CALCULATING THE DIFFERENCE

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Knowing the difference between the average fibre diameters of your primaries (FDp) and secondaries (FDs) for second fleeces will help you to breed guard hair out of your fleece. This difference can be estimated by calculating the average fibre diameters of these two fibre types using data from your fleece tests. In order to do this it is necessary to make a couple of assumptions.
Although the secondary to primary ratio (SP ratio) can vary from around 6 to 13, the average is about 9. If we adopt this average for all our alpacas then for every primary there are 9 secondaries or put another way, about 10% of the fibres are primaries. Therefore if the FDp and FDs are known, the average fibre diameter (FD) of a fleece sample can be calculated from the formula FD=[(FDsx9)+FDp]/10.

The second assumption involves the coarse edge micron (CEM) from your fleece tests. It is the number of microns separating the average fibre diameter from the coarsest 5% of fibres. Therefore if we assume that all these coarse fibres are primaries and based on the previous assumption that the primaries make up 10% of the fibres then the CEM and FD from your fleece tests will identify the average diameter of the primaries. It will be FDp=FD+CEM.

Having calculated the FDp and knowing the FD from the fleece tests we can now calculate the FDs by rearranging the above formula for the FD so that FDs=[(FDx10)-FDp]/9.

The above assumptions are reasonable for most alpacas. Even if the SP ratio is greater than 9, the error in calculating the FDs is unlikely to be more than about 1½%.
Anecdotal evidence suggests that for most alpacas the coarsest 5% of fibres will all be primaries when the CEM is greater than about 8 microns. For fleece of low micron with a low standard deviation (SD) however this may still be the case when the CEM is as low as 6 microns.
If the coarsest 5% does contain secondary fibres then the difference between the secondaries and primaries as determined from the above formulas will then be less than the calculated FDp-FDs.

The above formula for FDp indicates that reducing the CEM of successive generations will reduce the difference between the diameters of the primary and secondary fibres. This means that if you can't be bothered calculating the difference then, as long as you're CEM is coming down you are reducing the guard hair. Of course the FD must at least remain stable or preferably also be coming down.
The hardest part however is going to be breeding alpacas that have a relatively stable CEM and FD for at least the first few fleeces. It would probably be unrealistic to assume that alpacas could maintain stable values beyond say five years of age.

A visual assessment of the two alpacas below suggests that the good looking one on the left has less guard hair than the one on the right, however the mid side fleece data indicates the opposite. This is because the guard hair and the rest of the fibres on the good looking alpaca are of a similar length. The fleece data however indicates that this alpaca has more guard hair through the saddle than the alpaca on the right.

2nd FD 16.0µ, SD 3.1µ, CEM 6.6µ
5th FD 24.4µ, SD 4.5µ, CEM 8.8µ
A good looking male that has blown out but showing no visible guard hair.

2nd FD 14.5µ, SD 3.0µ, CEM 6.3µ
5th FD 14.9µ, SD 3.2µ, CEM 7.0µ
A not so good looking male that has not blown out but is showing a lot of visible guard hair.

The mid side fleece data for these two alpacas and their degree of visible guard hair indicates that a cursory visual assessment of the extent of guard hair is not reliable. The extent of guard hair can only visually be determined by closely examining individual fibres within the saddle to determine to what extent and how many are straight.