LAMA WELLNESS SERVICE
NORM EVANS, DVM

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Joyce,

Some breeders have requested information on how to use the results of fiber biopsies. The results of your biopsies, when coupled with the histogram and alpaca's conformation should give good direction to your breeding program if you wish to follow it. The useful tools you get are 1) Density, 2) Secondary to primary ratio, 3) Sebaceous gland presence and density, 4) Secondary fiber medullation, and 5) Fiber cluster shape, symmetry, or infrastructure, and 6) Micron variation of the secondary and primary fibers.

1)Density is the number of follicles per square mm of skin. Based on 2100 biopsies, the average for Huacayas is 40.35. About 340 Suris have averaged 39.1 follicles sq mm. Superior breeding stock that seems to win in the show ring has a density of 50 to 60+.

2) The secondary to primary ratio is the number of smaller micron desirable fibers to each primary fiber or guard hair in each fiber cluster. The average that I have seen on about 2100 Huacayas is 8.9 to 1. The average S/P on 340 Suris is 8.6 to 1. It seems that near 9 to10 to 1 is desirable for the perception of better fiber cluster structure in the show ring. I count 25 fiber clusters and average that number for the S/P average so it may not agree with the picture scan on a particular alpaca.

3) The sebaceous gland presence has not been mentioned until 2006. I have followed the progress of alpacas on fiber nutrients in my research for the past 5 years. I saw that some responded with brightness or luster more efficiently than others. After the biopsies, I see that it is the ones with gland presence that responded more rapidly. After evaluating family lines, I see that these glands are appearing to be highly genetic and appear to be a strong male trait. These glands provide a nutrition pathway to the fiber along with the vessels and capillaries and are a very strong factor responsible for brightness and luster. When several judges started appreciating well nourished fleeces, I saw that I was headed in the right direction.

4) Secondary fiber medullation was thought to be bad. In fact, some say that all alpacas with secondary medullated fibers should be eliminated from the gene pool. The fact is that would take 98% of the Huacayas and Suris from the United States gene pool. The average that I see on biopsy is that about 40-50% of the secondary fibers are medullated. Some judges are actually rewarding it in the

ring because higher secondary medullation relates to more defined bundle structure which gives the fibers the perception of strength and maybe even density. In fleece shows however, the apparent feel from secondary medullation does not seem to be desired.

5) Fiber cluster shape, symmetry, structure, or infrastructure appears highly genetic but can be destroyed by sickness or infection. Ideally, we want all clusters to have an even distribution of fibers. Clusters that uniformly have 10 to 12 fibers are preferable to having one cluster with15 fibers beside a cluster with 8 fibers and another cluster with 11 fibers. The fact is we can predict this uniformity before you ever select your breeding. Look for tight symmetrical clusters of the same size and shape on your biopsy rather than irregularly shaped clusters with uneven fiber numbers. The density and S/P of the sire and dam and especially the nutrition to the dam during the last 4 months of pregnancy and of the cria the first 6 months seem to be major factors in determining adults fiber cluster regularity.

6) Micron size and variation of the secondary and primary fibers should receive major attention. Most all opinions agree that it is highly desirable to breed toward primary and secondary fibers that are healthy and near equal in size as measured in microns. Remember that there are 25,400 microns in an inch and my measurements often average about 2 microns larger than the histogram because of human error on my part. The primary fibers (guard hairs) are usually straight, much larger, and have a prickle factor that is unpleasant to human skin. (comfort factor) The 250 X scan of your biopsy gives a good indication of the micron variation on your particular alpaca. I count and measure 100 secondary and 50 primary fibers (depending on the specimen density) and show a typical view on this scan. This calibration is usually rather close to the histogram results where many more fibers are evaluated. Both are to be used as tools in selecting breedings. Our goal is to breed in the direction that both fibers are acceptable in size and as near equal in size as possible. Micron size appears strongly genetic but can be altered by sickness, weather extremes, nutrition, and other factors. The average variation that I see to date is 8.9 microns and any thing under 5 to 5.5 microns seems very desirable and genetically strong. A pattern is showing that males with a wide micron variation between secondarys and primarys (Example: 21 micron secondarys and 37 microns primarys) pass this wide variation on to 80+% of their offspring. A male with 22-23 micron secondarys and 28 micron primarys could be much more useful to most females.
How do we use this info? You breed strong points to weak points in your selection process. To improve as a herd, some animals will simply not help to strengthen the gene pool. This is the reason for knowing the stats on the females as well as the males, if you really want to more rapidly potentate your genetics. In about 30% of the cases, where both females and males are biopsied, the females actually have superior genetic characteristics to the males that they are bred to but often time the male has the name. Every farm that I visit

