Goat Newsletter

Cooperative Extension Program
Langston University

The Newsletter of the E (Kika) de la Garza American Institute for Goat Research *Fall 2015*

From the Director's Desk

Summer has come and gone and it was a mild summer compared to previous summers. Autumn is now here and the air is cool and crisp. Good weather for man and beast, which is good as we are gearing up for several research projects.

We have welcomed several new Visiting Scholars to assist us with those research projects. I wrote about Ms. **Luana P. S. Ribeiro**, a Ph.D. candidate from Universidade Federal da Bahia in Brazil, in our last newsletter. Ms. **Ribeiro** has joined us for a twelve-month scientific internship and will be studying the effects of initial body condition and diet nutritive value on performance of lactating dairy goats in early and mid-lactation.

Dr. **Shirron LeShure** also has recently joined us and will be working on two research projects. Dr. **LeShure** will be working on one research project entitled Sustainable Control of Greenhouse Gas Emission by Ruminant Livestock led by Dr. **Art Goetsch** and also on the research project entitled Enhancing Health and Productivity of Dairy Goats Using Smart Technology led by Dr. **Terry Gipson**. One of Dr. **LeShure's** studies under the latter research project will be to model rumination time using rumen bolus, pressure sensitive nosebands, and video observation in goats. This will allow us to determine rumination time, which is probably the best indicator of animal wellbeing, using indirect measures.

Dr. **Dereje Tadesse Gulich** also joined us this summer. Dr. **Gulich** will be working on the research project entitled Genomics of Resilience in Sheep to Climatic Stressors also led by Dr. **Art Goetsch**. One of Dr. **Gulich's** early studies on that research project will study the resilience of hair sheep breeds from different regions of the United States to high heat load. I have mentioned this project before and it is under the auspices of this project that Drs. **Goetsch**, **Gipson**, **Ryszard Puchala**, and **Yoko Tsukahara** traveled to the far corners of the United States to identify and purchase various ecotypes of Dorper, Katahdin, and St. Croix sheep. An ecotype is a genetically distinct geographic population within a breed, which is adapted to specific environmental conditions. The four geographical regions sampled in this study are northwest (primarily Oregon), southwest (primarily Texas), southeast (primarily Florida), and upper Midwest.

Dr. **Sebastian Paez Lama**, a veterinarian and current Ph.D. candidate from Instituto Argentino de Investigaciones de las Zonas Áridas , Centro Científico Tecnológico - Conicet - Mendoza in Argentine joined us in late summer. Dr. **Lama** will study the effects of method of intermittent supplementation of growing meat goat kids with the tree legume mimosa (*Albizia julibrissin*).

Lastly, Ms. **Hirut Yirga**, a Ph.D. candidate from Hara-

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maya University in Ethiopia joined us in early fall and will be studying with us for six months.

A recent visitor who has already come and gone is Dr. **Virginia Venturina** from the College of Veterinary Medicine at Central Luzon State University in the Philippines. Dr. **Venturina** underwent a training program on mastitis detection, prevention, and treatment in dairy goats under the tutelage of Dr. **Roger Merkel**. You can read more about Dr. **Venturina's** training on page 4 of this newsletter.

In addition to visitors, we have had a busy travel schedule also. I traveled with Dr. **Erick** Loetz on a follow-up visit to Dr. **Brigit Muasa** at the Central Veterinary Laboratories (CVL) Kabete in Kenya. Dr. **Muasa** was here last fall for 12 weeks as an USDA Borlaug Fellow learning more about assisted reproductive technologies with Dr. **Loetz**. CVL Kabete is on the margins of Nairobi, the nation's capital and an extremely large city. We were able to travel up-country to visit our friends at Egerton University near Nakuru and to visit some goat producers in the Naivasha area.

Dr. **Loetz** was busy as he and Dr. **Roger Merkel** spent a week in Nicaragua at the request of a local (Oklahoma) Baptist congregation. You can read more about their trip on page 3 of the newsletter.

