Summer 2019 – Volume 31, Issue 3

Hoof Print

The Small Ruminant Magazine

CELEBRATING 10 YEARS OF FUN AT THE KY SHEEP & FIBER FESTIVAL

MANAGING INTERNAL PARASITES

LIVESTOCK GUARDIAN DOG HEALTHCARE

2019 KENTUCKY
ANNUAL PRODUCER CONFERENCE
OCTOBER 26, 2019

Register Today!

www.kysheepandgoat.org/annual-producer-conference

KEYNOTE SPEAKER:
Susan Schoenian, Sheep and Goat Specialist
University of Maryland Western Research & Education Center

TOPICS INCLUDE:

- Using genetics to increase parasite resistance
- Feeding, water and shelter systems for rotational grazing
- Alternative parasite control
- Managing gut health and nutrition to maximize immunity

KGPA and KSWPA Annual Association Meetings & Board Member Elections – Submit Your Name Today!
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Kentucky Sheep & Wool Producers Association

Kentucky Goat Producers Association

$25/person or $40/couple
(FAMACHA training additional $15)

Check-in at 8:30am, program starts 9:00am.

Kentucky Sheep & Goat Development Office

Kentucky Proud

CLARK CO. EXTENSION OFFICE
1400 Fortune Drive
Hwy. 627, North
Winchester, KY 40391

Summer 2019 – Volume 31, Issue 3

Hoof **Print**

The Small Ruminant Magazine

Hoof **Print** Magazine
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Free with paid membership to one or more of our partner organizations.

***Hoof*Print**: *The Small Ruminant Magazine* is a periodical to promote better animal health, husbandry, and knowledge among sheep and goat producers. ***Hoof*Print** is the joint effort of members of the sheep and goat industries and serves as a united voice for all small ruminant producers.

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KADF
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GENETICALLY SPEAKING

HEALTH & MANAGEMENT

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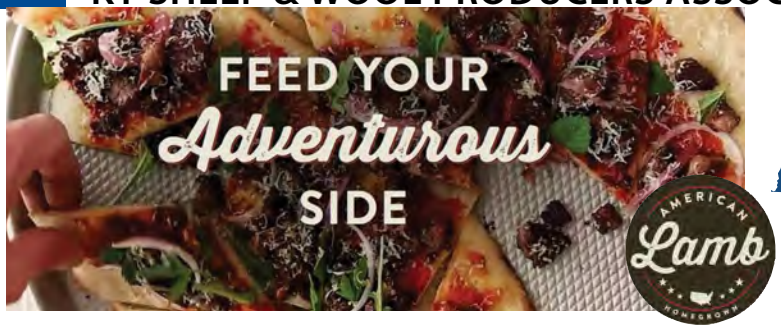

The KY Lamb Dinner guests embraced the movement to "ditch the normal and be adventurous!" On April 28, 2019 the Kentucky Sheep and Wool Producers Association hosted a dinner at Oscar Diggs in Lexington, KY to share the delicious and versatile flavors of American lamb.

Oscar Diggs

Oscar Diggs was hands down the restaurant of choice when owner, Ralph Quillon, expressed his interest in having lamb on his menu on a more regular basis. The four course dinner was an opportunity to introduce his customers to the wonderful flavors of lamb in the typical "Oscar Diggs style." The menu included a crispy lamb skin salad, a lamb carpaccio topped with the house made yogurt tzatziki and smoked picked peppers, and a generous lamb chop crusted with roasted scallions and parmesan finished with a lamb confit and Yukon potatoes with bitter Swiss chard. Each course was paired with signature drinks from Rooster Brewery including Harrier Wheat, Gone to Morocco, and Sleepy Puppy.

The lamb for the dinner was provided by three KSWPA members:

- Sue Churchill of Thistle's End Farm, Woodford County
- Eileen O'Donohue of KY Lamb, Washington County
- Endre, Betsy, Stefan, and Allison Fink of Fink Meats, Clark Co.

One of the highlights of the dinner were each of the producers sharing their love and dedication for producing quality lamb to the dinner guests.

The event proved to be a success, as stated by a guest, "This dinner certainly increased my appreciation for lamb!"

The Kentucky Sheep and Wool Producers Association understands the importance of promoting our industry's products and want to thank the major sponsors for the event: The Kentucky Sheep and Goat Check-Off, Oscar Diggs, and the American Lamb Board.

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JOIN or RENEW TODAY!
Visit www.kysheepandgoat.org

KSWPA Membership Benefits

- Quarterly issues of HoofPrint Magazine plus the newly designed 2019 Sheep and Goat Management Calendar
- A unified voice for the sheep industry and representation on important state and national committees
- Assistance with new marketing opportunities such as The Kentucky Sheep and Fiber Festival and HoofTrader.com
- Receive a membership to the American Sheep Industry, our national lobbying, marketing and promotional support system.
- Support of various educational and youth activities

Name: _____ **Phone:** _____ **E-Mail:** _____

Address: _____ **City :** _____ **State:** _____ **Zip:** _____

Please enclose a check for $30.00 made out to KSWPA and mail to:
Kentucky Sheep and Goat Development Office
P.O. Box 4709, Frankfort, KY 40604-4709.

PRESIDENT'S LETTER

Dear Kentucky Sheep & Wool Producers,

I hope everyone had a successful lambing session. We recently finished up lambing our 160 Katahdin ewes the first of May and it could not have gone much better. We have 250 lambs on the ground. Now we need to take good care of our lambs and their mamas so they will grow quickly for sale.

Please mark your calendars for our 2019 Annual Kentucky Producer Conference to be held on Saturday October 26 at the Clark County Extension Office. Our keynote speaker this year is Susan Schoenian. Susan retired as the sheep and goat specialist at the University of Maryland Small Ruminant Extension Program located at the Western Maryland Research & Education Center. Susan holds B.S. and M.S. degrees in Animal Science from Virginia Tech and Montana State University, respectively. She started working for the University of Maryland Extension in 1988.

Our annual conference is an opportunity to come together with other producers to share ideas and experiences that will help us all get better at raising our sheep. The speakers we get are some of the best in the country and provide us with the latest news and science about dealing with our small ruminants. Please plan on joining us this October.

The Kentucky Sheep and Wool Producers (KSWPA) in cooperation with the Kentucky Sheep and Goat Development office just finished up the 10th Annual KY Sheep and Fiber Festival at Masterson Station Park in Lexington. As usual I worked the front gate along with other KSWPA volunteers, and it pleases me that people repeatedly come to our festival from all over the region. I have met people from Missouri, Tennessee, Indiana, and Ohio, and they could not be more complementary of the festival workshops, the festival vendors, and the festival staff and volunteers.

For those of you who have not attended either the KY Sheep and Fiber Festival or the Bluegrass Classic stock dog trial, I encourage you to come and see us next May. The dog trial runs Thursday through Sunday the same weekend as the festival, and my family enjoys attending both events including the dog trial finals on Sunday. This trial is one of the largest, most prestigious, longest running stock dog trial in the country. Admission is free to the dog trial and you will be absolutely amazed by what the dog handlers can do to guide sheep with their dogs.

Our goal is to increase the membership of the Kentucky Sheep and Wool Producers Association (KSWPA). To do that, I need your help as members to ask all of your friends and family who are sheep producers, but not members, to join you in becoming a member of the KSWPA. As a member you have access to our breeder directory, our mentoring program, and a variety of educational programs including our online Small Ruminant Profit School (SRPS). Review the sample SRPS module on line at the YouTube link:https://youtu.be/HLFioNbPOds

As always encourage your family and friends to join the KSWPA. Here is the link:

https://www.kysheepandgoat.org/product-page/kentucky-sheep-and-wool-producers-association-membership

Best Wishes,

Bill Decker, President
Kentucky Sheep and Wool Producers Association

CALENDAR OF EVENTS

JULY

8th	graded sale Richmond
11th	graded sale Bowling Green
16th	South Central Goat & Sheep Producers Association; Barren County Extension Office, 6:30pm
16th	graded sale in West Kentucky Auction Barn
20th	graded sale Springfield
23rd	graded sale Paris
25th	graded sale Bowling Green

AUGUST

8th	graded sale Bowling Green
11-14	Eid al-Adha
12th	graded sale Richmond
15-25	Kentucky State Fair
17th	graded sale Springfield
20th	graded sale West Kentucky Auction Barn
20th	South Central Goat & Sheep Producers Association; Barren County Extension Office, 6:30pm
22nd	graded sale Bowling Green
27th	graded sale Paris
30-31	Islamic New Year

SEPTEMBER

9th	graded sale Richmond
10th	Central KY Sheep and Goat Association., Marion Co. Extension Office 7pm
12th	graded sale Bowling Green
12th	Jessamine County Goat and Sheep Association; Jessamine County Fairgrounds; 7:00pm
17th	graded sale West Kentucky Auction Barn
17th	South Central Goat & Sheep Producers Association; Barren County Extension Office, 6:30pm
19th	Fort Harrod Goat and Sheep Association Meeting; Mercer Co. Ext. Office; 6:30 pm potluck & 7pm meeting
21st	graded sale Springfield
24th	graded sale Paris
26th	graded sale Bowling Green
29 - 1	Rosh Hashanah

GOAT FIELD DAY

KGPA hosted the Goat Field Day on May 11, 2019 at the Jessamine County Fairgrounds. The event focused on commercial production and youth market projects. Topics discussed were markets, record keeping, cheese making, coccidia, nutrition & feeding, fitting, showmanship skills, and so much more. Be sure to watch our website to get details for the Goat Field Day in 2020!

KENTUCKY GOAT PRODUCERS ASSOCIATION

JOIN or RENEW TODAY!

KGPA Membership Application

Your $30 membership provides:

- 4 issues of the *Hoof*Print Magazine plus the newly designed 2019 Sheep and Goat Management Calendar
- A unified voice for the goat industry on the state and national level
- Representation on important committees such as the Check-Off and the Animal Care Standards boards
- Support of various educational and youth activities
- Youth Membership forms can be found at kysheepandgoat.org/KGPA.html
- **And much, much more!**

Visit www.kysheepandgoat.org to join today!

Name: _____

Address: _____City: _____State: _____Zip:_____

Phone: _____E-Mail: _____

Please enclose a check for $30 made out to KGPA and mail to:

Kentucky Sheep and Goat Development Office
P.O. Box 4709, Frankfort, KY 40604-4709.

