Are We Really Ready for Breed Standards?

By Eric Hoffman

Love the idea or hate it, developing breed standards is today's hot topic in alpaca meetings throughout North America. If you're wondering "What is a breed standard?" or "Why do we need a breed standard?," you aren't alone. If you're wondering why this has become such a pressing issue, you are not alone. If you are wondering if any of this will affect you, my answer is yes, it will. You may be among those who view the push for breed standards as a thinly veiled marketing plan to benefit a few breeders. Or you may see the development of standards as a necessary undertaking for a maturing livestock business.

Regardless of your point of view, I believe it is vital that we all understand what is at stake. There is a very real possibility the creation of an alpaca breed standard could negatively affect the health of the North American alpaca gene pool. It would most likely reduce the market value of many alpacas that do not fit the established standard. It is important to the well-being of our industry that all breeders be informed on this topic. To that end, I would like to add some thoughts to the discussion.

Historical perspective:

A breed standard involves breeding animals for a desired result. This has been done from time immemorial, but most aggressively after Gregor Mendel explained genetics to the world in the nineteenth century. Today many animal species have books dedicated to breeding and genetics. When it comes to South American camelids, there are no such books and few genetic studies.

This is, in part, because of the alpaca's unique history. Until very recently (1983) they have been isolated in the high Andes, and owned by impoverished people living in countries where meager research funds were usually focused on disease prevention. We know there have been at least two widespread genetic bottlenecks in the alpaca populations in South America. Millions of domestic camelids were destroyed following the Spanish conquest of the Incas in 1532. This was accomplished through the introduction of European livestock diseases and deliberate policies to starve the indigenous human population by destroying their livestock. Hybridization between llamas and alpacas is also thought to have increased with the destruction of the Inca husbandry system.

During the 1970's and early 80's many large herds in Peru were purged of their colored animals in favor of white animals because the large fiber mills in Arequipa began offering more money for white and light fleeces. The transformation from 70 percent colored herds to 70 percent white or light fawn occurred in less than a decade. Inbreeding and line breeding were commonplace and still are. Defective animals were often sent to slaughter, an option not practiced in North America. In the 1980s exports began to North America, Australia, and Europe, from many of the populations of animals described above.

The first alpacas were exported from South America for sale to the North American public in 1983, shortly after the arrival of a couple dozen alpacas from England in 1982. Imports continued until 1998 when the registries were closed. As author and one of the founders of the Alpaca Registry Inc. (ARI), I'd like to point out that when the registry was written in 1988, a large population of llamas was already established in North America. One of the primary reasons for creating an alpaca registry (where lineages are verified by science - blood typing/DNA), was to ensure that llamas and llama/alpaca crosses known as huarizos weren't mistakenly or deliberately registered as alpacas. We were working to protect the North American alpaca gene pool from llama influences. It was not our intention to limit diversity within the alpaca gene pool.

During the heaviest period of importations in the mid 1990s the two North American registries, the Alpaca Registry Inc. (ARI) and the Canadian Llama and Alpaca Association's registry, (CLAA) instituted screening requirements for imported alpacas seeking entry into either registry. A team of university-based veterinarians from Colorado State University, Oregon State University, U.C. Davis, and other camelid experts developed screening protocols.

The requirements were designed to ensure the alpacas accepted into the registries were phenotypically alpacas, conformationally sound and had fine fleece. The inbound animals were screened for these characteristics by trained teams of screeners and veterinarians. The same teams screened for

both registries. The screening procedure was based on a point system and was widely accepted as an objective tool because it relied on taking measurements and recording the findings. The evaluators signed every evaluation form attesting to their findings.

There was no mystery about what occurred. If the alpaca qualified it was allowed to enter the registry and become a part of the North American alpaca gene pool. If it didn't qualify it was not registered and usually stayed in the country of origin. Quality control instituted through screening helped improve the alpaca herds in North America. The screening criteria required importers to select excellent animals that could qualify and be registered. Registries and breed associations all over the world have used this screening system. In all probably 20,000 alpacas have been screened using these forms.

The owner of an alpaca screened into a registry was assured their alpaca was sound, an alpaca phenotype, and possessed reasonably good fiber. The alpacas in this population came from many sources in South America. As with any population there were differences in size, proportion, color, fiber quality, and other characteristics. Even though the standards are fairly exacting on structural soundness and fiber, the screening process was intentionally created as a species (not breed) evaluation, recognizing there should be diversity within the species. For example, screened animals could be between 32 and 39 inches at the withers, because that was the height range for alpaca, the species. Having worked for many alpaca and llama registries, we found it is rare to find an alpaca above 39 inches at the withers that didn't have some llama characteristics. These differences in height, color, weight and, to some extent, fiber allowed for greater biodiversity within the definition of an alpaca.