**seems impressed with how their crias are improved compared to previous years. This certainly is the case and we notice that the show ring is becoming much more competitive. Much of this success can be a compliment to breeder management in the selection of males utilized as well as to improved nutrition. Close observation of the programs enjoying much success have utilized the above tools in their breeding selection program.**

**Hope this is useful.**

**Norm Evans, DVM**

**LAMA WELLNESS SERVICE**
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**September 26, 2010**

**Joyce Johnson**
**Shadowland Ranch**
**325 Highway DD**
**Defiance, MO 63341**

**Joyce,**

**I appreciate the opportunity to do skin and fiber evaluation on your male Lightening Locks**
**I enclosed pictures so that anyone can recount or evaluate these findings. I can do micron counts on 100 secondary and 50 primary fibers as a guide, but your histogram of 2000 to 3000 fibers is likely more accurate.**
**I am not sure of the importance of medullated fibers. I find that 100% of the primaries are medullated and 30 to 50% of the secondary are medullated. If desired the medullated fibers can be observed and counted on the pictures that provide the S/P ratio on the observed fiber clusters. The number of secondary medullated fibers may effect breeding decisions. The average is about 50% on most samples.**
**I gain more knowledge of fleece quality by observing and counting sebaceous gland density as I see a correlation between this and what senior judges are referring to as "well nourished fleece" with superior luster in the show ring. The sebaceous glands secrete "sebum", a combination of free fatty acids and glycerides. Sebum reduces water loss from the skin surface, protects the skin from infection by bacteria and fungi.**

**"Lightening Locks" demonstrates level 4 of 4 gland structure as noted by the gray areas around the hair follicles on all 4 scans. This should be associated with luster and fiber quality. The glandular infrastructure is likely genetic and gland presence is likely nutritional. Observe the 4 fiber clusters from Lightening Locks showing the S/P ratio at 10.5 to 1. Twenty-five fiber clusters had an average S/P of 10.9 to 1. The density study from 4 sections of 1 SQ MM of skin surface is 48 follicles per SQ MM of skin. The average density that I evaluate is 39 follicles SQ MM and the average S/P is about 8.6 to 1. Note from the 250X view that Lightening Locks shows only 30% secondary medullated**