CALENDAR OF EVENTS

JULY

8th graded sale Richmond
11th graded sale Bowling Green
16th South Central Goat and Sheep Producers Meeting, Barren Co. Ext Office, 6:30pm (CT)
16th graded sale in West Kentucky Auction Barn
20th graded sale Springfield
20th American Dairy Goat Sanctioned Show, Franklin County Fairgrounds
21st American Dairy Goat Sanctioned Show, Harrison County Fairgrounds
23rd graded sale Paris
25th graded sale Bowling Green

AUGUST

8th graded sale Bowling Green
11-14 Eid al-Adha
12th graded sale Richmond
15-25 Kentucky State Fair
Dairy Goats: August 15-18
Market Goats: August 19-21
Boer Goats: August 16-18
17th graded sale Springfield
20th graded sale West Kentucky Auction Barn
20th South Central Goat and Sheep Producers Meeting, Barren Co. Ext Office, 6:30pm (CT)
22nd graded sale Bowling Green
27th graded sale Paris
30-31 Islamic New Year

SEPTEMBER

9th graded sale Richmond
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19th Fort Harrod Goat and Sheep Association Meeting; Mercer County Extension Office; 6:30 pm potluck and 7 pm meeting
21st graded sale Springfield
24th graded sale Paris
26th graded sale Bowling Green
29-1 Rosh Hashanah

OCTOBER

1st Rosh Hashanah

Letter from the President

KGPA NOTE'S FROM THE KIDDING BARN

Dear KGPA Members,

Hope your summer has been full of spending quality time with family and friends! If you are raising goats that you enjoy showing, hope that this issue of HoofPrint can help with keeping your animals in tip top shape and winning blue ribbons. Summer is the time to enjoy the fruits of our hard work spent in the winter and spring kidding does and raising kids!

By the time you are reading this letter, we enjoyed a great turnout for our third annual KGPA Field Day. We had several excellent speakers, and very informative demonstrations and lectures. Huge thank you to Kay DeMoss and her family, and the members of the Jessamine County Goat Club for sponsoring this event and assisting with providing animals for the demonstrations. Also a big thank you to Denise Martin for cooking up some great goat meat for lunch! I am looking forward to next year's field day. If anyone is interested in hosting the field day at their farm let us know.

Along with parasite issues in the summer, the heat and humidity in late June, July and August can seriously affect fertility in our bucks. Remember to keep your bucks in an area where they can get excellent shade with a good breeze in order to minimize heat stress during this time. Continue to monitor FAMACHA scores on your goats so you can treat those developing parasite loads from *Haemonchus contortus* before it gets too severe.

Remember to mark your calendars for the KY State Fair, August 15-24. If you can, try to help Kelley with our KSGDO AgLand display. You will enjoy telling your story to the many families that stop by just to learn about Ag!

Have A Great Summer!
Beth Johnson, DVM
President, KGPA

"Real difficulties can be overcome;
it is only the imaginary ones that are unconquerable."
– Theodore Vail

KGPA and KSWPA NEED YOUR HELP!

With the increasing population of goats and sheep in our state, there are lots of people who could benefit from your knowledge. Having a mentor could be the difference between a new producer thriving or diving! Consider becoming a mentor so that you can make a difference in someone's life. Together we can continue to strengthen and grow our industries.

kysheepandgoat.org/become-a-mentor

Hello from Tennessee!

I hope this finds everyone well and relieved that lambing season is finally over. We've been done now for more than a month and lambs are growing fast on plentiful spring grasses. Here in Middle Tennessee, we've gone from mud to dust in a month which is making some areas fairly parched. We sure could use some rain now that the first cutting of hay is in the barn. As I write this, we have the best chance of rain we've had in a while, but only sprinkles thus far.

Our Sheep Shearing School was held in April at Middle TN State University and we had great attendance once more. Mr. Doug Rathke always does a fine job with classroom and hands on instruction for all attendees. If you haven't attended this event, you need to set on your calendar next year for the 3rd weekend of April. Check our website as time draws near.

The Wool Pool was held Wednesday, June 12 in Columbia, TN and Thursday, June 18 in Dandridge. Visit our website, tennesseessheep.org or contact Mr. Mark Powell at shepherboy1@yahoo.com for a summary on the event.

Also of interest, this is the Year of Wool at the Wilson County Fair (my home county), August 16th thru 24th. There will be a featured Wool Show held during the fair August 16 – 24 so plan to enter your best fleeces for this competition. If you haven't heard, the Wilson County Fair is an award-winning agricultural fair conveniently located right off I-40, about 25 minutes East of Nashville. Visit wilsoncountyfair.net for more information.

Save the date for our annual sheep conference, December 6 & 7, 2019. More details to follow. Be sure to save tenneesseesheep.org in your favorites!

Take care and hope to see you at one of our events this summer!

Best Regards,

Debbie Joines, TSPA President

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If you are interested in a committee please select below:

_____ Wool
_____ Youth
_____ Jr. Expo
_____ Sale
_____ Production Education
_____ Membership/Revenue
_____ Publicity
_____ Annual Meeting

JOIN ONLINE TODAY!

TSPA Membership Application

Annual Dues: Adult: $30.00 Junior $10.00

Name: _____

Address: _____ City: _____ State: ___ Zip: _____

Phone: _____ E-Mail: _____

Breed(s) of Sheep: _____

Please enclose a check for amount made out to TSPA and mail to:
Tennessee Sheep Producer's Association • 4233 Poplar Hill Road, Watertown, TN 37184

Pay dues and join online at www.tennesseesheep.org/joinonline.htm

Tennessee Junior Sheep EXPOSITION

July 18-20, 2019

Ward Agricultural Center
on the Wilson County Fairgrounds
Lebanon, Tennessee

The Tennessee Sheep Producer Association is again working with The University of Tennessee to secure funding for appropriate awards for sheep exhibitors. As a member of the Tennessee Sheep Producers Association, I wanted to ask that you consider making a contribution to help defray some of the cost for these awards. Any amount you would like to donate would be helpful. Checks can be made payable to the Tennessee Sheep Producers Association and mailed to:

Mark Powell
4233 Poplar Hill Road
Watertown, TN 37184

If you wish to donate online, visit www.tennesseesheep.org/expo.htm

Livestock Guardian Dog Healthcare

by Emily Clement

The best way to ensure longevity of a livestock guardian dog (LGD) is through providing for its health and wellness. Just as equipment needs maintenance to keep it working well, so does your LGD. This is accomplished by consulting a veterinarian to establish a wellness plan for your particular animal and its needs. This wellness plan should include a vaccination schedule, nutritional consultation, and parasite exams, treatments, and prevention recommendations. It is important that your LGD has proper nutrition for its life stage and purpose and is kept on the recommended vaccination schedule from puppyhood throughout its life. The dog should be examined frequently: you should check the dog daily and a veterinarian should examine each LGD at least annually to maintain health, intervene in any problems before they become serious, and provide preventative treatments and required vaccinations.

Immunity and Vaccinations

Immunity is the body's ability to defend itself against outside organisms. The immune system is composed of cells and structures that work together to protect the animal by shielding it from invaders entering the body. If a threat is detected, the body starts a cellular response to prevent disease. Without a healthy immune system, disease can occur and the animal could die. There are several ways immunity is established. One way is through passive immunity, which is the transfer of antibodies in the colostrum (the first form of milk the mother produces after giving birth). Another way is through vaccination with repeated booster shots to allow the animal to generate an adequate response to a disease.

According to the American Animal Hospital Association (AAHA), puppies gain their initial immunity by consuming their mother's colostrum within the first 24 hours of life, especially during the first 4-6 hours (American Animal Hospital Association, 2017). If a puppy did not nurse the antibody-rich first milk from its mother, it needs to have its immunity built up with vaccinations and this needs to be done sooner than a pup that nursed colostrum from its mother.

All puppies need a series of vaccinations starting at 6-8 weeks of age. These are often referred to as their "first" or "puppy" shots. These shots are usually combination vaccines that contain **d**istemper, **h**epatitis/**a**denovirus, and **p**arvovirus (DHPP or DAPP). Immune response, from any vaccination, takes two weeks from the date it was given. Maternally transferred immunity decreases by 8-10 weeks of age. Therefore, this vaccine series can both cover when the dam's immunity is wearing off and/or give a challenge to the immune system to stimulate it. It is important to complete the second round of shots 3-4 weeks after the first shots (follow your veterinarian's recommendation). This round challenges the immune response in order to strengthen it. The third round of vaccinations, which occurs 3-4 weeks later and usually concludes the "puppy " shot series, includes the legally required rabies vaccination. DHPP/DAPP and rabies are considered the "core" vaccinations by the AAHA (American Animal Hospital Association, 2017).

A vaccine, not considered "core" but frequently recommended because LGDs spend their lives among livestock, is leptospirosis. Leptospirosis is a bacterial infection, also transmissible to humans. The reservoir is wildlife and domestic livestock. It is passed in the urine. Dogs can be contaminated if they swim or drink from stagnant water. The leptospirosis vaccination can be given in combination with the distemper, hepatitis, parvovirus vaccine (DHLPP).

Canine Core vaccines:
Distemper
Adenovirus/Hepatitis
Parvovirus
Parainfluenza
Rabies

Non-core vaccines:
Bordetella (kennel cough)
Canine Influenza
Leptospira
Lyme disease

(American Animal Hospital Association, 2017)

Intestinal Parasite Prevention Recommendations (CAPC, 2019)

- ☐ Veterinary physical exam every 6-12 months
- ☐ Test annually for heartworms and tick transmitted diseases
- ☐ Conduct fecal exam at least 4 times in first year and at least 2 times a year there after.
- ☐ In areas where Lyme disease is present, vaccinate for it.

Depending on working conditions and your location, your dog may be at risk for other diseases for which vaccines are available. These are considered "non-core" vaccines. All vaccinations and conditions should be discussed with your veterinarian to ensure your dog receives the appropriate combination of vaccinations for its situation.

The age and previous vaccine history of the dog will dictate what vaccines are needed. For example; if you acquire a dog at 8 months of age and it does not come with a record of the completed puppy series of vaccinations, its immunity may be incomplete. Therefore, an initial vaccination and a booster, two to three weeks later, is advised to ensure the best possible immunity to the challenges it will face.

After completing the initial vaccinations series, the dog will need annual vaccinations to challenge and strengthen the immune system. Several vaccines can result in effective immune response for over one year and may not require annual boosters. Your veterinarian will advise you on which vaccines that need to be administered depending on your animal's specific lifestyle and situation to ensure coverage without "over" or "under" vaccinating your animal. Vaccination is the one of the safest and most cost effective means of preventing infectious diseases in dogs (American Animal Hospital Association, 2017).

Parasites

Internal parasites

Roundworm eggs are found in the environment (in the soil) and come from feces left by dogs and other animals. The eggs transform into an infective stage in the soil and are consumed by small mammals that forage close to the ground. Dogs frequently prey upon these small mammals and become infected through ingestion.

Hookworm eggs are found in the soil as well. The transmission of this parasite can be from direct contact through the skin of the dog, ingestion from grooming themselves (e.g., by licking the paws since they touch soil) and through the womb or milk of an infected dam. Hookworms feed on blood from the capillaries in the lining of the intestine. Not managing these blood-sucking parasites can cause anemia as well as poor nutrient absorption due to weakened intestinal health.

Whipworms also infect dogs through ingestion. They pass from infected animals to the soil where they develop into an infective stage. Similar to hookworm infestation, whipworm eggs are ingested by dogs from cleaning themselves or eating/licking anything that has touched infected soil. According to the Companion Animal Parasite Council (CAPC) the eggs, when passed in feces, are "highly resistant to desiccation, extremes in temperature, and ultraviolet radiation" (CAPC, 2019a).