Where are we today?

North American alpaca breeders are building an industry from a strong base with a core of carefully screened animals. We have two closed alpaca registries (Alpaca Registry Inc. (ARI) and the Canadian Llama and Alpaca Association's registry, CLAA), each with high rates of compliance, meaning most alpaca owners in North America belong to one or both. A closed registry means the animals in the registry are the only ones who can contribute to its gene pool, so the genetic material available is limited to what exists in that population. 97% of alpacas in the world don't belong to a registry of any kind.

Alpacas in the two North American registries are said to be pedigree alpacas. Each registered alpaca has a certificate (pedigree) verifying the animal's identity, its lineage and breed type (suri or huacaya).

When pondering why there is a push to create an alpaca breed standard, my 30-year involvement in camelid raising, a familiarity with what's going on with alpacas on four continents, and knowledge of breed standards for other forms of livestock compels me to ask:

- Why do we need a breed standard?
- Who would write the breed standard?
- What criteria would be used?
- Will there be a system to identify desirable genes within the registered population and thus improve the species?

Or, will the pressure to conform to the standard limit genetic diversity and produce a plethora of genetic diseases?

- Will genetically transmitted diseases be addressed by breed standards?
- Do we know enough about alpaca genetics (including fiber characteristic inheritance), to make a scientifically based standard?
- Should a DNA based registry, whose primary mission was originally to record lineage, involve itself in a breed standard?
- Would the adoption of breed standards create two registries within one i.e., animals that meet the standard and those that don't?
- Will the standard be controlled by a committee and operate like today's show committee?
- Will fads and marketing hype influence a standard?
- What would the economic impact of imposing a breed standard be?
- Will the people in decision-making roles for breed standards distinguish between artificial (essentially aesthetic judgements) and essential criteria (characteristics which are necessary for an animals health or that are quantifiable e.g. Histograms?
- Will a standard lead to species improvement?
- Is there a healthier, friendlier and less judgmental way to bring about genetic improvement to animals?

Breed standards might seem like a good thing – a road map to excellence. They have brought about amazing changes in some domestic animals. There are examples of standards that have increased milk and meat production and fertility rates. These types of standards, which involve an end product, are often developed in concert with scientific research and improving the marketability of an end product. Not all breed standards have worked out. In many cases the intended changes brought about by endorsing a short list of traits to accomplish a particular goal have resulted in ongoing genetic problems. These are costly to the human

participants and can be painful and even cruel to the animals produced to conform to a standard.

Lessons from other breed standards:

The authoritative 584-page book, The Dog and Its Genome (Cold Spring Harbor Laboratory Press, New York, 2006), is a resource I highly recommend to anyone wanting to soberly consider the possible unforeseen complications of pursuing a breed standard based on a narrow set of criteria. This is a serious science text with contributions from more than 80 authors citing more than 2500 references from peer-reviewed papers.

Early in the book we find the "Development of Breed Standards," which reads, "The development of breed standards by a parent club places selective pressure toward a specific phenotype. This acts to narrow the acceptable breeding population. Strict breed standards, competitions, closed studbooks, popular sires, and genetic disease control can all act to manipulate the gene pools of dog breeds. Depending on these selective pressures, gene frequencies can significantly change from generation to generation. What is considered natural selection is rarely the dominant force in dog breeding. The frequency of individual genes (whether of a beneficial, detrimental, or null effect) can increase, decrease or even be lost to the breeding population due to selective pressure. Breed-related genetic disorders develop based on the increased frequency of disease-causing genes within breeds. Sometimes this occurs due to the founder effect from popular sires. Disorders are unintentionally selected because of their linkage to desirable traits established by the club in their breed standards."

Alpacas will never be dogs, but alpacas are subject to some of the same forces described above. Many readers will no doubt see parallels in the outcomes created for dog breeders by the development of breed standards and developments taking place in the alpaca industry. Often the desired outcome "The correct look" trumped all other considerations for dog breeders. A standard might describe the dog's coat type, color, ear shape, measurements of the skull and jaw, height, weight, tail, balance, muscular development, and behavior in excruciating detail. From time to time these multi-faceted descriptions are "tightened up" by breed committees to accommodate pressure from powerful figures involved in the breed. Mutations are often celebrated and pushed forward as a breed improvement. Desired traits are exaggerated by selection. At the same time breed committees adhere to "The integrity of the breed" with religious reverence. Integrity of the breed can involve appearance, productivity and/or behavior.

