

Density – what is it?

It is probably the most over-used and misunderstood descriptors alpaca breeders use in making breeding decisions and creating selling literature.

Put simply, density is the number of hair follicles in a given area, usually per square millimetre.

There is only one way to arrive at this number and that is through a skin biopsy but this option is not available in some countries, sadly.

A skin biopsy is usually a 10mm punch of skin taken from a handspan down from the backbone over the third last rib (usually called the mid-side, where fiber samples should be collected from), processed onto a microscope slide which is then read through a 4K camera computer program. At that time the number of primary and secondary fibers are not only counted but also measured for diameter and Standard Deviation calculated.

As a selection tool, this information is invaluable when one considers that there are only three factors that determine fleece weight – density, length and micron.

The benefit for breeders who are intent on producing high in demand fleeces is that by making organized density and length their two primary selection traits to deliver sustainable profits.

Density is set at conception.

Approximately halfway through the pregnancy the cells that produce follicles (fibroblasts) initiate the production of the primary follicles for a period of 2- 3 weeks after which they are shutdown and then produce the secondaries for a period of about four weeks. Once those follicles are established the left-over fibroblasts convert into collagen which determines skin thickness.

It follows then that thick skinned alpacas are likely to be less dense than thinner, softer-skinned animals – thinner skins process into softer, more malleable leather which attracts premium pricing.

It is interesting to note that the finest fibers in a cria fleece are the primary hairs.

The result of this process is that a cria is at its densest at birth after which it loses density as it grows into an adult – which is why it is always wise to look at density by comparing animals at the same age and size when assessing the trait especially when purchasing genetics.

Density does not increase as an alpaca ages or after the first shearing.

What does happen is that primary fibers thicken (coarsen) as the skin stretches over the growing skeleton thus increasing the space between fibers and so raising fiber diameter – as fiber thicken, medullation increases especially in the stronger micron fibers. At the same time the organization within the staple becomes less noticeable, the light reflects less brightly and soil penetration increases. As this happens it is often noticeable that the tips of the staples develop a twist which becomes more and more pronounced as the alignment of the fibers becomes looser and looser.

Because skin biopsies are prohibited in parts of Europe it is worth understanding how to assess it in a live animal.

First and foremost is understanding there is density and then there is organized density – there is a big difference between the two.

When opening a fleece one can see jagged lines of skin between the follicle groups in dense alpacas. When that jagged line is not apparent the fleece is described as 'disorganized'. The difference between the two is that when it comes to processing, the organized fleece will process with much less waste.

It is interesting to note that hair follicles take up less than 7% of the skin area of an alpaca at maturity.

Second is the degree to which soil penetrates the staples – less dense animals allow soil to become trapped between the fibers simply because the follicles are spaced further apart in the skin. The further down the staple the penetration occurs the more disorganized or dense the animal is.

Third is the definition of the crimp. Crimp is a structural artifact that allows the fibers to align together thus protecting the staples from collecting and holding soil, vegetable matter and moisture. When the crimp is highly defined it means the follicles are very close together and so the alpaca is dense in a very organized way.

The top 10% of US tested males have density numbers in the 80 - 95 follicles/sq.mm and the females in the 60 – 70 range. Considering that follicles occupy only about 7% of the skin area of an adult there is plenty of room for improvement – as a guide, merino rams regularly meet 120 follicles/sq.mm

In dense alpacas with longer staple length the staples tend to drape from the skin because the staples are thinner and weigh more than those that stand more erect from the skin. These animals also attract less contamination in the fleece even as they roll simply because any soil tends to fall out rather than settle toward the skin as with shorter stapled animals.

Ian Watt has been consulting in the alpaca industry of Australia and the United States since 1991. He mentored in biopsy testing with Dr Jim Watts using the SRS breeding philosophy and has been providing a biopsy service since 2002 along with an OFDA 2000 fiber testing service for breeders in the US, Australia and Canada.