Tapeworms commonly come from two sources: eating rodents and rabbits and ingesting flea feces. The disease tapeworms cause in dogs is usually not as serious as other parasites, but it is a good indicator of other health problems. A frequent sign of tapeworm infection is seeing rice-like segments on feces and around the anus of the dog, which can be found in your daily checks of your dog. Using flea control measures will prevent spread of tapeworms by fleas although we cannot eliminate the consumption of infected rodents and rabbits by the dogs when they are guarding livestock. Your vet may recommend periodic treatment for tapeworms knowing the lifestyle of the LGD makes them susceptible to this parasite.

Two other internal parasites that cause concern in dogs are coccidia and giardia. While these both have the potential to cause medical problems, they are especially problematic in younger animals who live in dense populations and environments that are frequently contaminated with feces. Coccidia is not a worm; it is a sporulated, microscopic parasite that feeds on the cells in the intestinal lining of the dog. It is spread through ingestion of infected fecal material or an infected rodent. Giardia is a microscopic organism that develops

by feeding off intestinal wall of its host. Giardia develop and divide inside the host (dog) and are shed in feces, which infect the ground with the infective stage of giardia. Dogs acquire or reinfect themselves with giardia by sniffing infected waste and soil and then licking their nose, cleaning their feet, or ingesting infected fecal material.

Risks associated with flea and tick infestations:

Both: Anemia, skin problems

Fleas: tapeworms, allergic skin infection

Ticks: Lyme disease, Erlichia, Babesia, Rocky Mountain spotted fever, and tick

External parasites

Fleas and ticks

Fleas and ticks feed on blood meals, which they get from biting animals. Beyond the nuisance and distress of the initial bite and itch reaction, both fleas and ticks can cause additional diseases to the dog. Dogs acquire fleas from other animals living in their environment. Wild animals, such as raccoons, that have fleas shed flea eggs, which are deposited in the environment. When the eggs hatch, the new fleas can infect the dog.

Flea bites are irritating to the skin and set off a vicious cycle of inflammation and possible infection. The skin is a body's first line of defense against bacterial and viral invaders therefore when an animal's skin is damaged, it is more susceptible to disease. In addition, as mentioned, fleas are also a source of a type of tapeworm that can become an internal parasite of dogs. When a flea-infested dog grooms itself, it ingests the flea feces, which carry the egg of the tapeworm. The tapeworm develops and reproduces inside the dog.

In our area, ticks can also carry several blood parasites and bacteria, that can affect both humans and dogs, cause disease, and in some cases, lead to paralysis and even death. Ticks live and thrive in humid, grassy or wooded areas and attach to their host only to feed. Some species of ticks require multiple hosts to complete their lifecycle. They prefer warm moist areas such as the ears, armpits, and the groin area. After feeding they drop off to the ground to either mature into another life stage, or lay eggs. Disease is spread from the tick to the host by way of the bite. Not only does the bite cause a wound and irritation, but through the saliva of an infected tick, disease is spread to the dog.

Prevention and treatment: there are many options available for flea and ticks. Choices include a once-a-month topical application, an oral product given every one to three months, and an eight-month waterproof collar; all of these options are proven safe and effective. These products work in one or several ways. They kill any flea or tick on the animal as they walk through the fur or after it ingests a blood meal. Not all flea products are created equal and some, even though they are sold over-the-counter and at pet supply stores, contain chemicals that can be dangerous for your dog (these can be even worse if your cat is exposed to the chemicals). It is important to read and understand all labels and safety warnings before using these products. You can expect to pay $10-15 a month for safe, and effective flea and tick control. Aside from the obvious discomfort and agitation the dog experiences having fleas and ticks; trying to cut corners on prevention will cost more money in the long run, by needing to treat the resulting skin problems and potential diseases. It is recommended to give year-round, broad- spectrum parasite control that is effective against heartworms, gastrointestinal parasites, fleas, and ticks (CAPC, 2019b). Prevention is less expensive than treatment.

Mites

The most common mites affecting dogs are ear mites and mange mites. *Ear mites* feed on the oil and wax in the ear canal of animals. Ear mites are highly contagious, extremely irritating to the animal, and usually result in an ear infection from scratching as well as possible hematoma from head shaking.

Mange mites live buried in the skin and hair follicle. There are two types of mange mites. *Sarcoptic* mange is highly contagious and very itchy. *Demodectic* mange is from a mite that animals and people naturally have on their bodies in small numbers, but are usually kept in check by a healthy immune system; therefore, demodectic mange is an indicator of a weakened immune system, especially in puppies. For appropriate treatment, the type of mite must be diagnosed properly, including a diagnostic skin scraping.

Mosquitos

Dogs acquire heartworms from the bite of an infected mosquito. Heartworms are a parasite that are so small you cannot see them. We are unable to detect the signs of heartworm disease until it is very serious; it can even be fatal. Heartworms are detected through a blood test from your veterinarian. The test detects if heartworms are present and can detect this prior to the animal showing signs. If you live where there are mosquitos, then your dog is at risk of heartworm infection. Heartworm disease is 100% preventable by having your dog on a preventative medication, which can be given orally, topically, and is even offered in injectable option that is given every six months. If the dog is older than 4-6 months of age, the dog will need to have a blood test to ensure it is negative for the parasite before beginning the preventative. Dogs in our area need to stay on heartworm preventative year-round due to our local climate and lack of long, hard freezes (killing all mosquitos). The fantastic news about the seemingly overwhelming threat of these parasites is that heartworm preventatives have the added benefit of controlling some of the gastrointestinal parasites as well.

Flies

The flies that irritate your livestock will also bite your dog. Flies tend to bit LGDs on the nose and on the tops of the ears, as well as the ear tips. This can cause headshaking and scratching, which damages the skin and potentially lead to other problems. The use of fly ointment, particularly on those areas prone to biting, can provide protection for your dog against fly bites.

Spay/Neuter

Recommendations vary with each situation, but the basic guidelines to follow are:

Spay/neuter your LGD if you do not intend to breed it. If you choose to breed, do so responsibly by knowing the genetics of both male and female and ensure they have no genetic abnormalities that would be passed to the offspring. Behavior, temperament, and working ability should be evaluated for both potential parents before you even consider creating more dogs. You should also have the dogs checked by x-ray to ensure they do not have hip dysplasia before you consider breeding them. Breeding should always be a planned event; accidental breeding is not acceptable because you are responsible for your animal and its behavior at all times.

If you choose to breed your LGD, you must have a solid plan in place for the

Spaying and Neutering

Pro:

- No pet overpopulation
- Dogs can live longer
- Less health risks
- Not spreading undesirable genetics
- No unwanted males drawn to property
- No time away from stock due to pregnancy and rearing
- Less likely to roam
- More even and predictable temperament

Cons:

- Early (prepubescent) spay/neuter may affect bone growth and hormonally related development.

Timing should be a personal decision between you and your veterinarian

offspring and their care. This plan needs to include medical care (shots, deworming treatments, and flea and tick prevention) as well as placement of all puppies. LGDs can have large litters (5-10 pups) and you must be prepared to provide for their needs as well as the needs of the pregnant/nursing dam. Good nutrition, adequate and safe housing, care for the initial medical needs, and adequate time needs to be invested for appropriate training and handling of the young pups are all essential.

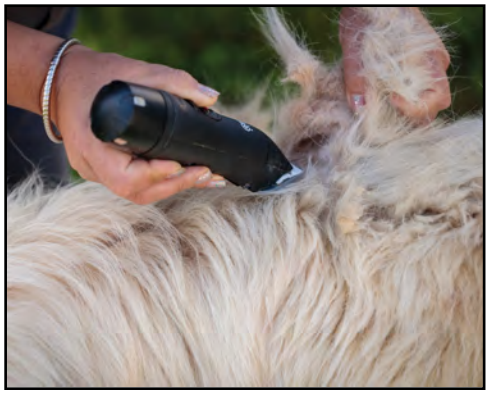
Grooming

Grooming needs to start at an early age; this includes brushing, handling feet and paws for inspection and nail trimming, handling and looking in the ear, as well as lifting the lips to observe teeth and gum health. Introducing regular brushing (not just when you see mats) ensures the health and well-being of your LGD throughout the animal's life.

Some owners of LGDs choose to shave their dogs in warmer weather. This is not necessary if you are able to regularly brush your dog, ensuring it is shed out and free from mats. The hair coat protects the dog from the sun, insects, and the environment. It also has multiple layers that insulates the dog, keeping the animal warm in the winter and cool in the summer (by air circulating between the layers), if the undercoat is fully shed. If you are unable to regularly groom (brush and detangle) your dog, you may consider a moderate (not close to the skin) shave to avoid matting and subsequent skin problems.

Mats are not only uncomfortable, they disrupt airflow, attract parasites, trap moisture, and cause skin problems. Mats are twisted and tangled hair; some contain random objects (sticks, cockleburs, leaves, even wire) wrapped tightly inside (see pictures of mats along the spine, rump, and flanks of LGDs).

Hotspots are a chain reaction caused by an irritation to the skin (which naturally has bacteria on it). Hotspots can start with an allergy such as to an insect bite (flea, tick, fly, or mosquito) that irritates the skin, causing the animal to lick and chew the area. The moisture from licking along with the additional irritation caused by biting, chewing, and scratching causes bacteria already on the skin to penetrate the skin. This sets off an inflammatory, infectious, and very uncomfortable situation for the dog. Hotspots require treatment. The surrounding area must be shaved, the skin cleaned and medicated, and the area must be kept dry (see picture of shaving mats).



If you observe your dog is shaking its head more than normal, you will need to take a look inside its ears. Look for any swelling, odor, discharge, or debris. Ears should be routinely checked and cleaned or treated (if necessary) because hearing is imperative for a LGD to be alerted to impending threats as early as possible (see picture of holding ear to examine).

Nails can become broken, split, traumatically injured, or even pulled out all of which can lead to pain as well as allowing infection into the body. It is important to check feet often, ensuring there are no objects (cockleburs, sticks, glass, metal, etc.) in or around the toes or between the pads. Also note if you feel any heat or notice any pain, swelling, odor, or discharge. Check all toenails for condition and length. Some LGDs have multiple dewclaws (extra toes) that do not touch the ground and do not get worn down naturally. Dewclaws can easily become overgrown, causing the nail to grow into the foot, which can cause a painful infection. Since we depend on LGDs to cover land with agility, maintaining their foot health is crucial for them to protect their stock (see picture of dewclaw trimming).

Annual Veterinary Costs

Generally speaking, annual veterinary costs for LGDs average from $500-1000. Minimally, this covers an annual physical (at least one although two is recommended), fecal exam, a heartworm test, vaccinations, dental cleaning, and much-needed preventative medications (flea, tick, heartworm,

gastrointestinal parasites, and some mites). We entrust LGDs with our valuable stock so ensuring their health and well-being is an investment in our stock's survival and profitability.

The average cost of an LGD is around $1000 for the first year, which includes the purchase price of the dog, vaccinations, spay/neuter, and preventative (flea, tick, heartworm), and approximately $500/ year thereafter (life expectancy of LGDs is about 12 years). Assuming the dog is of little protection the first year and increases in functionality in its second and third year the LGD will earn its keep by increasing the number of livestock animals weaned. If weaned stock bring in $100-$140 each, the dog would earn its keep and you will break even financially with the first 4-5 head weaned per year (Redden et al, 2013).