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In some instances this can take bizarre turns as has happened to the English bulldog. Breed standards require its head to be so massive and its hips so narrow that puppies are born by Caesarean section rather than through the birth canal. Boxers in the show ring appear muscular, capable, agile and alert, even though 75% of the breed is thought to have hip displasia resulting in many animals being euthanized early in their lives. Deafness is a problem associated with dalmatians in North America. The breed standards require that dalmatians with a large black patch on their ear be disqualified (preferring smaller spots instead) from the breed, even though it has been scientifically proven that dogs with the "undesirable" ear patch are rarely deaf! Breeds of livestock are not immune to this kind of thing. Ask any Hereford cattle producer or Arabian horse breeder if their breeds have had any breed specific genetic problems.

Unwanted Outcomes of Limiting the Gene Pool:

It is impressive to see a good dog show when the various breeds strut their stuff, but looking at the champions doesn't tell the whole story. More than 500 genetically based diseases have been reported in dogs, which is second only to humans. Of the genetic diseases in dogs one of the more common expressions is considered simple monogenic mode, i.e., most likely "brought to the surface" by the exposure of recessive genes by downsizing a gene pool. This commonly occurs when breeding closely related animals or otherwise reducing the scope of a gene pool. Genetic diseases are also recognized as multi-factorial, which means a disorder may be due to combinations of genes that modify the expression of traits and make the defect's origins difficult to identify. Genetic disorders can be anatomical in nature, metabolic, and predisposed. Developing particular kinds of cancer at a young age is an example of predisposed. One of the dog genome book's editors Dr. Elaine A Ostrander of the National Institute of Health points out the downside of emphasizing a few characteristics at all costs, "The outcome of such restrictions [deliberately limiting genetic diversity] is a comparatively high incidence of genetic disease in purebred dogs, which is unfortunate for both the owners and breeders, as well as the dogs themselves."

Scarcity of Genetic Studies in Alpacas:

How does this match up with what

we know about alpacas? In the few genetic studies that have been undertaken with alpacas about 80 markers (which aren't genes) have been identified as opposed to 19,120 genes in dogs. The alpaca markers are mostly those defined by Cecilia Penedo PhD at U.C. Davis for parentage verification when the ARI registry was made in 1988. The genetic road map for dogs is much further along. For example, in the dog 17 genes have been identified that determine craniofacial formation. In alpacas no genes have been identified in this area (or in any other area), though there are numerous facial defects recorded, ranging from mild overbites to disfiguring wry face, cleft palate, and terminal choanal atresia.

In 2001 Alpaca Research Foundation medical researcher Patricia Craven, likened how little is known about the alpaca's genetic map to trying to drive a car from San Francisco to New York from the information found on a single road sign. As a result of scant information many disorders and defects identified in alpacas are labeled congenital (present at birth), rather than genetic because the studies to identify the origins of a defect have yet to be conclusively conducted. There is a long list of possibly inherited defects in alpacas. Some of them are: choanal atresia, choanal ani, wry face, gopher ears, polydactyl (multiple toes), scoliosis, immunodeficiency disorders, angular limb deformities, cataracts, deafness, heart defects, ovarian and testicular abnormalities, and dwarfism.

In recent years The Alpaca Research Foundation (ARF) has funded two genetic projects, one in the United States aimed at identifying markers, the other a survey in Chile of congenital defects in wild and domestic camelids that might have genetic origins. These two projects are steps in the right direction and, if they are successful, may provide an adequate foundation to launch more specific studies. But, as things stand today, we lack the most basic genetic information.

Phillip Sponenberg DVM, PhD, is a well-known livestock geneticist who wrote two chapters on genetics in The Complete Alpaca Book. In "Chapter 24: Basic Genetic Diseases and Principles for Breeding," Dr. Sponenberg identifies approximately 70 defects found in alpacas that are congenital (present at birth) and either genetically or environmentally caused. Without conclusive research and agreement about how to treat such defects, we are ripe for spreading unwanted genes, especially if the wrong stud males become dominant in breeding circles. For example, two

highly undesirable defects, choanal atresia (fatal in crias) and wry face (disfiguring mandible deviation), were studied at Oregon State University and Colorado State University respectively. Though the researchers felt both these severe defects were genetic in nature a single gene inheritance appeared unlikely after years of research. It is more likely that these are complicated polygenic defects, whose inheritance pattern needs more effort and money to decipher. Brad Smith DVM, PhD, who conducted studies on choanal atresia, and wrote about it in the Spring 2000 issue of The Alpaca Registry Journal concluded, "The mode of inheritance has not been resolved, but the disease will be classified as a heritable defect." More funding was needed to create a test for carriers, but the funding has never materialized.

