ALPACA RESEARCH FOUNDATION

ANNUAL APPEAL 2014

ARF PRESIDENT'S REPORT

It's that time of year again! You are receiving this communication because you are an alpaca owner and care about the health and well-being of your wonderful animals. The Alpaca Research Foundation (ARF) is a 501(c)3 non-profit corporation whose goal is to financially support and encourage scientific research to benefit the North American alpaca community. 100% of our donations go to support research. ARF maintains a close relationship with the Morris Animal Foundation (MAF), the world's largest supporter of companion animal research. MAF has a Llama and Alpaca Division in which we play an ancillary role. At www.alpacaresearchfoundation.org or www.facebook.com/alpacaresearch one can find much more in the way of pertinent information regarding our workings, studies, and accomplishments.

Ongoing research funded by ARF includes studies on genetics of alpaca fiber quality, alpaca color genetics, in-depth analysis of the alpaca genome to enable further investigation into hereditary diseases and traits, locating the genetic cause of choanal atresia in alpacas, the anemia of chronic disease in alpacas, and the pharmacology of a long-acting de-wormer in alpacas.

Two new studies have just been funded to start in 2014. One evaluates protocols for anesthesia in alpacas to be performed in the field rather than in the hospital or clinic. In the field there is much less support to deal with the complications of anesthesia. Therefore, safe and effective anesthesia is of critical importance. In addition, a project which studies the pharmacology of a powerful pain-killer in alpacas, buprenorphine, will add another useful medication to our armamentarium.

Due to continuously decreasing donations, a subject we painfully have had to mention for the past few years, we had an exceedingly difficult time this year deciding which studies to fund. Unfortunately, we were forced to deny approval for a project we would like to have had done, not because of scientific merit or applicability, but because of lack of finances. We at ARF hope that many of you will take the time to go to our website, click on "Make A Difference," and see what you can do to help us achieve our goals. The net result will hopefully be healthy and happy alpacas as well as happy alpaca owners. A great thanks to all of you who have donated in the past and to those of you who plan to help us in the future.

Sincerely,

Alan ("Abe") Rosenbloom, MD
President

ARF funds applied research. Basic research is funded—if and only if—there is a high potential for applicability in the future.

ARF SUCCESSES

ARF has funded research that has lead to:

- A next generation map of the alpaca genome becoming available on US government websites This has spurred research into the development of genetic tests for commercially important traits and heritable defects, which will benefit the alpaca industry.
- Identification of the ovulation-inducing factor in alpaca semen that can induce ovulation by intramuscular injection, as nerve growth factor.
- Development of appropriate vaccination protocols in alpacas for rabies, West Nile Virus, and eastern equine encephalitis.
- Determination of what works and what doesn't in the treatment of alpaca ulcer disease, a potentially devastating disorder.
- A better understanding of the etiology and treatment of hyperglycemia (high blood sugar) in alpacas, a serious complication with dire consequences if not aggressively attended.
- Improved methods for detection and treatment of M. haemolamae ("Epe"), E.mac and the corona virus that causes acute contagious respiratory disease in alpacas.
- Proper doseage for treatment of alpacas with several drugs including the sedative midazolam, anti-inflammatory medication flunixin, the antibiotics florfenicol and enrofloxacin, and the analgesic Tramadol, to name a few.
- Methods for management of anthelmintic resistance in alpacas.

VOLUNTEER

The ARF Development Committee was disbanded this summer due to lack of volunteers. The committee was formed in 2000 and its first success was the Super Stud Raffle, which has raised money for ARF continuously for 14 years. Sadly we will not have a Super Stud Raffle this year. We have had many enthusiastic volunteer members over the years and we sincerely appreciate their efforts. At this time, with donations continuing to fall, and important research projects not being funded, we need volunteers with interest and skill in raising funds. For more information please contact Patricia Craven at pacraven1@gmail.com.

ALPACA COLOR GENETICS: WHERE DO WE STAND?

By Kylie Munyard

Colour research in our lab has followed a journey from the candidate gene approach (i.e. this gene does X in horses/mice, so it should do the same in alpacas), to a chemical approach (i.e. what exactly constitutes "brown" fibre in alpacas?), to an expression analysis approach (i.e. what genes are active in alpaca skin of different colours.