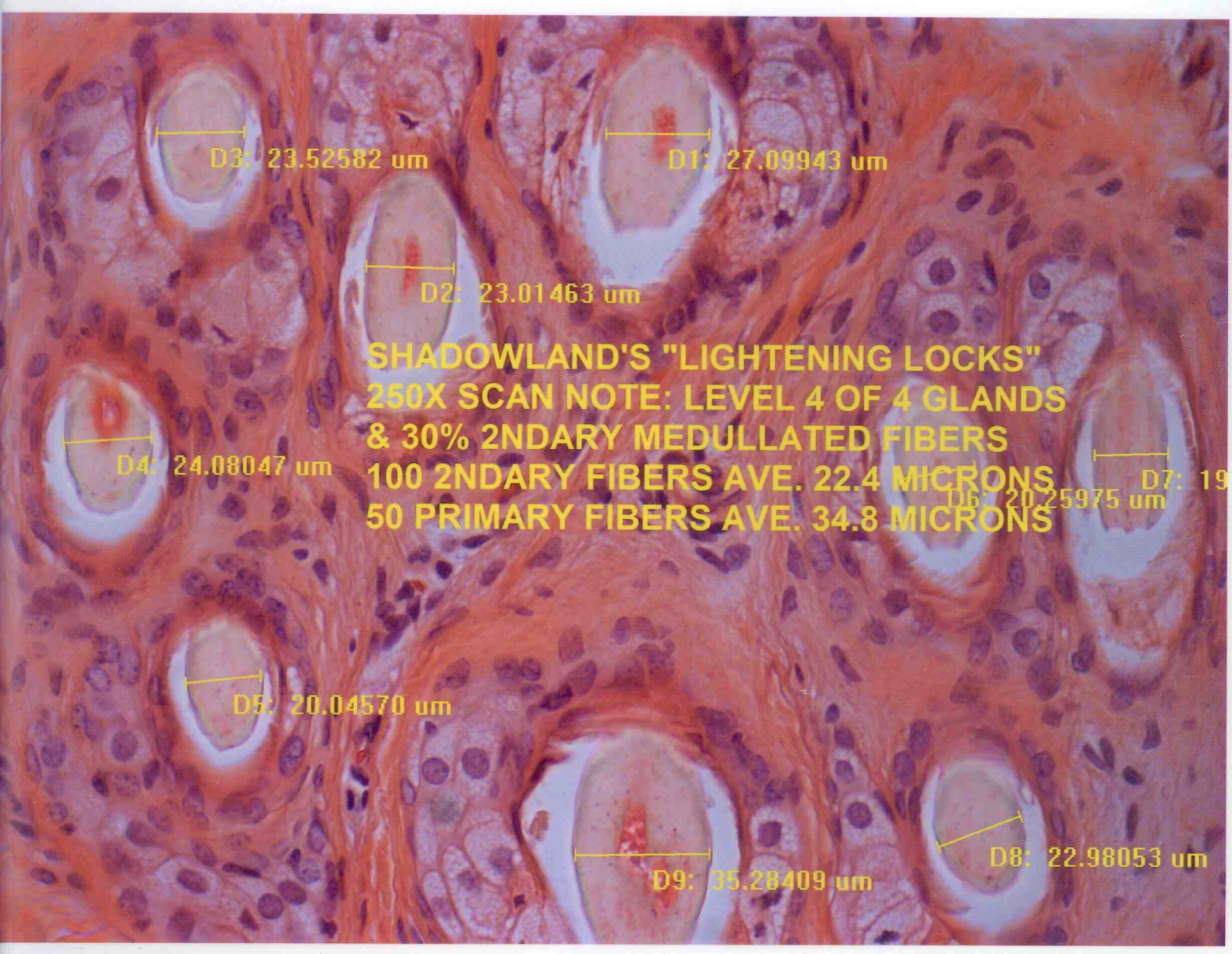
**fibers. This should be associated with excellent handle. One hundred secondary fibers averaged 22.4 microns while 50 primary fibers averaged 34.8 microns for a variation of 12.4 microns. His strong points are his above average density, S/P, tight fiber cluster uniformity and gland presence.**

**If blood work, panels, fiber analysis, history, and histograms are correlated with the S/P and density, we may demonstrate useful tools for maximizing fiber production. This work may also influence your breeding decisions.**

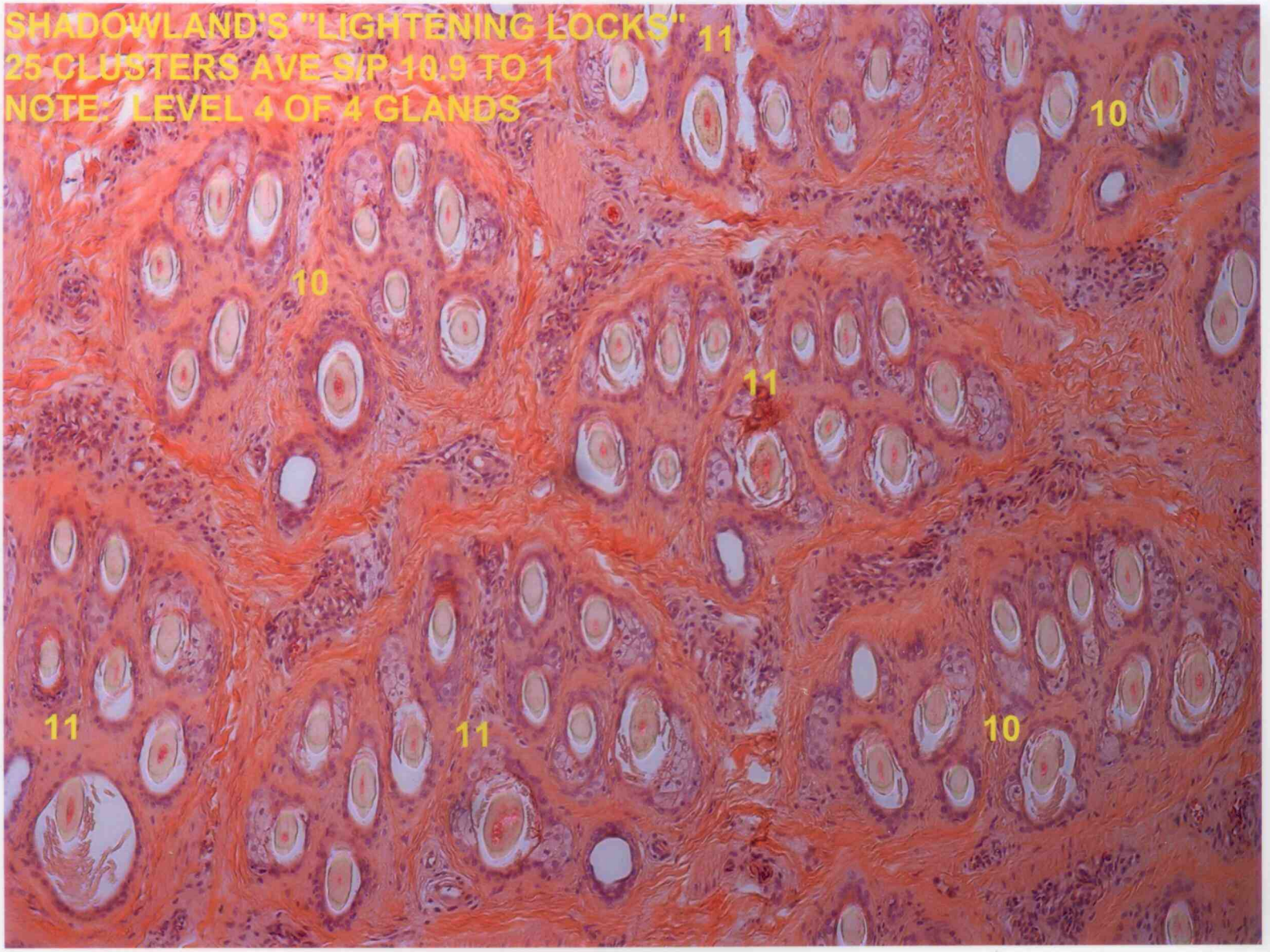
**I think the above information can provide helpful direction to maximize your selection process for future breeding decisions. Female stats are very important. I appreciate the opportunity to have been a part of your program.**

