

**Volume 2  
Edition 1**

# Sheep Trails

USDA, ARS Sheep Industry Stakeholder Update

## Calendar

Jan. 19-23: ASI  
Convention

March 7: PolyPay,  
Suffolk and Katahdin  
ewes begin lambing

March 14: OPP Free  
yearlings begin lambing

April 28: Katahdin ewe  
lambs begin lambing

May 4: OPP Free ewe  
begin lambing

May 17: Comp. IV ewes  
begin lambing

Sept. 14: Polypay and  
Romanov Ewes begin  
lambing

Sept. TBD: Select  
Breeding Stock Sale

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### Update from USMARC Director



Dr. Boggess update on the USMARC sheep programs and future plans.

### Sheep Operation Update and Progress Report



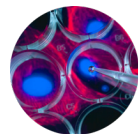
Mark Hoogendoorn's summary of the 2021 Annual USMARC Sheep Sale.

### Romanov Research from USMARC



Romanov research programs at USMARC.

### USDA ARS Research Reports



Research summaries for current ARS sheep research at USMARC and our partner ARS locations.

# USDA ARS Sheep Trails

## USMARC Director's Pen!



Hello from USMARC and welcome to Sheep Trails!

Our goal is to provide the sheep industry with new research and news of interest to the sheep industry. And, we have a lot of good news to share!

We remain very excited about our growing research program and our ARS and external research partners! We continue to aggressively build collaborative partnerships with our sister ARS locations, with academia and with industry stakeholders. Our stakeholder support is extraordinary and appreciated! Our stakeholders help us direct and develop our research programs. They serve on our "Blue Ribbon Panel" (BRP) to review our flock

and animal management and animal care programs. The BRP recommends improvements in programs and facilities, and monitors progress and implementation. This program has been on hold while we work through the pandemic, but we look forward to returning to much more stakeholder interactions in the near future!

In the good news category, we have had clean inspections from APHIS over the past year. Our proactive and interactive relationship with our APHIS colleagues are considered opportunities to strengthen our already strong programs for animal care and animal husbandry, and APHIS is a partner in our ongoing success. The overall health, productivity, and management of the USMARC flock is excellent, but we are always looking for opportunities to grow and improve.

Of course, we remain very excited about our growing research programs and our expanding collaborations. We had the first Suffolk lambs at USMARC this spring in many years. The Suffolk flock is focused on an industry driven "terminal sire" project. We continue to improve and grow the "Composite IV" (½ Romanov, ¼ White Dorper, ¼ Katahdin) program with great success. The Romanov flock is now lambing in the Fall and that program is thriving. And we continue to expand our work and flock sizes for the PolyPay and Katahdin breeds; and adding additional support to the National Sheep Improvement Program.

Our research programs are also expanding through new collaborations and an extraordinary reference flock initiative with our partners in Booneville, AR and Dubois, ID. We are working with these locations and many land-grant university partners as well! And, we have many other projects developing that promise to produce tremendous benefit to the sheep industry. These initiatives also served to inform our new 5-year research programs which we have completed and are now ready for peer review. Once reviewed and approved the new plans will be in place for the next five years. We will share the new plan in the summer Stakeholder Summary.

So, as you can see, we remain very excited and optimistic for our sheep research program here at USMARC! Please join us on our journey forward and let us know how we can make our programs even better. We need your support on the ground and in WDC. Help us to help you!

All the best from USMARC!

Mark Boggess



## USMARC Sheep Operations Update and Progress Report

Mark Hoogendoorn



The 2021 year has been an exciting year for the USMARC sheep operations. We have started new research projects, fine-tuned our current projects, and enjoyed the all-around positivity in the sheep industry. Spring and fall lambing flocks have come and gone smoothly. Nearly all the spring born lambs

have been marketed, and the fall lambs are growing well just a few weeks after weaning.

I would also like to say it has been a pleasure working with the crew the past two years as the sheep operations manager. Each member has grown into their own unique and important roll on the sheep team. I would like to specifically point out two crew members who have grown into their unique roll, Kayla Nuss and Brent Richards. Kayla has stepped up in the nursery raising our orphan lambs. She has been open to new ideas to improve her impact in the sheep unit. She has also taken over the lead role in the tech side of things by helping work out the kinks in the electronic ID system and data transfer to the database. Brent has been accurate and diligent in his feeding. His attention to detail keeps the sheep on the right plane of nutrition, proper body condition, and the bunks clean of excess feed.