The fact that the necessary studies to answer questions such as this are not being completed should loom as a significant concern for anyone who seriously advocates defining breed selection criteria that diminish the genetic diversity that now exists. We need to learn more before we downsize this gene pool. An example of how we may already be flirting with serious genetic problems is illustrated by the experience of a new alpaca owner whose cria was born with the fatal condition known as a choanal atresia. The breeder told the new owner that choanal atresia was not a genetic defect, and offered to replace the cria. The owner wondered if the dam, which was purchased pregnant from the breeder, should also be replaced. The owner contacted several research veterinarians who helped answer his questions. In the end the breeder fully cooperated and agreed to replace both the cria and dam. The new owner was happy and felt fairly treated because he was afforded a fresh start. In situations such as this the stud, who may have produced other choanal atresias, may continue to be used and be advertised as superior because of his phenotype characteristics. The stud owner has a somewhat defensible position, "they (scientists) don't know where it (choanal atresia) comes from," which will remain true until a definitive study is completed. Accomplishing this seems to me to be far more important for the alpaca industry than creating a breed standard.

Look for Yourself:

We already have tools to help breeders improve their animals. The use of screening forms (examples of which are provided on the CQ web site www.llamas-alpacas.com/screening-forms.pdf), can help identify healthy alpacas with good fiber. The system is easily understood and is objective rather than subjective in nature. It focuses on species determination, structural soundness and fiber quality without a prejudice towards different styles of animals. It disqualifies animals with significant conformational defects, sub-

standard fiber, and phenotype characteristics suggesting llama influence. The screening instrument deliberately does not address aesthetic criteria, such as the prominence of fiber on legs or between the ears, color of toe nails, secondary fiber qualities, and other "things" that breeders sometimes talk about when critiquing one another's animals. The information is objective (based heavily on measurement) and anyone can take the finished form back to the animal to verify the findings. There is no attempt to place animals in an order as happens in shows. Alpaca shows are enjoyed by many breeders and can certainly continue without a comprehensive breed standard; they have for years.

Screening is no longer done in the United States and Canada, but it is still a valuable tool that has found useful application in other parts of the world. The Australian Alpaca Registry used the system to create their "Stud Certification Program." This assures that certified studs are sound phenotypes (with no guarantees to genotype). The program is not overly disruptive or threatening to the rank and file breeder. Other entities have also made use of the original screening forms, particularly the British. One of the latest groups, Alpaka Zucht Verband Deutschland (German Alpaca Registry), is applying the original forms to screen their founder population. This organization also offers courses in alpaca screening to its members.

Veterinarians have developed detailed "Prepurchase Examinations" and some of the insurance companies have developed fairly comprehensive examination forms that can be used to judge an animal's soundness. Yocum-McColl Laboratories continues to add useful forms of measurements to their Laserscan histograms. It is now possible to measure average fiber diameter (AFD), coefficient of variation (CV) and standard deviation (SD), microns >30 (prickle factor), spin fineness (SP) mean curvature (measured in degrees per millimeter), which is the amount of crimp, crinkle or curvature in a sample. Lastly, the amount of medullation can be measured in light colored samples. This is amazing and extremely helpful. When it comes to end-product (fiber), the sophistication of available testing gives breeders the essential tools to monitor their animals and make their own decisions.

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What's the Rush?

Many of the problems with existing breed standards occurred because breeders didn't know the ramifications of what they were codifying. Passion and ignorance combined forces. A desired look or performance may have been achieved but often with a price that included sacrificing genetic diversity and the inability to undo what was done. Rushing to replicate this may not be wise.

Our situation is different. We have a pedigreed closed population. They have their differences, but most of the animals within the registries are alpaca phenotypes. Considering that the registered alpaca population is around 70,000 animals, this is a huge accomplishment and an impressive genetic reservoir. Because the population is closed, the bio-diversity in this population is finite. Shouldn't we explore and understand what we have before we deplete the existing diversity?

The micro-satellite studies of researchers in South America like Jane Wheeler Ph.D. have proven definitively that the vicuña is the wild progenitor to the alpaca. Attempts to understand the fiber connection between alpacas and their fine-fleeced vicuna progenitor have just begun. Shouldn't we understand the histology (fiber science) of the camelid family prior to making rules about alpaca fiber characteristics? Presently much of the information applied to alpaca fiber is based on research from sheep, which isn't always transferable. Why rush to judgment using data collected from a different species?

The history of other breed associations demonstrates that once a group commits to a "breed standard" it becomes the breeding goal. Breed associations are nearly always unable to change course, despite genetic surprises or scientific breakthroughs. Adherence to the "integrity of the breed" and entrenched financial interest rules in the end. Are we ready to define the integrity of alpacas with the limited amount of knowledge we have today?

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About the Author

Eric Hoffman wrote the original Alpaca Registry Inc. and served on its board in its formative years. He has also worked as a screener for many years. He is the primary author of The Complete Alpaca Book (revised second edition). Eric has written four other books and authored hundreds of magazine articles.