Our research activities are continuing apace. Our research project entitled Sustainable Small Ruminant Production Through Selection for Resistance to Internal Parasites and the research project entitled Genomics of Resilience in Sheep to Climatic Stressors both involve genomics, especially single nucleotide polymorphisms (SNP), which are basically markers that are uniformly distributed across the chromosomes. If you remember your basic biology from high school, DNA is comprised of four nucleotides: cytosine (C), guanine (G), adenine (A), or thymine (T) and A always pairs with T and C always pairs with G. An example of a SNP is a A-T pair replaced by a C-G pair. Recently, the International Goat Genome Consortium developed a 50K (53,347) SNP BeadChip that has been commercialized by Illumina, a genomics company in California. The SNP data coupled with the phenotypic (what we see or measure) data that we gather at Langston hopefully will identify SNPs with large effects for either resistance to internal parasites or resilience to climate change. That is our hope.

A new research project is entitled Genome-Wide Association Analysis for the Identification of Alpine Goats with High Milk Production funded through USDA AFRI Exploratory Program and is also SNP-based research. This project is led by Dr. **Yonathan Tilahun**. Genomics is certainly the wave of the future and we hope to become more involved in that field.

It is a brave, new world.

Evaluation of Goat Production Practices in Somotillo, Nicaragua

From October 5 to 10, Drs. **Roger Merkel** and **Erick Loetz** travelled to Somotillo, Nicaragua at the behest of First Baptist Church in Perkins, Oklahoma to evaluate goat production practices at a mission-run farm. The scientists visited the farm to observe the animals and management practices, look at the pastures and barns, and speak to farm personnel. This area of Nicaragua is characterized by distinct rainy and dry seasons. At this time of the year, forage is abundant but within two months, the rains will cease and both forage and water become pressing issues for production. During the last dry season, three wells ran dry on the farm property. Thus, planning for the dry season is paramount for herd productivity.

The pair of scientists also visited the Somotillo branch of the Universidad Nacional Autonoma de Nicaragua. This university utilizes the mission farmland area and animals for student on-farm practice in crops, horticulture, and animal science. Drs. Merkel and Loetz discussed current activities at the farm with university scientists and future plans.

Drs. **Merkel** and **Loetz** also visited some local farms to see village practices and learn more about agriculture in the area. Upon their return to Langston University, the scientists provided their sponsors with a report evaluating the current condition of the farm and recommendations for improvements.

Goats and sheep grazing in the fruit tree area of the mission farm.

The buck and ram barn at the mission farm in Somotillo, Nicaragua.

Training a Philippine Scientist in Mastitis Detection and Management

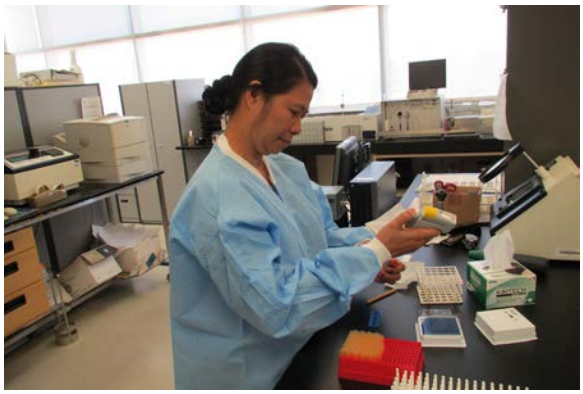
From August 3 to 15, the American Institute for Goat Research hosted Dr. Virginia Venturina from the College of Veterinary Medicine at Central Luzon State University in the Philippines for a training program on mastitis detection, prevention, and treatment in dairy goats. Central Luzon State University is part of the Dairy Goat Science and Technology Program of the Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development. The national dairy goat program focuses on various aspects of dairy goat production. Dr. Venturina serves as the Project Leader for the Development of Diagnostic and Management Protocols for Intramammary Infection in Goats. As such, it is her responsibility to develop and lead the research and extension activities in the areas of mastitis and udder health. Dr. Venturina's visit was designed for her to receive training on different detection methods of udder infection ranging from direct microscopic count to machine cell counters to animal-side indicator tests.

Virginia culturing milk for bacteria analysis at the Oklahoma Animal Disease Diagnostic Laboratory in Stillwater, OK.

Dr. Venturina began her training at the Oklahoma Animal Disease Diagnostic Laboratory (OADDL), located at Oklahoma State University in Stillwater, Oklahoma. Dr. Akhilesh Ramachandran, OADDL Section Head of Microbiology/Molecular Biology, and his staff provided training in milk bacterial culture. Dr. Venturina learned bacterial plating techniques for colony counts and how to use different types of media designed to identify the classes of bacteria found in milk. Dr. Venturina also learned different staining procedures for looking at bacteria under a microscope. Dr. Ramachandran and his staff demonstrated bacterial species identification using matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF) and discussed polymerase chain reaction species identification. An antibiotic susceptibility test was also run on bacteria. The OADDL training was very detailed and Dr. Venturina learned a great deal.