I would like to thank everyone that participated in making the 2021 USMARC Select Breeding Stock Sale a success. We attracted bidders to the seats and over the internet from multiple different states in the Midwest and even into Arkansas. All the ewe lambs sold 50-300% over

the average feeder lamb market price in the region. The Romanov yearling ewes drew the highest demand on the female side of the sale, and a single Romanov ram brought \$920 to top off that side of the sale. I look forward to hosting the sale again next year in Sutton, Ne. the second Saturday of September.



Sale Results:

We sold 258 hd and averaged \$298/hd.

To break it down further:

Composite IV ewe lambs brought \$200-330/hd  
Katahdin x Composite IV ewe lambs \$280/hd  
Katahdin ewe lambs \$250-330/hd  
Polypay ewe lambs \$365-370/hd  
Romanov yearling ewes \$450-720/hd  
Romanov Rams \$375-920/hd  
Katahdin Rams \$310-350/hd  
Composite IV rams \$270-470/hd

I would like to thank everyone who has supported USMARC sheep operations, and I hope that 2022 is as successful as 2021.

## Romanov Research from USMARC



*Alexa Johnson*

The USDA, ARS, U.S. Meat Animal Research Center (USMARC) has several breeds of sheep used in research. The Romanov breed, a Russian breed, that has unique characteristics, has provided additional avenues for research.

Romanov lambs are born with a black hair coat with white wool growing in as the sheep age. When mature, the breed is a mottled gray, white and black due to the black undercoat with a predominantly black head. The ewes are excellent mothers that produce high volumes of milk for their lambs. But this is where they are VERY unique and of great interest to the sheep industry; Romanov ewes are highly fertile, almost always give birth to three or more lambs when mature. Often, ewes have four or five lambs per birth and occasionally more, with one ewe giving birth to nine! Romanov ewes can easily raise two or three lambs, and any more than that are cared for in a nursery.

Prior to importing the Romanov breed, USMARC first evaluated exotic Finnsheep for projects looking at prolificacy. A project looking at the relative performance of crossbred ewes for production efficiency traits proved to establish the superiority of Finnsheep and Romanov breeds above other breeds, such as Dorset, Texel, and Montadale, as maternal or ewe breeds. Looking closer, scientists documented that the Romanov outperformed the Finnsheep in four general categories of traits: lamb survival, percentage lambing, number born per ewe lambing, and length of seasonal fertility, so the Finn Sheep was not considered for further research at the time.

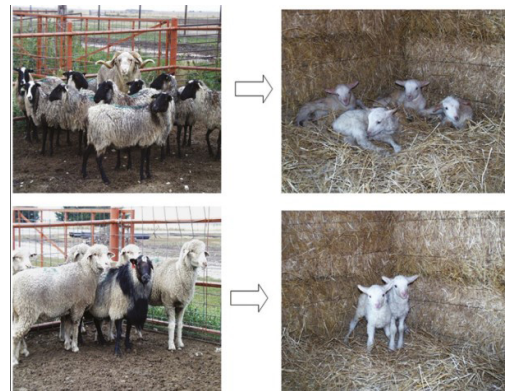
Romanov research at USMARC has been conducted for over 30 years and there have been many remarkable findings. The Romanov breed excels as a maternal breed with increased fertility and a lack of seasonality breeding issues associated with other breeds of sheep. However, the large number of lambs born requires much more intensive labor than most sheep producers desire or can accommodate. And, while the Romanov breed is very prolific these sheep do not excel in other important areas for the sheep industry, such as growth, lean meat yield, or behavior. To address these issues while capturing maximum value from the Romanov breed, Dr. Kreg Leymaster led several crossbreeding studies to evaluate how to optimize the amazing fertility and maternal ability in a crossbred or “composite” population. Consequently, the Romanov breed is now the main genetic contributor to the USMARC Composite IV (C-IV), which is 1/2 Romanov, 1/4 White Dorper, and 1/4 Katahdin. Based on comprehensive discussions with sheep industry stakeholders, the White Dorper and Katahdin breeds were selected to best compliment the Romanov breed in the C-IV population.