MC1R

Our most researched gene is the melanocortin-1 receptor (aka Mc1r). It is a small gene that is responsible for colour variation in many species (e.g. dogs, horses, sheep, humans, pigs, and mice) and was therefore a perfect candidate gene. Mc1r, and its partner gene agouti, control the production of pigment. Mammals only have two different types of pigment, black eumelanin and yellow/red pheomelanin, and the interplay between the Mc1r and agouti genes determines how much of which pigment is produced, when and where. We identified two DNA sequence differences (SNP's) that were highly correlated with colour. The outcome of this research is that we can now explain some of the colour variation in alpacas. We are able to perform a DNA test for the presence of either of these two function-impairing SNPs in Mc1r, and that information allows us to predict the potential colours an alpaca can produce.

AGOUTI

However, the SNPs in Mc1r do not explain the entire alpaca colour story. So we next examined the partner to Mc1r, the agouti gene. Our work with the agouti gene has led to identification of some of the changes in gene sequence (SNP's) that cause recessive black colour in alpacas. We do know, however, that we have not found all of the mutations that cause black in alpaca, and this work is continuing, thanks to ARF.

TYRP1

Brown in alpacas has always been a "grey" area. One person's brown is another person's dark fawn, or even black. In the scientific literature relating to mammals, brown is a very precise colour, and in most domestic mammals is caused by mutations in the tyrosinase related protein1 (Tyrp1) gene. These mutations lead to a non-functional Tyrp1, such that the normally black eumelanin is changed to brown coloured eumelanin. A genetically brown animal cannot have any black on it, anywhere, because all its black pigment has been converted to brown. Tyrp1 brown is recessive to black, and an animal needs to have two copies of the brown Tyrp1 allele to express that colour.

MELANIN ANALYSIS

In order to further investigate the question of the genetic identity of "brown" alpacas, we turned from DNA to the fibre itself. We used established chemical tests to measure the amount of total pigment (i.e. melanin) and the relative ratio of black to yellow pigment in hundreds of fibre samples Our conclusion from this research is that the vast majority of brown alpacas are actually various shades of yellow with different amounts of black added. It is probable; therefore, that most brown alpacas are expressing agouti gene variants.

This is a very brief summary of an article written by Dr. Kylie Munyard, Curtin University, Perth, Australia. It appeared in *Alpacas Magazine* in Fall 2014. If you would like to contribute to the support of Dr. Munyard's work through the Alpaca Research Foundation go to www.alpacaresearchfoundation.org and click on current research.

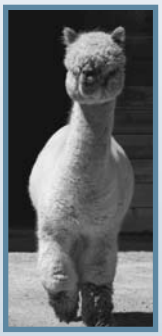
2014 SUPER STUD RAFFLE WINNERS

We would like to thank the following herdsire owners for donating their herdsire's services to the 2014 ARF Super Stud Raffle.

SURI—DIAMONTE OF PVA

Donated by
Erin Williams-Kerns and Glenn Kerns
AJ's Alpacas, Navarre, Ohio

Breeding won by
Patricia Toney, Portland, Tennessee



HUACAYA—SNOWMASS ROYAL CHALLENGER

Donated by
Pamela Brewster
Stillmeadow Farm, Stonington, Connecticut

Breeding won by
Hill Crest Alpacas, North Dartmouth, Massachusetts

CONGRATULATIONS TO THE WINNERS!

MEET THE ARF BOARD OF DIRECTORS

President, Alan (Abe) Rosenbloom, MD

Siler City, North Carolina, aarosenbloom@gmail.com

Abe has owned Black Tulip Farms Alpacas since 2000. He has been raising huacayas ever since. He has been a member of AOBA since 1997 and a member of ARI since 2000. He was one of the founding members of the Carolina Alpaca Breeders and Owners (CABO) and its first president.

Vice President, Lisa Williamson, DVM

Athens, Georgia, lisa1@uga.edu

Lisa is an Associate Professor of Large Animal Medicine at the University of Georgia College of Veterinary Medicine. She practices as a field service clinician, seeing horses, goats, sheep, and, of course, llamas and alpacas at their farms. Her research focus has been in the area of internal parasites that infect llamas and alpacas.

