

Phenotypic Links Between Skin Thickness, Follicular Density, And Fiber Growth Rates in Alpacas

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One of the benefits of objective measurement of phenotypic alpaca traits is that the resulting measurements can be collected and analyzed for additional insights that can benefit the industry as a whole. Breeders who commission these analyses of their animals, as well as the organizations that provide them, play an important role in advancing the understanding of alpaca trait relationships and their possible underlying genetic links.

Aggregated skin biopsy data represents a relatively unexplored research resource for the alpaca industry. Data collected from skin biopsy samples traditionally includes measures of density (follicle count, typically expressed as the average number of follicles appearing in a millimeter-square area of skin); primary and secondary fiber population average fiber diameters (AFDs) and the standard deviations of diameters (SDs); and the number of secondary follicles relative to primary follicles, known as the S:P ratio.

At our laboratory, we also measure and record the thickness of the skin and the daily growth rate of the fiber (calculated by measuring the length of an accompanying sample of fiber and dividing that length by the number of days since the animal was last shorn.) We record this additional information because we are aware of both genetic and phenotypic research on sheep that supports links between follicular density, fiber fineness, and fiber growth rates. As individual fiber traits like fineness, uniformity of micron, curvature, and staple length share similar relationships and are comparably heritable in both sheep and alpacas, we suspected that similar links between skin thickness, density, fineness and staple length may also hold among alpacas.

In that regard, any alpaca breeders will already be familiar with the work of Australian scientist Dr. Jim Watts, whose breeding philosophy essentially proposes that selecting for density and staple length when breeding sheep results in animals developing so-called “soft, rolling skin” that is correlated with fiber fineness and higher fleece yields for growers. In sheep, it has also been demonstrated that animals selected for improvement in the traits of density and staple length also have healthier skins, a trait which does not benefit them during their lives but potentially adds to the value of the hide in the terminal market.

To explore whether similar relationships between skin thickness and other traits of interest appear in alpacas, biopsy data collected from 85 individual animals were assembled and analyzed for correlations. The results appear in Exhibit 1. As shown, there was a high negative correlation between an alpaca’s skin thickness and density (thinner skins tended to have higher concentrations of follicles, as shown in Chart 1) and also between skin thickness and fleece growth rate (thinner skins tended to be associated with faster-growing fleeces, as shown in

Chart 2.) In addition, meaningful positive correlations existed between skin thickness and primary and secondary AFDs: Thinner skins tended to be associated with finer fiber. These are the same traits relationships observed in sheep.

Exhibit 1: Correlations between skin thickness and fleece traits among 85 alpacas.

	Skin Thickness
Density	-0.86
S:P Ratio	-0.50
AFD Primary	0.66
AFD Secondary	0.58
SD Primary	0.39
SD Secondary	0.54
P:S Micron Difference	0.47
Growth Rate	-0.78
Age In Months	0.26

Chart 1: Follicular density relative to skin thickness among 85 alpacas.

