



Questions & Answers About IAC Expected Progeny Differences

Q. What is an Expected Progeny Difference (EPD)?

- A.** An EPD is an estimate of the genetic merit of an individual alpaca based on accumulated performance records of the alpaca itself, its relatives and its progeny.
- EPDs are environmentally neutral, that is, they factor-in, or compensate for, environmental differences existing where the alpaca is reared.
 - As more information accumulates, the EPD can change
 - As data accumulates, the EPD becomes increasingly stable.
 - It is important to realize that the *reported* EPD is the best estimate we have of the *true* EPD.

Q. Why are EPDs important to me?

- A.** The intrinsic value of the alpaca is predicated on the fineness and quantity of the fiber it produces. EPDs enable breeders to make larger gains and faster progress in the overall quality and quantity of their alpacas' fiber. By precise selection of breeding partners, individual farms can now achieve their own specific genetic improvement goals. EPDs allow breeders to select breedings based on the alpaca's "Genotype" (their genetic merit) and not "Phenotype" (how they look) which tells the breeder little about the animal's true breeding value. The use of EPDs has proven effective in every commercial livestock industry. The alpaca industry is sure to follow suit. EPDs provide an additional indicator of an alpaca's value and are useful when purchasing or marketing alpacas.

Q. What is PE?

- A.** Prediction Error (PE) is a measure of the anticipated stability of an EPD. PE is the Standard Deviation for a given EPD

An EPD for an animal can be thought of as an estimate surrounded by potential error. The prediction error quantifies the magnitude of the potential error. Prediction error directly reflects the amount of potential future change in EPD that can be anticipated as more data accumulates on an animal, its relatives, and, most importantly, its progeny.

Prediction error is expressed in the same units as the trait being evaluated (pounds for weight traits, microns for fiber diameter).

Prediction error should be used as a risk management tool. The EPDs have already been adjusted to reflect the amount of information that is available. Thus alpacas that have good records and lots of offspring will already have more accurate EPDs than alpacas that have equally good records but only a few offspring.

Example of PE:

Which would be the better choice for reducing fiber diameter?

	EPD	PE	Deviation
Alpaca 1	-0.5	0.5	0.0 to -1.0
Alpaca 2	-0.5	0.3	-0.2 to -0.8

Higher Risk Factor:

If you have a Micron EPD for Average Fiber Diameter (AFD) of **-0.5** with a Prediction Error of **0.5**, you can expect the true value of the EPD will “usually” (2/3 of the time) be between **0.0** (“Average”) and **-1.0** (A full micron finer than average) (**-0.5 ± 0.5**). There is a one in six chance that the alpaca’s true EPD is poorer than the population average.

Lower Risk Factor:

If you have the same Micron EPD of **-0.5** with a PE of **0.3** you can expect less possible future change in the EPD. Thus the true value of the alpaca’s EPD will usually be between **-0.2** up to **-0.8** micron (**-0.5 ± 0.3**). Such an animal is very unlikely to have a true EPD that is poorer than the Population average.

Note however, that our best prediction (i.e., the EPD) is that these two animals are genetically equal. They differ only in the confidence associated with the prediction. To turn the tables a bit, Alpaca 1, with the higher PE, has one chance in six of having a true EPD better than -1.0. There is only a very slight chance that the second animal, with the lower PE, could really be that good!

PE risk is a two edged sword. A lower risk PE is more stable, but has less probability of improving. The PE is often the result of fewer fiber sample test records in the EPD analysis. Breeders are faced with this decision when selecting breeding males. Which is better, an older male with a lower PE and higher micron EPD, or a young male with a higher PE and lower micron EPD? The answer is it depends on your own judgment and sensitivity toward risk.

Q. What is ACC?

A. Accuracy (ACC) gives a relative measure of stability for a particular EPD, while the PE directly addresses the magnitude of possible future change in the EPD. The lower the PE, the higher the ACC.

Q. What is Genotype?

A. Genotype refers to the complete description of an individual's genetic makeup. Genotype is permanent and unaffected by environmental factors.

Q. What is Phenotype?

A. Phenotype is the outward appearance of an alpaca. Phenotype is the result of the individual's genotype, as well as the effect of the environment. Factors such as pastures, parasites, predators or nurturing, can affect the outward appearance of the animal. Phenotype can be measured and quantified.

Q. What is a Pedigree?

A. A pedigree is a recorded list or genealogy of an alpaca's ancestors. It is a registered or recorded known line of descent. A pedigree does not contain the information on any collateral relatives (brothers and sisters and their offspring) of an individual.

Q. What is Heritability?

A. Heritability is a measure of the strength of the relationship between performance (phenotypic values) and breeding values (genetic makeup) for a trait in a population. Heritability is a measure of the degree to which a trait such as fiber production or fiber diameter is genetically determined. Heritability is an important factor among the several factors determining how much genetic improvement can be made in any characteristic.

Q. What is a Histogram?

A. (1) A histogram is a common graphical presentation of quantitative data that illustrates variance effectively. In the case of alpacas, histograms are used to clearly show fleece trait measurements. [Yocom-McColl](#) utilizes the OFDA 100 analyzer to make measurements on which histograms are based. The variable of interest, such as fiber diameter measured in microns, is placed on the horizontal axis and the frequency values, such as the percentage of fibers per micron, are placed on the vertical axis. (2) The term "Histogram" is also used to refer to a micron test report that includes administrative information provided by the identification submitted with an alpacas fiber sample. The histogram used by the Ideal Alpaca Community is based on the analysis of a minimum of 2000 fibers.

Q. What is OFDA?

A. OFDA stands for "Optical Fibre Diameter Analysis". It refers to instruments used to make precise measurements on alpaca fiber. The measurements provide the data to create histograms. Measurements made with OFDA equipment comply with standards set by ASTM.