Treasurer, Patrick Long, DVM

Corvallis, Oregon, lama_dr@msn.com

Pat is a practicing veterinarian in Corvallis, Oregon. Llamas and alpacas comprise more than half of his practice. He is a member of the American Veterinary Medical Association and the Oregon Veterinary Association, and a board member of the North West Camelid Foundation, Alpaca Research Foundation, and the Morris Animal Foundation. He is coauthor of the book *Llama and Alpaca Neonatal Care*. Dr. Long has written many articles for *Alpacas Magazine* and has participated in several importation screenings for ARI. Dr. Long's areas of interest are herd health management, nutrition, and reproduction.

Secretary, Michelle L. Ing, DVM

Granite Bay, California, diamondmals@aol.com

Michelle graduated from UC Davis in 1996. She completed an internship in Equine Surgery in 1997 at Hagyard-Davidson McGee in Lexington, Kentucky. In 1998 she began her private practice with an emphasis in camelids in Spokane, Washington. Today she lives in Granite Bay, California, where her referral clinic is dedicated to camelids.

Patricia Craven, PhD

Ormond Beach, Florida, pacraven1@gmail.com

Patricia pursued a career in medical research in the areas of endocrinology and metabolism at the University of Pittsburgh for 35 years. She and her husband Bryan owned Cherry Ridge Alpacas. She has served on the board of directors of the Alpaca Research Foundation since 2001, and remains passionate about alpaca research.

Karen Baum, DVM

Huddleston, Virginia, lildoc@mindspring.com

Dr. Baum was formerly a member of the faculty of the College of Veterinary Medicine, Virginia Tech, where she founded the Large Animal Neonatal Intensive Care Unit and established the Lama Advisory Committee. She is now president and owner of Little Doc's Veterinary Care, a private large animal practice and clinic emphasizing llamas and alpacas. Karen has been on the ARF board of directors since its inception in 1997. She also serves on the BOD of the International Lama Registry (ILR). Karen is president of the International Llama Foundation (ILF), a nonprofit organization which is dedicated to educating people about camelids. Dr. Baum is past president and past vice-president of the Llama & Alpaca Association of Mid-Atlantic States (L.A.M.A.S.) and is enthusiastic about the llama and alpaca industries.

Randy Larson, DVM

Alpha, Illinois, larson26@winco.net

Randy Larson, DVM, operates Larson Camelid Services and was a partner in a mixed veterinary practice in Western Illinois for many years. As an alpaca owner and breeder with his wife Jan, his practice focus is now alpacas. He graduated from the University of Illinois, as did Jan and Randy's three children.

ARF WELCOMES SHAUNA R. BRUMMET, PHD TO THE BOARD

We are all very pleased that Shauna has agreed to return to the ARF Board of Directors.

Shauna served on the ARF board from 1998 to 2001. In 2004 she was elected to the ARI Board and served as VP and Chief Scientist for six years. After taking a required year off the ARI Board, during which time she remained as Chief Scientist, Shauna was re-elected and served as VP and Chief Scientist for a third term. During her time on the ARI board she was instrumental in helping to develop robust scientific tools to support the herd development plans of North American alpaca farmers. In addition to her work on the ARI board, Shauna helped organize the 1st International Workshop on Camelid Genetics and the 2011 Camelid Conference on Reproductive Biotechnologies and Genetics, collaborative efforts of ARI and ARF.

Shauna, with her husband Jeff bought their first alpacas in 1996 and operate Hobby Horse Farm in Medina Ohio.

The ARF Board members volunteer their time. ARF has no paid employees.

ARF RESEARCH STUDIES

STUDIES COMPLETED THIS YEAR

Chromosomal abnormalities associated with infertility in camelids

Principal Investigator: Terje Raudsepp, PhD, Texas A and M University

Many problems with alpaca fertility are caused by changes in chromosomes. This study has developed tools to look at markers of genes on chromosomes under the microscope. They have used this tool to visualize changes in chromosomes associated with infertility in alpacas. Dr. Raudsepp and her colleagues analyzed the chromosomes of over 51 alpacas and llamas with various reproduction related disorders. Chromosome abnormalities were found in 23.5% of the animals. The most frequent abnormality was the minute chromosome syndrome They also identified a translocation involving chromosome 20 in a sterile male. These findings could help veterinarians to diagnose and predict infertility in alpacas resulting in the saving of time and money for breeders.

