

## SOME THOUGHTS ON DENSITY

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If you were a young female alpaca, whose mother moved from the Andes soon after she had a one-night stand with some horny macho, what would you do in winter to keep warm? If there was plenty of high quality feed about, you would probably grow a nice long coat. Your fibres would be at least 100 mm long. If there wasn't much feed about then you're in trouble, because you're pregnant and trying to feed the two of you, so your coat won't grow as fast. You're going to have to do something else which doesn't need too much energy. You could grow extra fibres, but that only happens in the first 6 months or so after birth (Jim Watts), and you're coming into your second winter, so that's not going to work. So what you've got is what you're stuck with. Unless you can find one of those coats you wore for a few days after you were born, which probably wouldn't fit now anyway, then about the only thing left for you to do is to thicken up those fibres you've already grown. That means that your fleece is going to start to blow out, and what you might not have read yet in the local Alpaca Yaca is that things are going to get worse. As you get older the gaps between your fibres are going to get bigger, because you're growing more skin to cover your larger body, but worst of all, after you have stopped growing, you're going to start losing you hair. Some of your wool follicles are going to start shutting down and they're not going to regrow. So you'll just have to keep thickening up those fibres to fill in the gaps. More of the primary fibres, which are already thicker than the secondary fibres, are going to become guard hairs. They are going to become hollow, or medullated, just like an old tree whose trunk becomes hollow with age, and this is going to start happening to your secondary fibres as well (Cameron Holt). This will help though, because these hollow fibres act a bit like double-glazing, and help to keep out the cold. So the more medullated fibres, the more comfortable you're going to be, and they don't feel prickly to you.

Some of your friends though, seem to be better off. They don't seem to be as cold as you are. That's because their family moved from the Andes some five generations ago, and unlike your mother, their brief affairs in the new country have always been prearranged. This has meant that each generation has grown extra secondary fibres while they were young. In order to fit all these extra fibres in the same space, and still use up the same energy, they have had to grow them thinner. Their average fibre diameter is therefore very low, probably less than 18 microns. They are grouped around the primary fibres, which also have to be thinner for the same reasons. Each follicle group has three primary fibres and over 40 secondary fibres (Jim Watts). These bundles of fibres, which are no more than 1.5 mm wide (Jim Watts), are therefore much denser than yours are, since you probably have less than 20 secondary fibres per bundle. Therefore they don't have to thicken their fibres as much to fill in the gaps as they get older. Some of your older friends also seem to look a lot younger than you do. That's because they don't seem to have nearly as many guard hairs, they have better handle, and the humans seem to give them a lot more attention than they do you.

So what is density? Is a fleece dense because the animal has a large number of fibres per square millimetre, or is it dense because the fibre diameters are larger? The answer is in the handle. If a fleece is going to have good handle then the fibre diameters will have to be low, and that means that the fleece is going to be dense because the animal has a high density of fibres per square millimetre of skin. This also means that there are less guard hairs, since the primary fibres also have a low diameter, and therefore less medullation.

There is something else you could do, and that is not to grow up. If you stayed small, your density would stay high and you would no longer need to increase your fibre diameter to fill in

the gaps. But who doesn't want to grow up? If you did stay small, what would your fleece be like? It would have more density than your larger brothers and sisters, and your average fibre diameter would be much lower. Your fleece weight would be lower too, or would it? You'd still have the same number of fibres, they would probably be longer, they wouldn't be as thick, but then they wouldn't become as hollow, or medullated, either. If your fleece made the ultra fine bale then, at the end of the day, your fleece is going to be worth a lot more than your brothers and sisters fleece.

I mentioned earlier that plenty of high quality feed would produce a nice long coat. Would this also produce a greater fibre diameter? I think the answer lies in the genetics. If your family had been living above 3000 metres in the Andes ever since the Spanish kicked you off the rich lowlands back in the 16<sup>th</sup> century then over the ensuing 100 or so generations the environment would have manipulated you genes to ensure your survival. Some years there would have been plenty of feed to go around and in other years, things would have been tough. You would have wanted everything possible going for you. This would mean that in the good years your coat would be long and the fibres would be thick. That would mean that in the bad years, you might not have a long coat but at least it would be thick, and so you would survive.

This recent migration of alpacas has only been in Australia for some 5 generations, but already we are seeing the benefits of our genetic manipulation of these animals. By selecting for density, we are already seeing animals that are growing a long fleece, and still maintaining a low fibre diameter.