More recently, research by Drs. Brad Freking and Tom Murphy at USMARC better defined the contributions of the three breeds included in the USMARC C-IV breed. Their research showed that the White Dorper crossed to the Romanov produced significantly more lambs per ewe exposed in both barn lambing and pasture lambing situations when compared to four other breeds also crossed with Romanov. The White Dorper breed contributed superior growth and lean meat yield. The popular breed, Katahdin, further contributes to growth, parasite resistance, and hoof health and attracted the attention of the producers across the U.S.

# USDA ARS Sheep Trails

A third project completed at USMARC using the Romanov and Rambouillet breeds showed the uniqueness of the Romanov ewe. Figure 1 shows a Rambouillet ram mated with Romanov ewes and vice versa. As you can see in the top right photo, the Romanov ewes lambbed three to four lambs compared to the Rambouillet ewes having either one or two lambs per birth. Interestingly, when both groups of resulting female lambs were followed as breeding replacements there were no differences in lifetime productivity based on how the crossbred Romanov ewe lambs were originally produced. These findings were important because producers can create crossbred Romanov ewes using Romanov rams without needing purebred Romanov females.



Further research is now focused on preventing mastitis infection, and improving udder quality, pneumonia resistance, and behavioral characteristics – Romanovs tend to be a bit skittish and are more difficult to manage than other breeds. In addition to matching the C-IV to high-growth and heavy muscled rams, or terminal sires, to maximize the value of the lambs produced for market. The C-IV is now being adopted by the sheep industry and is a valuable genetic resource for the sheep industry.

In summary, the Romanov breed of sheep has been in the U.S. for many years and has been a great addition to the sheep industry. USMARC is continuing to research the Romanov breed, and we are excited to see the impact of this research for the sheep industry!

## Recent Sheep Publications

### Evolution of the sheep industry and genetic research in the United States: Opportunities for convergence in the 21st century

Harvey Blackburn - National Animal Germplasm Program - Ft. Collins, Co

Contributors: Jake Thorne - Texas A&M University, Brenda Murdoch - University of Idaho, Brad Freking - U.S. Meat Animal Research Center, Reid Redden - Texas A&M University, Tom Murphy - U.S. Meat Animal Research Center, and Bret Taylor - U.S. Sheep Experiment Station



Policy, markets, production systems, and environment all impact sheep profitability and how U. S. producers utilize genetic resources. In this review paper the authors discuss how these factors have impacted sheep production and how the research community has developed genetic technologies that the industry can use in developing more profitable enterprises. The paper traces the U. S. use of genetic resources, the use of quantitative genetics through current research in the area of genomics. The authors conclude that recent industry changes in combination with genetic technologies will result in the industry being poised to address issues in the 21st century. See: <https://doi.org/10.1111/age.13067> for more information.

## Genes involved in immune, gene translation and chromatin organization pathways associated with *Mycoplasma ovipneumoniae* presence in nasal secretions of domestic sheep

Michelle Mousel - Animal Disease Research Unit - Pullman, WA

Contributors: Stephen White - Animal Disease Research, currently at Genus R&D, Maria Herndon - Washington State University, David Herndon - Animal Disease Research, Bret Taylor - U.S. Sheep Experiment Station, Gabriella Becker - University of Idaho, and Brenda Murdoch - Univeristy of Idaho



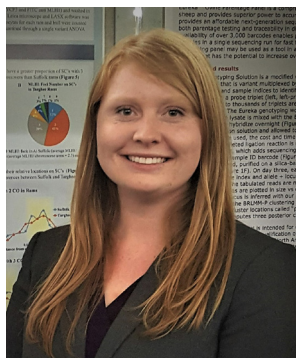
A contributor to polymicrobial pneumonia in domestic sheep is *Mycoplasma ovipneumoniae*. Determining if age, breed, sampling time, and year of sample collect impact detection of *M. ovipneumoniae* will

help determine if genomic studies should be conducted. Rambouillet had the lowest compared with Polypay and Suffolk and year-old sheep had the greatest amounts detected of *M. ovipneumoniae* from nasal mucus. Warmer weather may have had an impact on detection as April and September/October sampling times were higher than February.