Glucagon Like Peptide 1 Dosing in Alpacas

Principal Investigator: Chris Cebra, DVM, Oregon State University

Healthy alpacas are closet diabetics, and there are times when their blood sugar or fat fractions become too high or they develop fatty liver. Using insulin to treat those conditions has been effective, but has the disadvantage of potentially dropping blood sugar too low. An alternate medication, exanatide, has been tested, and appears to be safer than insulin. This study tested exanatide in a larger group of alpacas and established its clinical usefulness.

ONGOING STUDIES

Genetic basis of choanal atresia.

Principal Investigator: Belinda Appleton, PhD, University of Melbourne, Melbourne, Australia

Studies are under way to develop a genetic test that will detect mutations associated with choanal atresia and ultimately be able to predict which alpacas are likely to have cria with this disorder.

The pharmacokinetics of subcutaneous Eprinomectin ERI (LongRange®, Merial) administration in healthy adult alpacas.

Principal investigator: John M. Pollock, DVM, Tufts Cummings School of Veterinary Medicine, Woodstock, Connecticut

LongRange® is a new, long-acting (extended release) injectable dewormer which achieves effective blood levels to control mite infections (mange) in cattle at pasture for up to 56 days and intestinal worms (nematodes) for up to 150 days.. As drug levels and efficacy can vary between animal species, LongRange® needs to be specifically evaluated in alpacas to optimize its use, minimize its misuse and help prevent development of resistance.

Indicators of anemia of chronic inflammation in anemia of alpacas. Principal Investigator: Susan J. Tornquist, DVM, PhD College of Veterinary Medicine, Oregon State University Corvallis, OR

In this study, we will determine whether one of the most common causes of anemia in hospitalized human patients could be causing anemia in alpacas. It is known as anemia of chronic disease, and accompanies a wide variety of diseases. It's important to distinguish anemia of chronic disease from other causes of anemia, such as iron deficiency, because the treatments are quite different and treatment for iron deficiency could actually be detrimental to alpacas with anemia of chronic disease. It is also important understand the underlying cause of anemia so that potentially useful new therapies can be developed.

Keratin and Keratin Associated Protein in Alpaca Fiber Follicles

Principal Investigator: Kristy Daniels, PhD, Department of Animal Sciences, The Ohio State University

This study will examine keratin and keratin-associated protein gene expression in primary and secondary fiber follicles of huacaya alpacas with differing fleece quality. The ultimate goal is to learn more about alpaca fiber genetics and the genetic basis for different fiber follicle characteristics, so that one day alpaca breeding programs may consider selection for certain genes in order to achieve desired fiber phenotypes.

Are Polymorphisms in the non-coding regions of the agouti gene responsible for color variation in alpacas? Principal investigator: Kylie Munyard B.Sc (Hons), PhD Senior Lecturer — Molecular Genetics Curtin University, School of Biomedical Sciences Perth, Western Australia

Currently the genetics of color in alpacas is poorly understood and so breeding for specific colors or patterns (or trying to avoid them) is difficult. This project aims to build on previous successful research and fully characterize the agouti gene from alpacas of different colors. The sequences of different colored alpacas can then be compared, enabling researchers to identify mutations that either cause or contribute to color variation in alpacas.

NEW STUDIES FOR 2014

Evaluation of Three Short-Term Field Anesthesia Protocols

Principal Investigator: Aubrey N. Baird, DVM, Purdue University

Practicing veterinarians are frequently called upon to perform short-acting injectable general anesthesia of alpacas in a field setting. The reasons for such anesthesia vary from surgical procedures, wound therapy, bandage changes, diagnostic procedures such as radiographs or just a thorough examination that cannot be done safely or comfortably in the non-anesthetized animal. Many practitioners have a" favorite recipe" that works for them. However this is an area open for evaluation to determine a more effective, safer protocol. The determination of such a protocol would have immediate impact on the practice of alpaca field anesthesia.

The Pharmacokinetics and Pharmacodynamics of Buprenorphine and Sustained Release Buprenorphine in Adult Alpacas

Principal Investigator: Turi K. Arnes, DVM, Ohio State University

The opioid buprenorphine is commonly used for the treatment of pain in veterinary medicine because it causes minimal sedation and is relatively long lasting. While it has been studied in other species, studies in alpacas are limited. This study will provide veterinarians with information addressing pain management in alpacas, including effective doses, duration of action, and dosing interval. This knowledge will be beneficial for increasing veterinarians' ability to manage pain, supplement anesthesia, and improve care of critically ill camelids.