Livestock guardian dogs are certainly an asset to raising vulnerable livestock species. To operate at their peak, LGDs need proper care. Make LGD care part of your budget, just as you count on the animals they protect to provide income. Parasite preventatives, good nutrition, annual health exams, and grooming are essential to providing your LGD with the basic needs to do their best job.

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Emily Clement, *is a licensed Veterinary Technician currently working for Kentucky State University (KSU) with Dr. Ken Andries as a Small Ruminant Extension Associate and Research Co-Investigator. She has worked in the animal industry since 1994. Her experience spans from private veterinary practices, laboratories, wildlife rehabilitation, shelters, to teaching veterinary technology. Emily holds a Bachelor of Science in Agriculture from Murray State University and a Master's of Science in Public Administration from South University. She lives in Louisville, Kentucky where she shares her hobby farm/ garden and home with goats, bees, chickens, a potbellied- pig, and senior companion dogs.*

Questions regarding livestock guardian dogs can be sent to Emily.Clement@kysu.edu or Jerusha.Lay@kysu.edu.

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tales from
The Kentucky Fiber Trail
Summer 2019

Celebrating Ten Years of Fun at the Sheep & Fiber Festival

by Sarabeth Parido

The Kentucky Sheep & Fiber Festival, a natural fiber and local food event, celebrated its 10th year at Masterson Station Park in Lexington, Kentucky. It is quite a feat for a festival to last a decade. Trends come and go as do participants and volunteers- but our festival has grown and evolved over the years to become a highly anticipated event. Our final numbers are still pending, but we saw close to 5000 people come through the gate! The two-day festival showcased some of the nation's best fiber artists as well as offered nearly thirty workshops, sheep shearing demonstrations, and vendors with supplies for knitting, spinning, weaving, dyeing and crocheting.

This year, we changed our outdoor layout and added an incredible tent for our livestock vendors and fleece sale, thanks to funding provided by Agriculture Commissioner, Ryan Quarrels. The larger tent gave more space to our animals, to our vendors, and also hosted our fleece sale this year, which was a huge success for our fiber producers. Patrons arrived early on Saturday to get the first picks of the freshly shorn fleeces and proceeds went directly to the producer.

Our amazing vendors filled the Masterson Station Agriculture Building and Pavilion, with many more vendors lining the sidewalks of the park. Guests enjoyed two yarn buses this year, as well as many interactive vendor demonstrations throughout the day.

Our workshops highlighted the natural side of artistry. We had a sold out ecoprint class where students used leaves and foliage

Festival images courtesty of the City of Lexington Parks & Recreation Department

from their own yards, as well as a few fresh picked at the park, to dye silk and wool scarves. The class sold out so quickly our instructor, Theresa Brown, quickly opened another class to accommodate the waiting list! We also hosted natural dyeing, design, weaving classes, as well as many more classes for beginners.

Our sheep shearing demonstration was again a big hit, as guests got to see the sheep up close and personal as they were sheared. Many of our guests were able to ask questions, learn about the safety and health management of shearing as well as see wool skirted and bagged up, ready for market. For the very first time in festival history, we also sheared two mohair goats so that our guests could see and feel the difference between wool and mohair. Patrons were provided wool fact cards from the American Sheep Industry to help them learn more about the benefits and care of wool.

Our committee strives to see the festival continue to grow and offer the best of fiber arts and animals to our guests. Looking ahead to 2020 with excitement for where the next 10 years could take us.

Sarabeth Parido *is the Director of the Kentucky Sheep and Fiber Festival and The Kentucky Fiber Trail. She raises her own small flock of sheep in Clark County, Kentucky along with her husband and four sons. She spins and dyes her fiber into yarn and has taught knitting classes for nearly 20 years. Sarabeth is passionate about Kentucky fiber and wants to see great things happen for Kentucky wool producers.*

Record High Australian Crossbred Wool

Good News for U.S. Season

by Julie Stepanek Shiflett, PhD

Australia has experienced an unprecedented run-up of its crossbred wools. And this is good news for U.S. wool growers producing broader, coarser wool. It is this segment of the wool market that is most closely aligned with many wools in Kentucky and surrounding areas. In general, crossbred wool in Australia is from non-merino sheep, ranging from about 25 to 32 microns. Due to high lamb prices many Australian breeders introduced meat breeds into their flocks, reducing the average micron of wool, but increasing the value of lamb.

Australian crossbred prices have risen this year, while prices for finer merino wool has softened. Finer merino wools have shrunk in volume in Australia, and more importantly, its quality has declined, as Australia's drought takes its toll. Mr. Lamb, Endeavor Wool Exports commented, "We've seen record levels, or levels that are certainly at record highs over the last 25 years," (Australia ABC news, 4/5/19). Mr. Lamb added that a huge factor behind the price rise was a spike in Chinese demand for fake fur made out of wool. Wool consultant Andrew Dennis added: "Orders have hit the market, so people are scrambling to buy crossbred wool to satisfy that particular fashion demand," (Ibid).

Another factor supporting crossbred wool in Australia is the relative affordability of crossbreds relative to merino wool. As the price of merino wools increased, wool processors have looked to the cheaper broader wools in order to produce blended wool products and keep the 100% wool pledge to consumers. Mr. Dennis added, "People are using crossbred wool in place of merino wool to keep mills busy because it costs half the amount, and it's seen as the lower-risk way to fill machinery if the future is uncertain," (Ibid). Mr. Dennis confirmed that wool prices, as in many international markets, can be volatile and hard to predict, but he expected crossbred prices to remain strong for a few more months.

In Australia in early May, "the crossbreds continued to be the strongest performing sector of the market. Strong buyer demand helped to defy the trend seen in the merinos (finer wool), pushing prices higher," (Australian Wool Exchange, Ltd., 5/8/19). Twenty-six through 28 microns gained, although, on average, wools of all microns softened. "The better prepared lines enjoying the greatest gains," (Ibid).

Australian Wool Innovation's trade consultant, Scott Carmody, reported that the finer edge of crossbred wool, combined with finer Merino wool, produces a 'comeback' wool, (Australian farmonline, 2/2019).

On May 8, Australian wool prices were as follows for crossbred wools, average style and length, bellies out and unskirted (Australian Wool Exchange, 5/1/19). Twenty-five micron averaged U.S. $5.34 per lb. clean, 26 micron was $4.73 per lb., 28 micron averaged $4.08 per lb., 29 micron averaged $3.54 per lb. and 32 micron (the coarsest among this lineup) averaged $2.68 per lb. clean.

As a rule of thumb, divide clean prices by two to calculate greasy prices. Midwestern and Eastern growers are typically paid for greasy, not clean, wool. The converted greasy price for $4.08 per lb. clean for 28 micron is $2.04 per lb. greasy. Typically, U.S. growers can receive 75 to 85 percent of Australian wool prices because, in general, Australian wool is better prepared. If 28 micron received $2.04 per lb. greasy in Australia, then U.S. growers could expect roughly 80 percent, or $1.67 per lb. greasy. There are couple reasons why growers may receive lower returns. Lower priced wool may be because the wool is not well prepared. Perhaps the dirtiest part

of the clip, the bellies, are not separated. Also perhaps because it is because wool volumes are low regionally, and additional value-added in sorting and marketing is necessary before attracting wool buyers.

Domestic Wool Markets Thin

To date, only limited domestic wool prices have been reported by the Agricultural Marketing Service (AMS). It is recommended that wool growers use imported Australian wool prices as a price guide for this season's sale.

On May 10, California and the Western wool prices were reported by the U.S. Department of Agriculture (USDA) AMS. In general, prices for 24-27 micron wools were roughly 10 percent lower than received last year. It is expected that the U.S.-China trade jitters lowered price offers for coarser wools. The broader micron wool prices were as follows: 24 micron averaged $5.11 to $5.13 per lb. clean; 25 micron brought $4.25 per lb., 26 micron saw $3.54 per lb., and 27 micron was $3.08 per lb.

Wool Skirting and Classing adds Value

Any on-farm wool preparation that reduces wool pool or warehouse sorting can add value to growers' wool. Skirting removes the dirty parts of the wool clip, typically along the edges of the clip such as from its belly, legs and rear. The shorter wool from the neck and parts of the shoulder wool is also removed. The American Wool Council advises: "All fleeces must be carefully and minimally skirted to ensure that only inferior wool is removed and all good fleece wool remains with the fleece," (No date).

Classing wool means separating wool into various lines according to fineness (mean fiber diameter, or micron); yield (amount of clean wool obtained from greasy wool); length; strength (fiber should not break easily by hand); color and style (the overall physical appearance with regard to crimp, handle and color) (American Wool Council, no date).

Due to the fact that many eastern wool growers producer lower volumes of wool relative to western producers, the wool pool will likely conduct classing on behalf of producers. It this critical step, of combining like wools with like wools, that eastern wool growers pay their wool pool for. This process adds value because wool processors look for certain specifications of raw wool when fulfilling their orders.

A 2007 study revealed that, on average, wool that is skirted and classed received 8 percent higher prices than wool prepared with only belly wool removed in 1993 to 2002 (Anderson, et al., 2007). Skirting and classing of fine wool at the producer level is expected to continue to be a value-adding procedure that will enhance the position of U.S. wool in domestic and international markets.

Count of KY Wool Growers Down

The key to a good wool year in Kentucky and its neighbors is collecting a significant volume of like wool to attract buyers. Between 2012 and 2017, the USDA Census reported that the number of Kentucky sheep operations jumped 62 percent in 5 years to 2,818 operations. However, the number of operations producing wool fell 48 percent to 234 operations. That is, between 2012 and 2017, the share of sheep operations producing wool fell from 26 percent to 8 percent.

The lower share of wool operations in Kentucky mirrors a national trend. While the total number of U.S. sheep operations gained 15 percent between 2012 and 2017 to 101,387 operations, the number of operations producing wool fell 35 percent to 32,728 operations. The portion of operations running wool fell from 52 to 32 percent. Hair sheep have become more popular in many regions of the county that might not necessarily be well-suited to wool breeds such as in Texas.

Although the number of wool growers is down, wool production was up in Kentucky. In five years, 2014-2018, Kentucky wool production increased 15 percent to 275,000 lbs. greasy. Its wool yield average 6.4 lbs. per head of greasy wool for a total value of $261,000, up 14 percent in 5 years. Prices per lb. averaged 87 cents per lb. greasy in 2014 and 95 cents per lb. in 2018. The price trends reported by USDA generally follow national clean wool prices reported by AMS.

What's Next?

Wool sales this spring and exports this summer will be affected by the uncertainty of wool export tariffs to China. Last fall China enacted a 10 percent tariff on raw wool exports, but the threat of higher tariffs still looms. As of this writing in mid-May, U.S.-China trade talks had escalated and a new round of higher tariffs by both parties likely a reality. Reaffirming relationships with domestic wool processors and supporting local wool products will be key to enhancing domestic wool demand today and in years to come.