Colony growth of test cultures.

Somatic cells found in milk can be an indication of udder infection. Another aspect of Dr. Venturina's training was in various somatic cell detection and estimation methods. The "gold standard" for counting somatic cells in milk is via direct microscopic count. For goat milk, this is the pyronin y-methyl green stain procedure. Dr. Venturina received training in this procedure at the Dairy and Food Safety Laboratory of the Oklahoma Department



Learning to conduct direct microscopic count of somatic cells in goat milk at the Oklahoma Department of agriculture, Food and Forestry in Oklahoma City, OK

Virginia learning the Institute's milking procedure with Ms. Amanda Manley.

of Agriculture, Food and Forestry in Oklahoma City. During her visit, laboratory staff also explained the different milk regulatory tests done and how milk and milk product safety is enforced.

To learn about machine somatic cell counts and the workings of Dairy Herd Improvement in the US, Dr. Venturina evaluated milk samples in our DHI lab. In addition to somatic cell counts, she performed milk component analysis and was given background on how producers enroll herds in DHI, tests conducted, and records processed and sent to producers.

Virginia conducting a somatic cell estimation test on goat milk.

Another aspect of Dr. Venturina's training was comparison of various on-farm methods of subclinical mastitis detection. To accomplish that, Dr. Venturina conducted a small research trial comparing results of different somatic cell tests with a machine count done in the Institute DHI lab. The results of that small research trial are presented below.

Finally, Dr. Venturina had the opportunity to visit a couple dairy goat farms and talk with producers about management and animal health. Dr. Venturina gained valuable experience from her visit that will greatly benefit her as she continues to work on mastitis detection and management protocols for the Philippine National Dairy Goat Science and Technology Program. The issue of intramammary infection, both subclinical and clinical, is important for all dairy producers to improve animal well-being, increase production levels, and produce milk suitable for making wholesome human food products.

Virginia's first taste of Nigerian Dwarf milk. Thumbs up!

Dr. Venturina's Study

Rationale: Udder infection in dairy goats can affect milk yield and composition. Economic losses to producers include having less milk for sale, increased costs of production due to animal treatment, and the potential need to cull does having serious cases of mastitis that lead to loss of mammary gland tissue. Early detection of mastitis while still in the subclinical stage assists producers in designing appropriate treatment protocols and in assessing their production and management systems

for environmental or other factors that can contribute to mastitis occurrence.

Materials and Methods: Milk from the Alpine research herd was screened approximately 1 week prior to the trial to identify animals having high (> 1.5 million cells/ml) and low somatic cell counts. That threshold level was selected as this is the upper limit of somatic cells allowed in goat milk as stated in the 2011 Pasteurized Milk Ordinance. Twelve Alpine does in their third parity (slightly more than 4 years of age) were selected for this study and are shown in Table 1. Milk from each udder half of each doe was sampled for 4 consecutive mornings and the following determinations of normal vs. abnormal milk were made on each animal at each milking. SCC using the Bentley Instruments Milk Component and Somatic Cell Detection machine in Langston's Dairy Herd Improvement Laboratory with SCC ≤ 1.5 million determined as normal and above as abnormal. California Mastitis Test (CMT) score with score below 2 as normal and above as abnormal. SCC using DeLaval cell counter DCC with a score ≤ 1.5 million determined as normal and above as abnormal. Electrical conductivity was evaluated using the Mas-D-Tec® with a conductivity score < 5 determined as normal and above as abnormal. Estimation of SCC using PortaSCC® for Goats with score < 2 determined as normal and above as abnormal. Lactate dehydrogenase levels using UdderCheck™ that estimates level of lactate dehydrogenase using color strips (developed for dairy cattle) with a score < 3 determined as normal and above as abnormal. In addition, temperature was taken rectally and at two to three different places on the udder using an infrared thermometer and milk samples were cultured using a Quad Plate culture system to simultaneously culture samples for gram negative bacteria (coliforms), streptococcus, and staphylococcus. Because normal/abnormal milk is a binary response variable, a categorical analysis was conducted using PROC GLIMMIX in SAS®, which allows for a categorical analysis using a mixed model (random and fixed effects). The fixed effects were method (Bentley, CMT, DeLaval, Mas-D-Tec, Porta-SCC, or UdderCheck), day (1,2, 3, or 4), and side (left or right). The random effect was animal and temperatures (rectal and average of udder) were used as covariates.