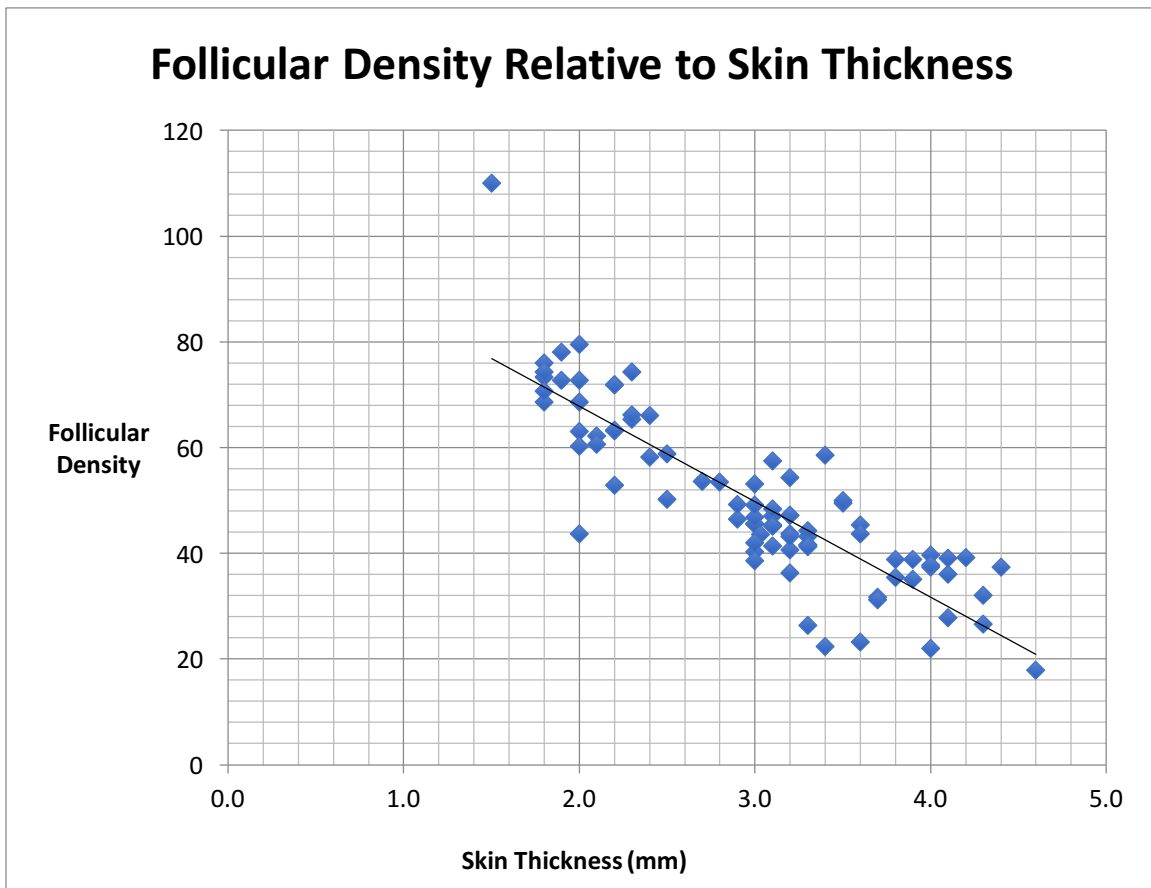
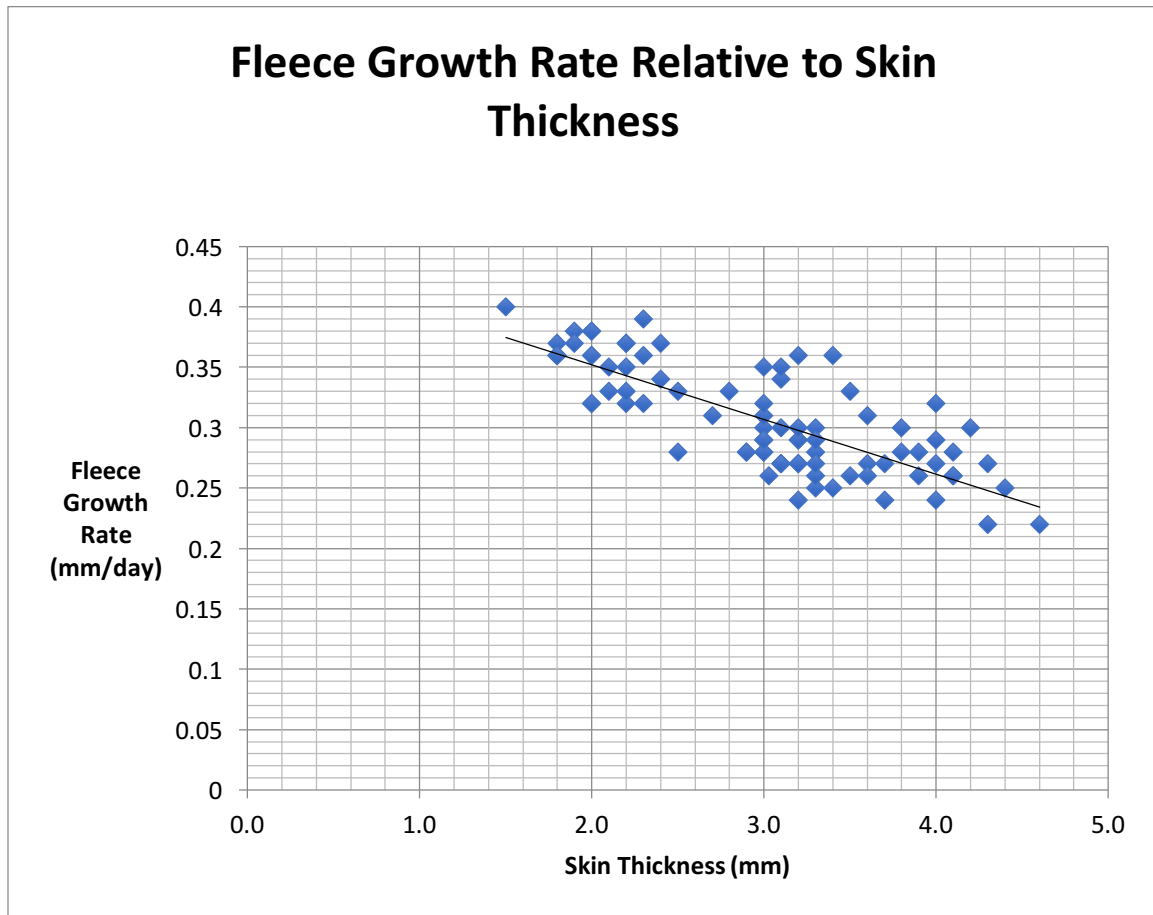


Chart 2: Fleece growth rates relative to skin thickness among 85 alpacas.



The likely link between skin thickness and other fleece traits of interest to alpaca breeders makes a simple and cost-effective way of measuring skin thickness on the farm quite desirable. Sheep breeders in Australia and New Zealand are exploring the use of ultrasound measurement of this trait, as is now done in the cattle industry in the U.S. and elsewhere. It may also be the case that thinner alpaca hides with their denser, finer follicle distribution make more supple or attractive leather, which may enhance the value of these hides in the terminal market. Finally, there may be as yet unknown links between skin thickness and alpaca health. These are all reasons to focus further study on skin thickness, and skin traits more generally, in alpacas.

More broadly, the similar relationships between skin thickness, density and fleece fineness traits among alpacas in this sample as compared to sheep suggest that alpaca breeders should continue to closely follow genetic research of sheep for clues regarding the likely genetic bases of fleece trait relationships among alpacas.