**Norm Evans, DVM**


SHADOWLAND RANCH 15X SCAN
"LIGHTENING LOCKS" NOTE: TIGHT
SYMMETRICAL FIBER CLUSTERS


D3: 23.52582 um
D1: 27.09943 um
D2: 23.01463 um
SHADOWLAND'S "LIGHTENING LOCKS"
250X SCAN NOTE: LEVEL 4 OF 4 GLANDS
& 30% 2NDARY MEDULLATED FIBERS
100 2NDARY FIBERS AVE. 22.4 MICRONS
50 PRIMARY FIBERS AVE. 34.8 MICRONS
D4: 24.08047 um
D6: 20.25975 um
D7: 19
D5: 20.04570 um
D8: 22.98053 um
D9: 35.28409 um


SHADOWLAND'S
"LIGHTENING
LOCKS"
DENSITY 48
FOLLICLES SQ
MM OF SKIN
51
55
40
45


SHADOWLAND'S "LIGHTENING LOCKS"
25 CLUSTERS AVE S/P 10.9 TO 1
NOTE: LEVEL 4 OF 4 GLANDS
11
10
10
11
11
11
10

# Snowmass Lightning Locks

ARI #822681

| | |
|---|---|
| Color: | White |
| Date of Birth: | June 18, 2003 |
| Country of Origin: | USA (Full Peruvian) |
| Sire: | Snowmass Silken Gold |
| Dam: | Snowmass Tunita |

Few sires can claim ownership to four white Championships in one year, all in major alpaca shows! Then again, there are even fewer white sires with the quality and quantity of suri locks that Lightning Locks exhibits, tightly twisted, dense, incredible handle, lots of luster and a micron count below 20! But, it's not merely his outstanding phenotype that sets him apart from the rest. Lightning Locks comes from two of the premiere alpaca herds in the country, Snowmass and Latah Creek, and his pedigree goes back to one of the top Accoyo suri herd sires ever, Pperuvian Uribe (Durazno). On top of his outstanding phenotype and genotype, no sooner did Lightning Locks complete his phenomenal show career than he began settling females at just over two years of age. Finally, as they say, the proof is in the progeny; and, his offspring have performed phenomenally in the show ring. If you're looking for one of the premiere white herd sires in the country, why not add the genetics of a male proven across the board - - Lightning Locks!

Awards Received:

1st Place & Champion – '05 AOBA National Alpaca Show, with 37 Entries

1st Place & Champion – '05 MaPaca Jubilee, with 42 entries

1st Place & Champion – '05 Futurity, with 31 entries

1st Place & Champion – '05 AWE, with 21 entries