Table 1. Days in Milk (DIM) and initial Somatic Cell Counts (SCC) of lactating does used in the study.

Animal ID	*DIM*	*Initial SCC*
952	115	188,000
984	145	283,000
1013	140	438,000
964	141	947,000
1003	77	1,390,000
1012	143	1,509,000
970	145	1,621,000
980	140	2,244,000
973	49	2,927,000
1002	145	3,428,000
967	139	4,860,000
990	145	5,078,000

Results: The frequency of normal/abnormal determinations for each method and day are presented in Table 2. The analysis revealed that rectal temperature, average udder temperature, or side of udder did not affect the determination of normal/abnormal milk. If Bentley is considered to be the benchmark against which all other method are to be evaluated, then the full categorical analysis revealed differences that only the Porta-SCC gave comparable results as the Bentley; however, Port-SCC tended to overestimate the frequency of abnormal milk samples. Day of sampling did not affect determination for Bentley, CMT, Mas-D-Tec, or Porta-SCC; however, the determination of normal/abnormal milk was affected by which day was sampled for Delaval and UdderCheck. In conclusion, the Porta-SCC appears to be a reliable substitute for the expensive Bentley system.

Table 2. Number of normal/abnormal milk determination by method and day (12 goats × 2 sides [right and left]).

	Day 1		*Day 2*		*Day 3*		*Day 4*	
Method	*normal*	*abnormal*	*normal*	*abnormal*	*normal*	*abnormal*	*normal*	*abnormal*
Bentley	*5*	*19*	*5*	*19*	*6*	*18*	*7*	*17*
CMT	*10*	*14*	*16*	*8*	*15*	*9*	*14*	*10*
DeLaval	*8*	*16*	*7*	*17*	*7*	*17*	*16*	*8*
Mas-D-Tec	*23*	*1*	*22*	*2*	*23*	*1*	*24*	*0*
Porta-SCC	*2*	*22*	*3*	*21*	*3*	*21*	*5*	*19*
UdderCheck	*2*	*22*	*12*	*12*	*13*	*11*	*21*	*3*

Research Spotlight

Effect of sire performance on parasite resistance.

Fifteen Dorper (D; 3.8 months of age, 64 lbs), 14 St. Croix (C; 3.9 months, 40 lbs), 14 Kiko (K; 4.0 months, 42 lbs), 13 Boer (B; 3.2 months, 49 lbs), and 17 Spanish (S; 3.1 months, 40 lbs) males were used to investigate effects of classification for resistance to *Haemonchus contortus* of sire and among and within breed differences in the second year of a central test for growth performance and response to artificial infection with infective larvae. In the first year of the test, males were randomly selected from 4 commercial farms in KS, MO, and OK and Langston University B and S goat herds. Animals used in this study were progeny of the sires (i.e., High and Moderate, with no progeny of susceptible males) selected in the first year. For both years, the test entailed an adjustment period of 2 weeks followed by 8 weeks of data collection. Animal groups were housed separately in adjacent pens with automated feeders allowing free-choice access to a 15% CP (DM) and 50% concentrate pelletized diet. During adaptation, anthelmintic treatment resulted in low fecal egg count (FEC; < 600/g), after which 10,000 larvae were administered orally. Packed cell volume (PCV) was measured weekly and FEC was determined 4 times in weeks 6–8. Breed affected ADG (0.68, 0.63, 0.35, 0.54, and 0.31 lb/day), DMI (4.85, 3.53, 2.87, 3.31, and 2.87 lbs), FEC (2,098, 1,278, 1,419, 1,335, and 716 eggs/g, original scale), and PCV (27.2, 31.7, 31.6, 28.1, and 25.6%; for D, C, K, B, and S, respectively). Means of resistance classification of sires were similar for FEC, PCV, ADG, and DMI. Correlation coefficients of sire and progeny FEC within breed were nonsignificant. In conclusion, with only one generation of selection, there was no detectable relationship in resistance to internal parasite between selected sires and progeny based on FEC after an artificial challenge with *H. contortus* larvae in a standardized environment.