Visit the Kentucky Sheep and Goat Development Office Wool Pool at https://www.kysheepandgoat.org/wool-pool to learn more about the wool pool and 2019 prices.

Julie Stepanek Shiflett, PhD *consults for the American Sheep Industry Association. She also consults independently, preparing feasibility studies for farmer and ranchers. Julie received her PhD in Agricultural Economics from Michigan State University and currently raises Boer goats in western Colorado.*

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Baa, Baa, Black Sheep *or* How Inheritance Works

by Debra Aaron, Professor, Department of Animal and Food Sciences, University of Kentucky

Genetics is the science of heredity. It seeks to explain differences and similarities exhibited by related individuals. The application of genetics to livestock improvement is known as ***animal breeding***. The objective of this article is to provide a refresher course on basic genetics and show how a knowledge of genetics can be used to improve sheep production now and in the future.

Basic Principles of Inheritance

Genes are the basic units of inheritance and, as such, form the link between generations. Genes are located on microscopic, threadlike structures called ***chromosomes***. Chromosomes, and thus, genes, occur in pairs in the nucleus of all body cells. Each gene pair occupies a specific location on a particular chromosome pair. Each species has a characteristic number of chromosomes and all normal individuals of that species will have the same number of chromosomes. In sheep, every body cell contains 27 pairs for a total of 54 chromosomes. Each of the chromosomes carries many genes. Think of genes as beads on the various chromosome strings.

Chemically, chromosomes are made up of ***DNA*** (deoxyribose nucleic acid), and genes are specific portions of the DNA molecule. Each biochemical reaction that occurs within an animal's body is controlled by a particular gene or set of genes. Specifically, genes control the synthesis of proteins, which, in turn, operate as enzymes in controlling cell development and function.

Geneticists now have a 'virtual' DNA map of almost the entire sheep genome. This will enable them to pinpoint the genetic controls for economically important production traits. While most unique genes are not yet identified, the sequence of nucleotides (the building blocks of DNA), is known for a short distance at more than 50,000 places along the sheep genome. Identification of the variations in these sequences (called single nucleotide polymorphisms—SNPs and pronounced 'snips') is the next step toward identifying the actual genes and their roles in controlling specific sheep production traits. Using a genomic tool called the Ovine SNP_{50} BeadChip (Ilumina, Inc.), researchers are able to characterize the small genetic differences that produce a wide range of economically important traits in sheep, such as improved growth rate, fertility, parasite resistance, and healthier meat products. This has the potential to transform the way producers select and breed sheep in the future.

Although genes occur in pairs and both members of a pair act cooperatively to produce effects in an animal, genes are transmitted from parent to offspring not in pairs, but singularly. During the formation of the sex cells, the egg and sperm, the genes of a pair, separate or go apart. This is known as ***segregation***. As a result, the sex cells each contain only one member of a gene pair. Which gene of a pair goes to an egg or sperm is simply a matter of chance.

When the egg and sperm unite at fertilization, the genes of a pair recombine in the offspring. In this process, the sex cells are, in effect, paired in the body cells of the offspring. Thus, half of an individual's genes come at random from the sire and half come at random from the dam. It is this chance segregation of genes in the production of sex cells and their ***recombination*** at fertilization that is the main cause of genetic differences among related individuals.

Inheritance of Wool Color: An Example

A simple example involving color inheritance in sheep illustrates the segregation of a gene pair in sex cells and the subsequent recombination of the genes in the offspring. For illustrative purposes, we will assume this trait is determined by a single pair of genes.

The two genes involved are a gene for white wool, symbolized by W, and a gene for black wool, symbolized by w. Each sheep will have two genes for this trait. The two genes will be located on one of the 27 chromosome pairs, with one gene on one member of the chromosome pair and the other gene at the same location on the other member of the chromosome pair. There are three possible gene combinations (***genotypes***) for the two genes being considered. These are shown in Table 1 (pg 21).

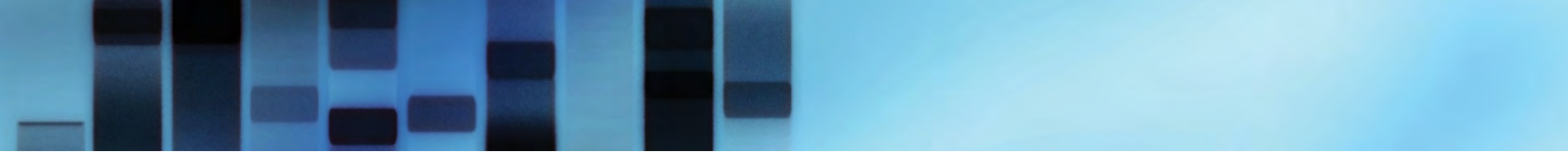

Table 1. Possible Gene Combinations for Wool Color Example

Genotype	Phenotype
WW	White-wooled
Ww	White-wooled
ww	Black-wooled

However, only two ***phenotypes***, white-wooled and black-wooled, are distinguishable. Phenotype refers to the appearance or measured performance of an individual for a trait.

Notice the phenotypes of sheep with genotypes WW and Ww are indistinguishable. The gene for white wool, W, is said to be a ***dominant*** gene because it masks or covers up the effect of the gene for black wool, w, which is called a ***recessive*** gene. Because the W gene is dominant over the w gene, black-wooled sheep must have the phenotype ww.

During reproduction, each parent transmits either a W or a w gene to the offspring. A sheep with genotype WW can only transmit a W gene to its offspring. Likewise, a sheep of genotype ww can only transmit a w gene to its offspring. Individuals with either of these two genotypes are said to be ***homozygous*** for this pair of genes because both genes of the pair are alike.

However, a sheep with genotype Ww can transmit either a W or a w gene to its offspring. Individuals with genotype Ww are said to be ***heterozygous*** for this pair of genes because the two genes of the pair are different. Heterozygous individuals are sometimes referred to as 'carriers' because their genotypes carry the recessive gene. On average, a sheep of genotype Ww will transmit the gene for white wool (W) to half its offspring and the gene for black wool (w) to the other half. As a result, the chance, or probability, an individual with genotype Ww will transmit the w gene to any one offspring is ½.

Probabilities

Using this information, the next step is to illustrate how genes of a pair recombine in the offspring when the egg and sperm unite at fertilization. With the three genotypes possible for a trait controlled by a single pair of genes (Table 1), it is possible to have six different kinds of matings (Table 2). Because the reproductive process ensures one gene from each gene pair will be transmitted to each sex cell and because chance determines the union of egg and sperm at fertilization, the expected offspring genotypic ratios can be found using simple probabilities. For example, consider the mating of two heterozygous (Ww) white-wooled sheep. What is the chance, or probability, of getting offspring of the three possible genotypes, 'WW, Ww, and ww?

Table 2. Possible Matings and Expected Genotypic and Phenotypic Ratios for Wool Color Example

Mating Type	Expected Ratios Among Offspring
WW (white-wooled) x WW (white-wooled)	All WW (white-wooled)
WW(white-wooled) x Ww (white-wooled)	1 WW to 1 Ww (all white-wooled)
WW (white-wooled x ww (black-wooled)	All Ww (white-wooled)
Ww (white-wooled) x Ww (white-wooled)	1 WW (white-wooled) to 2 Ww (white-wooled) to 1 ww (black-wooled)
Ww (white-wooled) x ww (black-wooled)	1 Ww (white-wooled) to 1 ww (black-wooled)
ww (black-wooled) x ww (black-wooled)	All ww (black-wooled)

Two basic probability rules can be used to answer this question. First, the chance, or probability, two independent events will occur together is the product (multiplication) of the chance, or likelihood, or each separate event. Second, the chance of occurrence of one or the other of two mutually exclusive events is the sum (addition) of the chances of each event occurring separately.

Half of the sex cells produced by heterozygous white-wooled sheep (Ww) will contain the gene for white wool (W) and the other half will contain the gene for black wool (w). The chance of the sperm carrying the w gene is ½ and the chance of the egg carrying the w gene is also ½ in this mating. Thus, using the first probability rule, the chance of a lamb from this kind of mating being black-wooled (ww) is ½ x ½ = ¼. Likewise, the chance of a lamb from this kind of mating being homozygous white-wooled (WW) is also ¼.

There are two ways of producing a lamb with the genotype Ww. A lamb will be heterozygous white-wooled if the sperm carries the W gene and the egg carries the w gene (which using the first probability rule will occur ½ x ½ = ¼ of the time) or if the sperm carries the w gene and the egg carries the W gene (which will also occur ¼ of the time). Finally, using the second probability rule, the chance of a lamb being Ww from this type of mating is the sum of the chances of each event occurring separately, ¼ + ¼ = ½.

On the average, the mating of two heterozygous white-wooled sheep would be expected to produce one WW (white-wooled) to two Ww (white-wooled) to one ww (black-wooled) offspring when four lambs are produced. Although both parents are white-wooled phenotypically, there is a one-in-four chance a mating of this type will produce a black-wooled (ww) offspring. Thus, heterozygous individuals do not breed true. White-wooled sheep are known to carry the black wool gene if they have at least one black-wooled lamb or if one of their parents is black-wooled.

All possible crosses involving the three genotypes, with the expected lamb genotypes and phenotypes for each, are illustrated in Table 2. The expected offspring ratios can be obtained using the same procedure as was used to obtain the offspring ratios for the mating between heterozygous (Ww x Ww) white-wooled sheep.

Types of Traits

Qualitative Traits. Color inheritance (white versus black wool) has been used to illustrate basic genetic principles involved in the transmission of characteristics from parent to offspring because only a single pair of genes is involved. In addition to wool color, several other traits in sheep are determined by one or only a few pairs of genes. The presence or absence of horns and some genetic defects, such as parrot mouth, inverted eyelids (entropion), and cryptorchidism, are also examples of traits in which one pair of genes has the major influence. In these examples, non-genetic or environmental factors have very little influence on phenotypic expression. Also, sharp distinctions usually exist between phenotypes.

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Quantitative Traits. Most traits of economic importance in sheep production (growth rate, feed efficiency, fleece weights, carcass characteristics, etc.) are controlled by many pairs of genes, the exact number of which is still not known. In addition, there is often no sharp distinction between phenotypes. To complicate matters further, environmental factors, such as nutrition, climate, and disease, may have a large effect on the phenotypic expression of these traits. Birth weight, 60-d weaning weight, yearling weight, and grease fleece weight are all examples of quantitative traits in sheep.

Inheritance of a Quantitative Trait

Inheritance of a quantitative trait is more complex than that of a qualitative trait, such as wool color, because of the increased number of genes involved. Thousands of gene combinations are possible in any animal. In quantitative traits, genes may act ***additively*** and individual gene effects are often small. When genes act additively, their effects can be compared to adding block upon block in constructing a building. Although the principles of segregation and recombination still hold, it is currently still impossible to identify individual genes and determine specific genotypic ratios in quantitative traits.