IAC Fleece Sample Measurements & EPDs

Q. Who is ASTM?

A. All yield and micron tests are performed according to [American Society for Testing and Materials](#) (ASTM) or the International Wool Textile Organization (IWTO) procedures. The ASTM standard (D2252) defines procedures for measuring fineness in Alpaca fiber.

Q. Who is the IWTO?

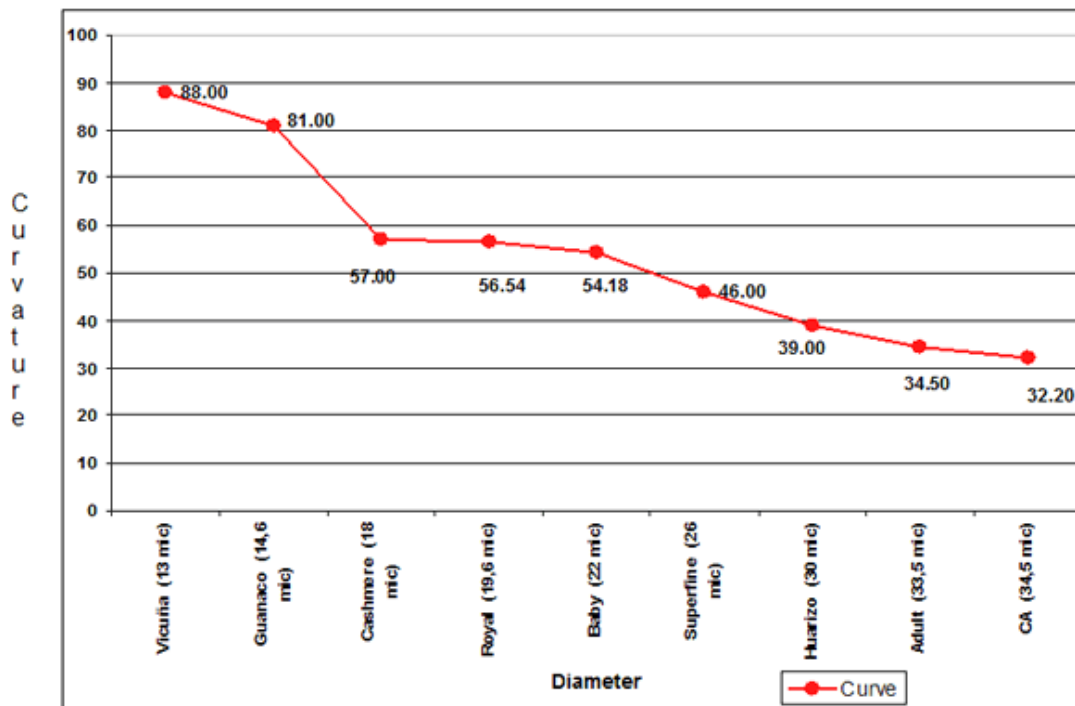
A. IWTO ([International Wool Textile Organization](#)) is the international body representing the interests of the world's wool-textile trade and industry.

Q. What is Curvature?

A. OFDA equipment provides a fiber measurement called “curvature” (deg/mm) which is related to crimp. Average Fiber Curvature (AFC) is determined by the measurement of a two millimeter (2mm), (0.0787 inch or 5/64 inch), snippets in degrees per millimeter (deg/mm). The greater the number of degrees per millimeter, the more frequent the crimp is, and in general the finer the fiber. Curvature loosely correlates to the number of crimps per inch. It should be noted, lower frequency curvature or crimp can be finer than high frequency crimp. The correlation is about .70. For wool, low curvature is described as less than 50 deg/mm, medium curvature has the range of 60-90 deg/mm, and high curvature has greater than 100 deg/mm.

As you can see from Table 1 below, Vicuña (12-13 microns), which is the finest natural fiber used to manufacture garments, has more curvature or crimp than Guanaco at 14.6 microns. Both are finer and have more curvature than cashmere. Cashmere curvature compares with Royal and Baby alpaca, but is a little finer.

TABLE 1



Q. When reviewing the results posted on the Ideal Alpaca Community website the Average Fiber Diameter EPD of the herd is not “zero” as would be expected? Why?

A. From Dr. David Notter, Geneticist, Virginia Tech University.

This is a reasonably straightforward situation. The question that you are raising is a common one. We perhaps are too casual in saying that the "average EPD in the base population is zero". That begs the question of what constitutes the "base population".

The default "base population" in most EPD software is automatically defined in the estimation procedure as the individuals that "terminate the pedigrees". I will define this latest new term in a moment. So as the EPDs come out of my computer, the mean EPD of the animals in the base population is zero. These "base population" animals are also sometimes referred to as the "founders" of the population.

If we consider the pedigree information provided by IAC, most animals have their sire and dam listed, and many have grandparents and more distant ancestors included as well. However, for each animal, the pedigree eventually terminates in animals that do not have known (or at least reported) parents. These animals, that do not have any pedigree information behind them, "terminate the pedigrees" and are considered to be the IAC "founder animals". These "founders" are the ones with zero EPDs. In the current IAC dataset, they probably correspond reasonably well to the imported animals recorded to provide baseline data.

The explanation for why current mean EPDs are below zero for fiber diameter and above zero for fleece weight is that selection has occurred since importation of the founder animals. Today's animals are better than those that established the population. We would argue that they are not as much better as they could be, or will be, with EPDs, but at least the population has moved a bit in the desirable direction.

The Studmaster males are not that much better than the overall IAC population because at this point, the overall population is comprised mainly of offspring and other descendants of Studmaster males and their contemporaries.

What we eventually want to see is each year the mean fiber diameter EPD goes down and the total fleece weight EPD goes up.