Y. Tsukahara, T.A. Gipson, S.P. Hart, L.J. Dawson, Z. Wang, R. Puchala, T. Sahlu, and A.L. Goetsch. 2015. Effects of breed and resistance classification of sire on progeny growth performance and response to artificial infection with Haemonchus contortus in a central performance test. Journal of Animal Science. 93(Suppl. s3):493.

Growth and parasite resistance.

Various breeds of young male sheep and goats from commercial farms in Arkansas, Kansas, Missouri, and Oklahoma and of Langston University (LU) were used in a centralized test at LU, which included artificial infection with *Haemonchus contortus*, to investigate growth performance and genetic resistance to internal parasitism. Year 1 included 2 Katahdin flocks (KS-A, n = 17, 3.5 months of age, 77 lbs; KS-B, 18, 4.0 months, 42 lbs), 20 Dorper (DS; 8.2 months, 99 lbs), 13 St. Croix (CS; 4.4 months, 46 lbs), 2 Boer herds (BG-A; 16, 3.8 months, 46 lbs; BG-B, 17, 42 lbs) 16 Kiko (KG; 3.1 months, 44 lbs), and 14 Spanish (SG; 4.4 months, 42 lbs). In year 2, animals were progeny from breeding groups classified in year 1 as of high and moderate resistance, with 15 DS (3.8 months, 64 lbs), 14 CS (3.9 months, 40 lbs), 14 KG (4.0 months, 42 lbs), 13 BG-A (3.2 months, 49 lbs), and 17 SG (3.1 months, 40 lbs). There was 2 weeks for adaptation and an 8-week test period, with automated feeders allowing free-choice access to a 50% concentrate pelletized diet. During adaptation, anthelmintic treatment resulted in low fecal egg count (FEC; < 600/g), after which 10,000 infective larvae were administrated orally. Packed cell volume (PCV) was measured weekly and FEC was determined 4 times in weeks 6 to 8. Breed affected FEC in year 1 (1,512, 2,196, 3,072, 1,229, 1,069 2,713, 3,575, and 1,182 eggs/g for KS-A, KS-B, DS, CS, BG-A, BG-B, KG, and SG, respectively) and year 2 (2,621, 1,368, 1,413, 1,669, and 884 eggs/g for DS, CS, BG-A, KG, and SG, respectively). Animals were placed in 3 categories of resistance (i.e., high, moderate, low) within flocks/herds based primarily on FEC using cubic clustering criterion. In conclusion, based on FEC after an artificial challenge with *H. contortus* larvae in a standardized environment, there was considerable variability among flocks/herds of small ruminants in resistance to internal parasitism due to multiple factors such as species, breed, and genetic differences within breed.

Y. Tsukahara, T.A. Gipson, S.P. Hart, L.J. Dawson, Z. Wang, R. Puchala, T. Sahlu, and A.L. Goetsch. 2015. Growth performance and resistance to internal parasitism of small ruminant males from the south-central US in a centralized test. Journal of Animal Science. 93(Suppl. s3):494.

Noteworthy News

►In September, Drs. **Erick Loetz** and **Tilahun Sahlu** traveled to Nairobi, Kenya to fulfill objectives of the USDA Borlaug Fellow project.

►In September and October, Dr. **Steve Hart** provided goats for the State Fair of Oklahoma and for the Tulsa State Fair for their respective Birthing Centers and was Superintendent of the State Fair of Oklahoma Open Boer Goat Show sanctioned by ABGA.

► In October, Dr. **Steve Hart,** gave presentations on internal parasite control for the OK Farmers and Ranchers Association in Rose, OK.

► In October, Dr. **Steve Hart,** gave a presentation on internal parasite control at the Goat Boot Camp in Ada, OK.

► In October, Drs. **Terry Gipson**, **Steve Hart, Art Goetsch**, and **Yoko Tsukahara** gave presentations on research projects at the St. Croix Hair Sheep International Association meeting held in Edmond and Langston, OK.

►In October, Drs. **Erick Loetz** and **Roger Merkel** traveled to Nicaragua to assess developmental training and cooperation possibilities.

Meat Goat Production Handbook - 2nd Edition is available in spiral or case binding.

http://www2.luresext.edu/goats/extension/handbookorderform.pdf for order details.

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