Yearling Grease Fleece Weight: An Example

The following simple, hypothetical example illustrates the concept of quantitative inheritance. Suppose yearling grease fleece weight in sheep is influenced by two pairs of genes (one pair at the A locus and the other pair at the B locus) with additive [AaBb = ½ (AABB + aabb)] and equal (A = B) gene effects. Also, environmental effects are assumed to be the same for all genotypes. Phenotypic values are assigned to genotypes to reflect these assumptions.

Suppose individuals with genotype aabb have yearling grease fleece weights of 8 lb and every A or B gene contributes 2 lb to an individual's yearling grease fleece weight. Thus, individuals with genotype AABB would have yearling grease fleece weights of 16 lb. If individuals with genotype AaBb (12 lb) are mated together, the expected genotypic and phenotypic ratios among the offspring produced are shown in Table 3.

Table 3. Expected Genotypic and Phenotypic Ratios for Yearling Grease Fleece Weight Example (AaBb x AaBb)

Genotypes	Yearling Grease Fleece Weight (lb)
1 AABB	16
2 AABb	14
2 AaBB	14
1 AAbb	12
4 AaBb	12
1 aaBB	12
2 Aabb	10
2 aaBb	10
1 aabb	8

Notice the individuals that were mated have yearling grease fleece weights of 12 lb and the average yearling grease fleece weight of the lambs produced is also 12 lb. However, considerable variation exists among the offspring (grease fleece weights range from 8 to 16 lb).

A Word of Caution

It is important to realize this illustration is oversimplified. Most quantitative traits, like yearling grease fleece weight, are influenced by other types of gene action, such as dominance and epistasis (genes at one locus influence the action of genes at another locus), in addition to the additive gene action illustrated here. Also, yearling grease fleece weight in sheep is influenced by many pairs of genes and the contribution of the different gene pairs may vary. Furthermore, yearling grease fleece weight is influenced by breed, as well as environmental factors, such as feeding level, season, and climate.

All of these factors tend to complicate the genotypic expression of the individual. In reality, the phenotype of a quantitative trait may not reflect the genotype directly because of environmental and non-additive genetic effects.

Genetic Improvement Through Selection

Genetic improvement results from selection and is possible because different genotypes tend to determine different phenotypes. Because genotypic expression is often limited or exaggerated by environmental effects in quantitative traits, their genetic improvement is more complicated than genetic improvement of qualitative traits. Not all of the phenotypic differences exhibited by parents are transmitted to their offspring.

Heritability

The proportion of the phenotypic differences among animals for a specific trait that is transmitted to their offspring is known as ***heritability***. The higher the heritability for a trait, the more rapid the rate of genetic improvement for that trait. Heritability values may range from 0 to 100%. Generally, reproductive traits are lowly heritable (0 to 20%), growth traits are low to moderately heritable (20 to 40%), and fleece and carcass traits are moderate to highly heritable (30 to 60%). Estimates of 30% for weaning weight and 40% for yearling weight indicate selection should be fairly effective for these traits. However, it is important to realize traits vary in heritability and, as a result, rates of genetic improvement will vary, depending on the specific trait involved.

Breeding Values

Heritability can be used to estimate an animal's ***breeding value*** (EBV). Every animal has a breeding value for each trait. Breeding values represent the total additive effect for all genes influencing the phenotype for a specific trait. In other words, breeding values are a measure of gene transmitting ability. Unfortunately, we cannot observe an animal's breeding value directly.

Breeding values can be estimated as the difference between the individual animal's performance and the average of its contemporary group (***selection differential***) multiplied by the proportion of the difference expected to be transmitted to the offspring (***heritability*** for the trait). Because the breeding value is an estimate of what an individual is expected to transmit to its offspring for a particular trait, those animals with the highest breeding values should be expected to produce the most desirable progeny. As a result, they increase the frequency of desirable genes in the flock or breed.

Because an animal contributes only half its genes to its offspring, an individual transmits only half its breeding value. For example, if a ram has a breeding value of 12 lb for weaning weight, on the average he should transmit 6 lb of that to his progeny.

In other words, if this ram was mated to a random sample of ewes, the resulting progeny are expected to be 6 lb above average for weaning weight. This value (one half of the breeding value) is referred to as the ***expected progeny difference*** (EPD).

Estimated breeding values are most useful for comparing genetic merit between individuals within the same breed. Suppose the ram in the previous example (weaning weight EBV = 12 lb; EPD = 6 lb) is compared to a ram having a weaning weight EBV of 4 lb (EPD = 2 lb). We would expect an average difference of 4 lb (6 - 2 lb) in the weaning weights of their offspring, with the advantage going to the first ram. The ram with the highest EBV (EPD) wins.

When available, performance of relatives (progeny, siblings, ancestors) can be used to estimate the genetic merit of an animal. For example, information from the individual, paternal half-sibs, maternal half-sibs, and progeny can be combined into a single estimate of the individual's EBV for a specific trait. Including information on relatives, in addition to the individual's own performance, will increase the accuracy of EBV estimation, especially for lowly heritable traits. When the heritability of a trait is moderately high, the individual's own record is more important and the improvement in accuracy is less.

Presently, the National Sheep Improvement Program (NSIP), in conjunction with Australia's LambPlan, calculates EBV for maternal, growth, and wool traits using information on the individual, ancestors, collateral relatives, and progeny. These EBVs can be used to make genetic comparisons among the animals evaluated within a breed. Currently, breeds participating in NSIP/LambPlan include Border Leicester, Columbia, Dorper/White Dorper, Dorset, Hampshire, Katahdin, Lincoln, Oxford, Polypay, Rambouillet, Shropshire, and Suffolk.

Summary

Understanding the basic principles of inheritance is necessary if producers are to use genetic tools for sheep improvement. Although the basic principles hold for all traits, the inheritance and genetic improvement of a quantitative trait, such as yearling grease fleece weight, weaning weight, yearling weight, etc., is more complex than that of a qualitative trait, such as wool color. Traditional selection, based on estimation of genetic merit using the individual's phenotype and information on relatives, has resulted in improved sheep production. This has been enhanced by breed-wide genetic evaluations conducted by the National Sheep Improvement Program and LambPlan. In the future, genetic improvement in economically important traits may be accelerated even further using genomic tools for direct selection of genetic differences underlying phenotypes.

Dr. Debra K. Aaron, PhD, *professor in the UK Dept. of Animal Sciences, teaches animal science and genetics. Her research interests are in sheep breeding and genetics.*

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MANAGING INTERNAL PARASITES IN THE WOES OF SUMMERTIME

by Beth Johnson, DVM

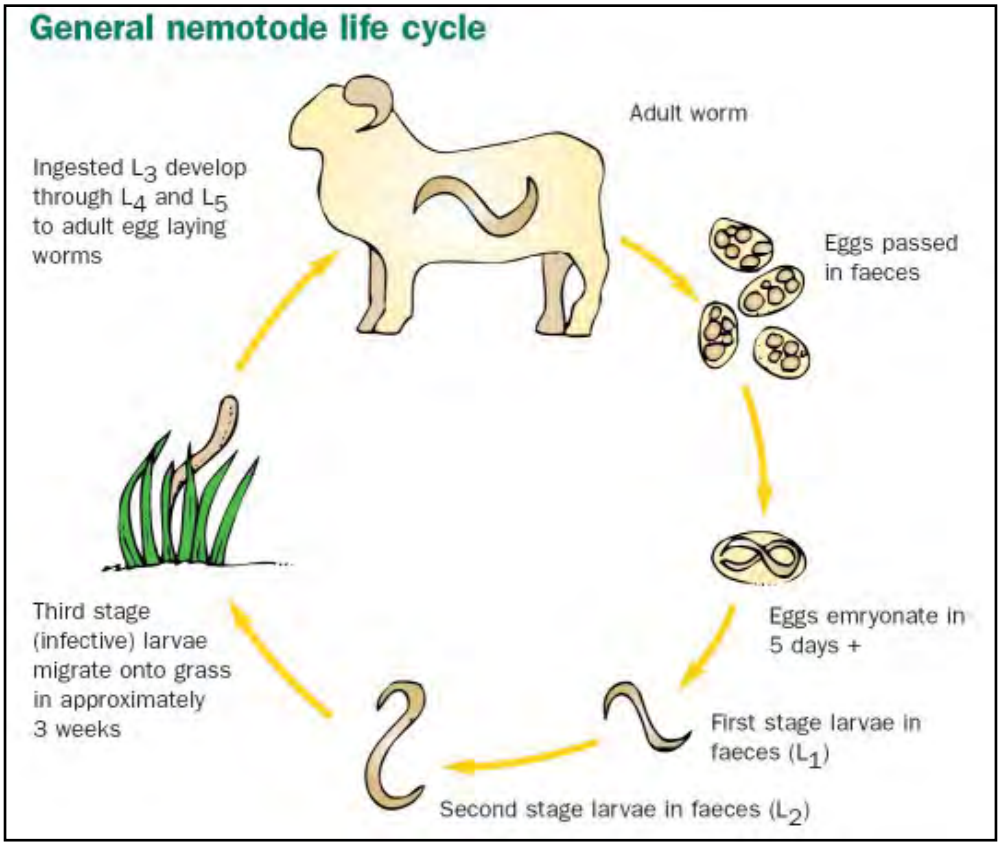
Summertime is when our animals flourish due to the abundant forages available in our state. But why does it seem that the young sheep and goats don't seem to perform as well as they should with the excellent forage available to them. Most of the time it is due to the increased parasite burden that they are challenged with during the late spring, summer and fall. Hopefully this article will help with managing your flock/herd while they are out grazing this summer.

We must first understand what parasites are exposed to our animals. **Enemy Number 1**: *Haemonchus contortus*. This is a very prolific blood sucking parasite that resides in the abomasum of sheep and goats. The life cycle of this nematode and other nematodes, i.e. Trichostrongylus and Ostertagia (HOT Complex) is pictured in **Figure 1**. As you can see the primary mode of transmission is ingesting the third stage larvae on a blade of forage. The larvae crawls up a blade of grass and is usually found within dew droplets on the blade of grass. The larvae usually aren't found any higher than 2 inches on the blade of grass. This is why it is important to graze pastures that are at least higher than 4-6 inches, and not graze any lower than 3-4 inches in height. Rotational grazing systems which are discussed later in this article are very important in parasite control for small ruminants.

Enemy Number 2: Tapeworms. Tapeworms are the only parasite that can be visualized in the feces of infected sheep and goats. Tapeworm segments which contain the eggs are small white flat worms easily visualized. There are two different life cycles of the tapeworm parasite, one of which involves a snail as an intermediate host. Similar to another parasite, *Paralephastrongylus vulgaris*, commonly referred to as the meningeal worm.

Enemy Number 3: Coccidiosis. Coccidiosis involves a protozoal organism that colonizes in the small intestinal tract and undergoes multiplication and eruption from the mucosal epithelial lining of the intestines. This eruption causes significant damage to the intestinal epithelium which affects nutrient digestion and absorption. Coccidiosis is a disease that can be controlled by keeping the environment clean and through the use of coccidiostats in the grain or minerals provided to sheep and goats. Minimizing overcrowding and overgrazing are two important management tools used to control intestinal parasites and coccidiosis.

