Report

## University of Maryland

#### DETERMINING ANTHELMINTIC RESISTANCE ON SHEEP FARMS IN THE SOUTHEASTERN US

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#### Materials and Methods

- ASI's Let's Grow Program funded a project to determine anthelmintic resistance on 30 commercial sheep farms in the southeastern US.
  - Maryland, via University of Maryland
  - Virginia, via Virginia State University
  - Georgia, via Fort Valley State University
- The project cost-shared the DrenchRite® test for producers.
  - \$225 paid by Let's Grow funds
  - \$225 paid by producer

LET'S GROW

This study was made possible by funding from the Let's Grow committee of the American Sheep Industry Association (ASI).

UNIVERSITY OF MARYLAND EXTENSION  
Virginia Cooperative Extension  
FORT VALLEY STATE UNIVERSITY

LET'S GROW

### Summer 2017 issue of Wild & Woolly

#### Anthelmintic Resistance On Sheep Farms In The Southeastern US

Last year, the American Sheep Industry Association's Let's Grow Program funded a project to determine anthelmintic (dewormer) resistance on thirty commercial sheep farms in Maryland, Virginia, and Georgia.

The DrenchRite® test was used to determine resistance. It is a labor-intensive laboratory test that determines resistance to all dewormers and dewormer "classes" simultaneously from a single pooled fecal sample. The University of Georgia is the only place where the test is performed (in the US).

In 2016, samples were submitted from 26 farms. Four more farms will be sampled this summer. The project cost-shared the test for farmers interested in testing for resistance. The test costs \$450. The project paid half.

While a fecal egg count reduction test quantifies the eggs in a sample and compares it to a pre-treatment or control fecal egg count, the DrenchRite test lets the

The worm larvae most commonly identified in the twenty-six samples was *Haemonchus contortus*, better known as the barber pole worm. On average, the samples contain  $82.1 \pm 3.8\%$  *Haemonchus*. All but two farms had more than 50% *Haemonchus*.

The percentage of farms with resistance to benzimidazoles (SafeGuard®, Valbazen®), avermectins (Ivomec®, Dectomax®, Eprinex®), moxidectin (Cydectin®), and levamisole (Prohibit®, Leva-Med®) was determined to be 100, 92.3, 84.6, and 42.3 percent respectively.

Resistance to moxidectin and levamisole was lower on Maryland farms, compared to farms in Virginia and Georgia. Resistance to avermectins was similar. All farms had resistance to benzimidazoles. All farms had resistance to one or more anthelmintics, but there were differences between farms and states.

For effective control programs, farmers need to test for



## Fall 2016 issue of Wild & Woolly quarterly newsletter

### Are Dewormers Still Effective on Your Farm?

The American Sheep Industry Association's Let's Grow Program provided funding to facilitate testing for anthelmintic (dewormer) resistance on commercial sheep farms in three southeastern states: Maryland, Virginia, and Georgia.

It is a well-known fact that worms have developed resistance to all the dewormers and dewormer classes currently available to sheep and goat producers. Resistance varies by geographic region. It is worse in the Southeast, because this is where internal parasites are most prevalent. It also varies by farm. It is worse on farms that deworm frequently. It tends to be worse on goat farms, as they usually have a greater need for deworming than sheep.

On average, worms have become most resistant to the benzimidazole or "white" class of dewormers which includes fenbendazole (SafeGuard®) and albendazole (Valbazen®). A high level of resistance is also prevalent among the avermectins, which includes ivermectin.

a dewormer may still deliver an effective treatment, but increasingly it will be less effective at killing worms, reducing fecal egg counts, and saving clinically parasitized animals.

The first sample you collect should contain at least 200 EPG. In fact, the data is more reliable with much higher initial fecal egg counts, as 200 EPG is a very low egg count for the barber pole worm. The barber pole worm is a very prolific egg layer. Ideally, you should collect and compare samples from 10 to 15 animals. You need to do this for each drug you want to test. It's also a good idea to collect samples from animals which do not receive treatment (a control group). Doing a fecal egg count reduction test on one animal or a few animals will give you a general idea if the drug works, especially if clinical signs are improved, but it will not tell you definitively if resistant worms are present.

There are several advantages to the fecal egg count reduction test. Producers can learn to do their own fecal

## Column in Delmarva Farmer and Lancaster Farming, October 2016

Shepherd's Notebook for October 2016  
Susan Schoenian  
Sheep & Goat Specialist  
University of Maryland Extension

Suggested title: Are the dewormers still effective on your farm?

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