Breed differences suggested there may be DNA differences affecting *M. ovipneumoniae* detection. Indeed, testing over 500,000 markers with average *M. ovipneumoniae* DNA detected in nasal mucus from Polypay, Rambouillet, and Suffolk sheep found regions on chromosomes 4, 6, 7, 9, 10, 15, 17, and 22 were associated. Markers were within or near genes known to have immune functions and change DNA organization. Both these functions would be expected to change when sheep respond to polymicrobial pneumonia. Work is ongoing to identify the exact DNA changes that caused the difference in *M. ovipneumoniae* detection in nasal mucus in order to develop tools for use by the sheep industry to reduce polymicrobial pneumonia.

## Genetic variation in type two taste receptor genes is associated with bitter tasting phenylthiocarbamide consumption in mature Targhee and Rambouillet rams

Kimberly Davenport - Univeristy of Idaho - Moscow, ID



Contributors: Bret Taylor - U.S. Sheep Experiment Station, Dillan Henslee - Univeristy of Idaho, Claire Southerland - Univeristy of Idaho, Joel Yelich - Univeristy of Idaho, Melinda Ellison - Univeristy of Idaho, and Brenda Murdoch - Univeristy of Idaho

Dietary preference in humans is genetically correlated with the 7-transmembrane G-protein coupled receptors known as type-two taste receptors (TAS2R). These are the only known taste receptors to perceive bitterness. In sheep, bitterness is the most sensitive of the five taste senses,

often resulting in the avoidance of some forages. We recently classified male sheep (rams) as those that are very sensitive to bitterness, moderately sensitive to bitterness, and apparently unaware of bitterness in drinking water spiked with phenylthiocarbamide (PTC), a known bittering compound. We then evaluated the relationship between the consumption level of PTC and haplotypes present within various TAS2R genes. We successfully identified several single nucleotide polymorphisms and haplotypes that were significantly associated with consumption of the bitter tasting PTC compound by the rams. Further research is needed to validate these associations and determine the mechanisms that link genetic variation in TAS2R genes to bitter taste perception in sheep. This may enable producers to select sheep more likely to consume bitter forage, such as sagebrush, as a flock and rangeland management strategy.

## Relationships among intramammary health, udder and teat characteristics, and productivity of extensively managed ewes

*Tom Murphy - U.S. Meat Animal Research Center - Clay Center, NE*

*Contributors: Whit Stewart - University of Wyoming, Bret Taylor - U.S. Sheep Experiment Station, Bledar Bisha - University of Wyoming, Carl Yeoman - Montana State University, Megan Van Emon - Montana State University, and Ryan Knuth - Montana State University*



Mastitis is an inflammation of the mammary tissue typically in response to a bacterial infection. Signs of clinical mastitis include immense udder swelling, fever, and secretion of abnormal milk. In sheep, clinical infection is associated with increased risk of ewe and lamb

mortality and is estimated to account for 7% of all ewes culled each year in the U.S. However, ewes with subclinical mastitis (SCM) have no observable signs of infection and, because of this, the prevalence and economic impact of SCM are not well understood. Milk was sampled from clinically healthy ewes at Montana State University and the USDA U.S. Sheep Experiment Station. Bacteria which have the potential to cause mastitis were present in 36% of milk samples. Morphometric traits of the udder were not found useful for predicting SCM. Somatic cell count (SCC) in milk, an indication of immune response, was negatively associated

with weight of lamb weaned. Ewes with elevated SCC were expected to wean 5 to 8 kg less lamb than healthy ewes, which equates to a lost revenue of \$19 to \$32 per ewe. This research confirms that SCM is common in lactating ewes and is an economically important disease. Future research will focus on how to mitigate the negative impact of SCM on U.S. sheep production.



*Photo Credit: Alexa Johnson*

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## References for Publications Included

Evolution of the sheep industry and genetic research in the United States: Opportunities for convergence in the 21st century  
<https://doi.org/10.1111/age.13067>

Genes involved in immune, gene translation and chromatin organization pathways associated with *Mycoplasma ovipneumoniae* presence in nasal secretions of domestic sheep  
<https://doi.org/10.1371/journal.pone.0247209>

Genetic variation in type two taste receptor genes is associated with bitter tasting phenylthiocarbamide consumption in mature Targhee and Rambouillet rams  
<https://doi.org/10.1093/tas/txab142>

Relationships among intramammary health, udder and teat characteristics, and productivity of extensively managed ewes  
<https://doi.org/10.1093/jas/skab059>

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