Figure 1. Life cycle of Gastrointestinal Nematodes (GIN)



Hypobiosis

Understanding parasitism requires one to understand hypobiosis which is the ability of nematode larvae to arrest development and persist in the host until times more conducive for infectivity either in the environment or within young neonates. Periparturient rise is a phenomenon which occurs in the pregnant sheep and goats that allows the arrested development of hypobiotic larvae to develop into adults insuring pasture contamination of infective eggs and subsequent larvae to young lambs and kids which are extremely susceptible to these parasites. Strategic deworming, i.e. deworming the dam at lambing or kidding, reduces the load of infective larvae on the pasture.

We also see hypobiosis during periods of good immune function in the host and subsequent maturation of hypobiotic larvae during periods of suppressed immune function, i.e. sickness, stress, lambing/kidding. Parasites can also enter a state of hypobiosis when the environment is not conducive for survival of the parasite. Examples of harsh environmental conditions include the severe cold of the winter and dry hot environments during

the summer. Therefore, understanding the physiology of the host and the parasite, and utilizing anthelmintic treatments during these periods will aid in reducing parasite infectivity on pasture and improve performance of your lambs and kids, especially in the spring, summer and fall.

Maintaining Refugia

Refugia is a term used in parasite control to maintain a population of parasites which are susceptible to the anthelmintic treatments utilized on a farm. One important way to maximize refugia is to only deworm the sheep and goats within your flock/herd that need it. Remember that research has demonstrated that 20% of animals within a herd can produce 80% of the eggs. Identification of the sheep or goats utilizing FAMACHA and/or Five Point Check©, and deworming only animals exhibiting signs of parasitism will maximize refugia within the herd.

The Five Point Check© method involves evaluating sheep and goat's ocular membranes (FAMACHA score), jaw (presence of bottle jaw), nose (are nasal bots present), back (body condition score) and tail (dag, i.e.presence of diarrhea, score). The Five Point Check© allows a producer to determine if an animal is heavily parasitized by more than just *Haemonchus contortus* whereas the FAMACHA method only identifies those feeling the effect from H. contortus, i.e. anemia.

Anthelmintic therapy

When the sheep or goat appears to require anthelmintic treatment there are essentially three classes of compounds to choose from:

- Benzimidazoles
  - Fenbendazole (Safegard, Panacur)
  - Albendazole (Valbazen, Synanthic)
- Avermectin / Milbemycins
  - Ivermectin (Ivomec)
  - Moxidectin (Cydectin, Quest)
- Imidazothiazoles/ Tetrahydropyrimidines
  - Levamisole (Prohibit), morantel (Rumatel)

The current thought is to utilize two drugs from different classes when a sheep or goat is dewormed. i.e. safeguard/cydectin

When introducing new sheep or goats onto your farm you may want to use a drug from all three classes. i.e. safegard/cydectin/prohibit and perform fecal exams 7-10 days after deworming. If the animal is still harboring eggs then they may possess parasites that are resistant to anthelmintic drugs and you should be concerned about introducing that animal into your flock/herd.

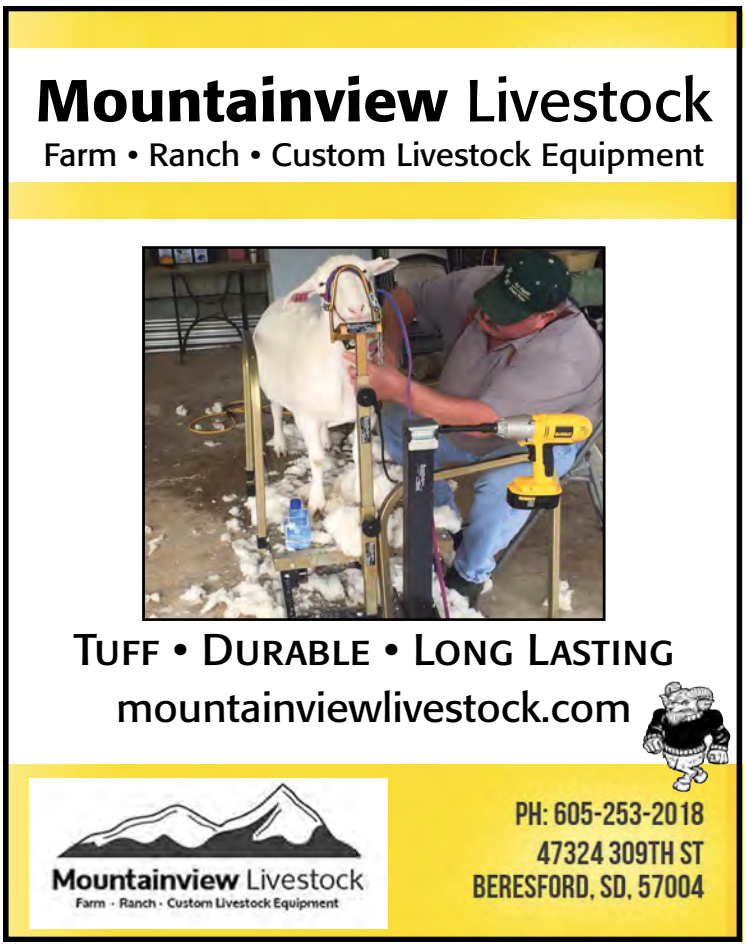
Strategic deworming utilizes deworming during periods of stress, periparturient rise, and environmental conditions which are conducive to parasite infectivity. For example, only deworming sheep or goats that have a FAMACHA score of 3, 4 or 5. Through strategic deworming sheep and goats we maintain high levels of refugia within the flock/herd.

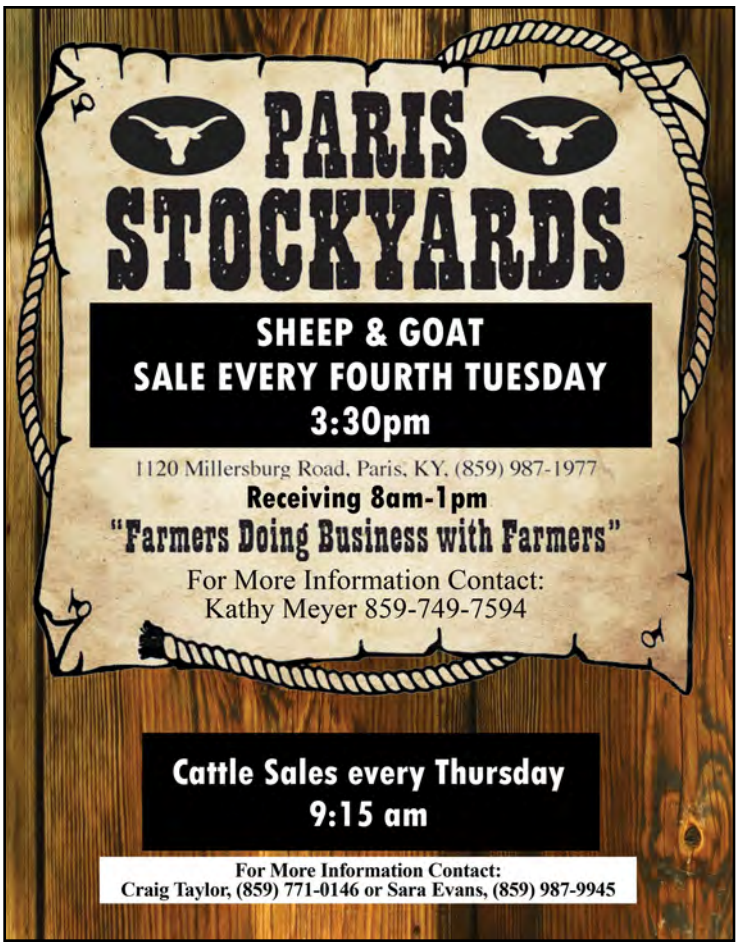
Alternative parasite control therapies:

Copper Oxide Wire Particles (COWP)

Copper is a mineral which is essential to both sheep and goats. Many sheep do not require much copper in their diet but we are diagnosing more cases of copper deficiencies in sheep and goats due to the lack of copper in the environment, feedstuffs, and minerals. Copper deficient animals experience reduced immune

Internal Parasites continues on pg. 26





Internal Parasites continued from pg. 25

function, increased susceptibility to internal parasitism, weakness, fetal abnormalities, poor hair coat, etc.

Copper deficiency may be diagnosed through measuring the level of copper in the serum. Unfortunately this is not the most accurate method for detecting the true mineral status of the sheep or goat. Liver biopsy mineral assays or performing mineral assay on the liver of a deceased animal yields a more accurate picture of herd mineral status. It is always wise to have a thorough necropsy completed on animals that die within your flock/herd to determine death of the an animal. If a necropsy is completed, always request a liver mineral analysis.

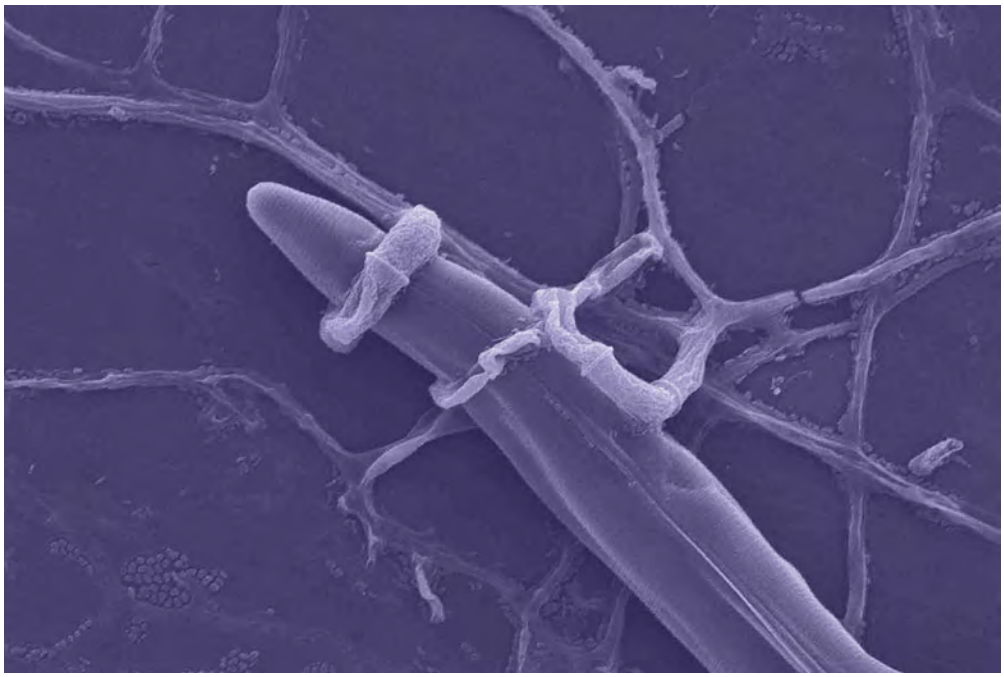
If copper deficiency is a concern within a flock or herd, the free choice mineral provided should be evaluated. Copper oxide wire particles have been shown to assist as an alternative parasite control method. This is especially true if the herd or flock is deficient in copper. Fortunately there are copper oxide wire particle capsules that are commercially available in 2g & 4g sizes. Prior to using COWP's on a sheep flock, copper analysis should be done. Goats are usually not as susceptible to copper toxicity. Sheep flocks with diagnosed copper deficiency should use the 2 gram boluses in animals >80lbs. Goats can receive a 4 gram bolus in animals >80lb or a 2 gram bolus in animals <80 lbs.

High tannin containing forages

There has been quite a bit of research studying the effects of high tannin forages and how they assist in controlling intestinal parasites. Research indicates that there is a reduction in total fecal egg output in small ruminants grazing AU Grazer, a variety of lespedeza. Other high tannin forages are: chicory, birdsfoot trefoil, and sainfoin.

Sericea lespedeza is easily grown and goats and sheep tolerate it well in the early stages of growth. There are commercially available lespedeza pellets produced by several feed companies. There has been some research indicating a benefit to controlling gastrointestinal nematodes (GIN) and coccidia when these pellets are fed. A mixed grass/legume hay with lespedeza in it may also be beneficial.

Figure 2. Newly marketed fungi, Duddingtonia flagrans, trapping nematode larvae



Fungi that inhibit egg development into larvae.

A new biological product available in the United States is a fungi, *Duddingtonia flagrans*, which traps nematode larvae. See **Figure 2**. When fed to livestock, the fungal spores pass through the gut of the animal and are excreted with the worm eggs in the dung. The fungal spores then germinate and grow networks of traps that ensnare and kill the worm larvae soon after they emerge from the eggs. One important point is this new product does not kill the adult worm. Therefore it is important to deworm sheep and goats exhibiting signs of significant parasite loads, i.e anemia, exercise/heat intolerance, rough hair coat, weight loss, and weakness. Due to the effects of the fungi on the developing larvae and subsequent reduction in the number of larvae consumed by sheep and goats, reinfection is reduced on pasture.

An important concept is this product must be fed daily during periods of possible shedding of eggs onto pasture which is almost the entire year in Kentucky. The product is marketed as Livamol® with BioWorma® through International Animal Health Products (**See Figure 3**). It is important to feed this product as a top dress and should not undergo any processing which involves heat, i.e. incorporated into a complete pellet. It can be mixed in a textured feed mix which does not undergo heat during mixing.

Figure 3: Livamol® with BioWorma®

Pasture Management:

When considering pasture management to reduce parasite load there are several areas to consider:

- Rotational Grazing
- Including browse
- Including tannin rich forages
- Grazing multispecies of animals
- Harvesting hay
- Increasing forage quality

Rotational Grazing: The majority of infective larvae will be found within the bottom three inches of plants; therefore, moving animals before overgrazing occurs will help control infection. As stated earlier, nematode eggs develop within 3-4 days to the infective L3 stage (see **Figure 1**). Best control may be achieved by moving animals

every 1-3 days to a new area. This will also reduce time spent in one loafing area within a grazing pasture which can lead to reinfection. Rotating pastures will also maximize forage quality. Pastures should not be grazed for a period of 28-60 days depending on regrowth and season of the year. One option is to mow the pastures that are not being grazed for hay. This also allows sunlight to kill eggs and larvae that are present on the pasture.

Following Recommended Grazing Heights: Depending on the type of forage (cool season perennial grasses, warm season perennial grasses, and/or warm season annuals), animals should be turned into pastures at optimum nutrient utilization and allowed to graze the forages to not less than 4-6 inches of height.

Electric fencing has made it easier to subdivide pastures into lots that can be rotated through to allow better utilization of forages and minimize parasite infestation on the pastures. Contact your local electric fence retailer to design a fence that is easiest for your operation and cost effective.

Cutting pastures for hay exposes the eggs and developing larvae to sunlight. These pastures can then be allowed to regrow and be grazed later in the season at minimal infectivity of gastrointestinal nematodes (GIN's).

Grazing multiple species:

The gastrointestinal parasites that infect horses and cattle are different than the ones infecting sheep and goats; therefore, in a rotational system a producer may decide to graze them together. Or a better method is to graze the sheep and goats in a rotation with cattle or horses following after them. The only concern if grazed together is the supplemental minerals and/or feed that is provided to each species. One benefit to using multiple species is that they prefer to eat different plant species. Sheep and goats typically consume some of the more noxious weeds, making the pastures better utilized by keeping weeds to a minimum.

The bottom line to parasite control is to maximize nutrient intake by grazing quality pastures that have been properly maintained! If animal's nutritional needs are being met with the use of good forage, well balanced minerals, and plenty of good clean water then, you are well on your way to controlling gastrointestinal parasites and increasing the weight gain on those young lambs and kids.

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Dr. Beth Johnson *is a Staff Veterinarian in the Kentucky Department of Agriculture and has 40 years of experience raising and treating small ruminants. Her family farms in Parksville, KY where she raises Gelbvieh cattle and Boer goats.*

Lyme Disease in Livestock Guard Dogs

by Jessie Lay, DVM

Livestock guard dogs are the protectors of not only the livestock, but also the investment of the producer on many small ruminant farms. These gentle giants are often easy going and low maintenance; however, there are several dangers associated with their line of work. A common problem seen in livestock guard dogs is external parasites and higher risk of rickettsial diseases such as, Lyme disease, Rocky Mountain spotted fever, and ehrlichiosis.

Lyme disease is caused by a bacteria called Borrelia burgdorferi. It is more prevalent in some geographic areas than others, but we commonly see it in Kentucky. It is transmitted by multiple types of ticks however the deer tick or the black legged tick (Ixodes spp.) are the most common vectors of this disease in Kentucky. It is important to note that the ticks themselves don't cause the infection; they are simply the carriers of the disease. Therefore, not all ticks harbor the bacteria, but the ones that harbor B. burgdorferi, do not get sick themselves. Instead, when an infected tick attaches itself to a livestock guard dog (or the livestock themselves) the ticks inject the bacteria into the animal. Once an infected tick bites the animal, it may be months before the dog begins showing symptoms of the disease.

The route of transmission is very important as we start talking about the general risks to various animals. Since livestock guard animals are housed outdoors, it makes them likely to be exposed to ticks than the average house dog. Thus, guard dogs are more likely to receive a tick bite than the average house dog. While not every tick carries the disease, the more tick bites a dog receives increases the probability that an infected tick will bite the guard dog. In addition, livestock guard dogs often have very thick hair coats and are usually not brushed daily so we are less likely to notice if the guard dog has ticks on them.

Not all affected animals will display the same symptoms. Some dogs may become infected and be asymptomatic, showing no symptoms at all. The most common form of Lyme disease starts with a fever and the dog losing its appetite. The symptoms may then progress to include swollen joints and lameness, which may be intermittent or which shifts affected legs. Once again, especially in older livestock guard dogs, the symptoms may be overlooked or assumed to be arthritis or hip dysplasia so it is important to have guard dogs showing these symptoms evaluated by your veterinarian.

The most dangerous form of Lyme disease affects the animal's kidneys and this is usually fatal. Symptoms of Lyme disease involving the kidneys mimic acute kidney failure. Dogs become anorexic, drink more water than usual, and may even vomit. Livestock guard dogs often share water sources with the livestock, making it difficult to measure or notice the increase in water consumption in the dogs.

Although it is less common, Lyme disease may also present as neurologic or cardiac disorders. In these cases, the symptoms may range from coughing to facial paralysis or even seizures.

If you suspect that a livestock guard dog has Lyme disease, it should be taken to a veterinarian. Based on history and symptoms, the veterinarian may recommend a blood test. Most blood tests can only detect whether the dog has been exposed to Lyme disease. Your veterinarian will make a diagnosis on the clinical signs the animal is displaying and a positive test for exposure to Lyme disease. If your veterinarian diagnoses or suspects Lyme disease, the treatment includes antibiotics for several weeks. Although this may eliminate some or most of the symptoms, some dogs may have lifelong joint issues or damage to the kidneys that may not be reversible.

Lyme disease itself cannot be transmitted directly from animals to people; however, the ticks involved in Lyme disease transmission may bite both animals and people. The human health risk is that ticks that become infected may then bite other animals or humans. This means that if a guard dog becomes infected, even if it's not showing symptoms, then ticks that bite the guard dog after it is infected may then transmit Lyme disease to the livestock or farmers.

Prevention is the best control of Lyme disease. First and most importantly, the best preventive measure you can take is protecting your guard dogs from ticks. Many products are effective flea and tick preventatives, including topical or oral products. Talk to your veterinarian as to which product they recommend for your guard dog(s).

A vaccine is available for dogs. The vaccine is generally not considered a "core vaccine," which is a vaccine that every dog needs. The Lyme disease vaccine is generally given only to dogs that are at an increased risk for this disease. Talk to your veterinarian about the risk your guard dog may face and your veterinarian can advise you as to whether they will add it to the vaccine regimen for your livestock guard dog(s).

Jessie Lay, DVM Kentucky State University

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- **$50,000 in New Farmer Recruitment loans** have been given to 25 new/ beginning producers in Kentucky since 2012
- **$40,000** given for special projects to help producers increase marketing efforts throughout the state since 2012
- **$10,800** spent in promotion of sheep & goat products in 2018
- **$3,000** given to conduct parasite research

KY Sheep & Goat Check-Off Sponsors the Try Something Different Tonight marketing campaign
# of people who tasted lamb and goat products: **25,000**
# of people who have learned about products and cooking techniques: **5 million**

To learn more about the Kentucky Sheep and Goat Check-off Program visit
www.kysheepandgoat.org/Check_Off.html

KY Sheep & Goat CHECK-OFF

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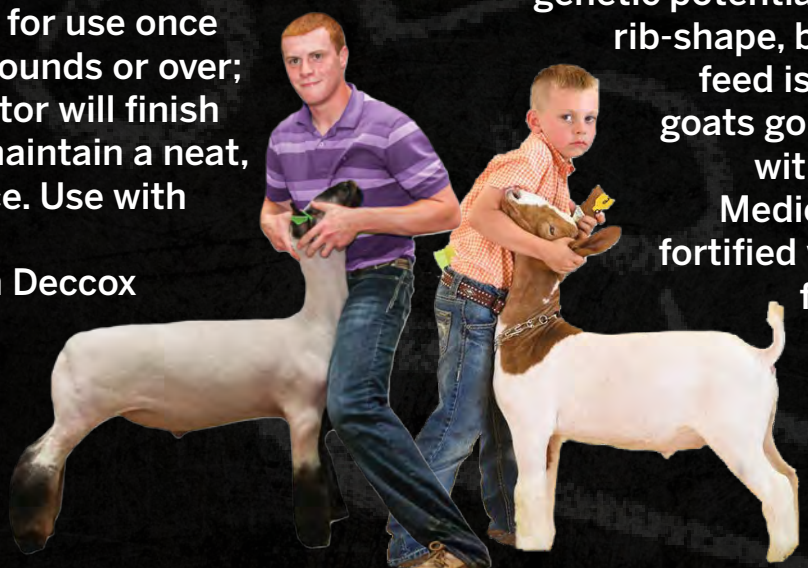

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