A new Angle on Alpaca Conformation

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**Introduction**

Now that our alpacas have been shorn, it is the best time to assess their conformation. *Conformation* can be defined as the shape or contour of an animal, resulting from the appropriate arrangement, or balance, of all body parts. ¹ It should not be confused with *anatomy* or *morphology*, which is the form and structure of organisms. ² All alpacas have the same anatomy but individuals differ by their conformation. In particular, conformation is what gives an animal its type. Conformation is also very important to the health and well-being of the animal and is discussed in breed standards. ⁴,⁵,⁷,⁸,¹⁰,¹⁴

The terminology used to describe conformation is rich, precise, poetic, often confusing, and sometimes redundant. There are basically two descriptive jargons: the veterinary / biologic terminology and the more current breeders’ terminology.

In this article, I will try to offer a new angle on alpaca conformation by concentrating on what is normal (the ideal conformation), rather than abnormal, with an emphasis on conformation of the limbs.

**Ideal alpaca conformation**

Figure 1 is a diagram of the ideal conformation of an alpaca. The proper (anatomical) terminology is set out in Figure 2.
Some important points should be noted. A few names have been assigned to some animal body parts because they resemble areas in the human body; however they are not the analogous animal counterparts of the human structures. For example the knee is really a wrist (carpus), and the ankle is actually the metacarpo-phalangeal joint (or metatarso-phalangeal joint for the hind limb). The real knee is called the stifle and the real ankle (tarsus) is called the hock.

The withers correspond to the region between the two shoulder blades. The back follows the withers and becomes the loins beyond the last rib. The rump or croup corresponds to the sacrum and is always very bony in alpacas. The expanded iliac crests which can be felt under the alpaca rump are one of the Camelid adaptations to allow for the pacing gait.
Figure 2 – Essential anatomical terminology
Figures 3 and 4 illustrate the important proportions, ratios and angles which form the basis of the ideal alpaca conformation. The most original alpaca characteristic is that the hindquarters are only slightly higher than the forequarters, as all Camelids have fore and hind limbs of approximately equal length.  

- Hip in line with hock
- Stifle in line with toes
- Shoulder in line with toes
- Top line higher at the rear than at the withers
- Stifle slightly higher than elbow
- Point of the hock higher than knee

Figure 3 – Ideal alpaca proportions
In Figure 4, distance \( D \) is the distance between the point of the buttock and the ground and it should be equal to the distance between the hip (or the hock) and a vertical line through the shoulder joint. Distance \( d \) is the distance between the elbow and the ground. It should be equal to the depth of the body, and to the length of the neck (up to the occipital protuberance). However, in crias this is not the case, as the distance between the elbow and the ground is approximately twice the depth of the body.

Distance \( d \) is approximately \( \frac{2}{3} \) of distance \( D \). More exactly, on Figure 4, the ratio \( D / d \) is 1.62. This is a very common ratio in natural structures, and has been used for centuries by architects and artists to achieve ideal proportions in their work. It is called \( \varphi \) (\( \phi \)), the Golden Ratio or Divine Proportion.

The alpaca pelvis forms a 50° to 60° angle with the horizontal. The pastern angle is at least 65° to 70° to the ground, and even more, especially for the front pastern (up to 80° to nearly vertical). When resting, the neck and head should be held at approximately 25° to the vertical. Normal angulation of the hock should be approximately 140°.

![Figure 4 – Ideal alpaca ratios and angles](image-url)
The height at the withers in an adult alpaca should be approximately 90 cm but can vary from 75 to 102 cm, depending on sex and country of origin.\textsuperscript{1,9,10,14}

Front and rear views are not illustrated as it is easy to understand what the ideal alpaca conformation should be: “Viewed from the front, a plumb line held at the point of the shoulder should bisect each bone and joint from the knee down, and the plumb bob should end between the toes. Viewed from the rear, a plumb line held at the pinbone [other name for point of the buttock] should approximately bisect each bone and joint and the plumb bob should end between the two pads of the rear foot.”\textsuperscript{1}

Similarly, conformation of the head and other parts of the body such as genitalia are not illustrated. The reader is asked to refer to other easily available publications for further descriptions.\textsuperscript{1,3,5,7,8,10,14}

**Conformational faults**

The majority of the common conformational faults affecting the limbs can easily be understood by referring to the joint involved. In these faults, the joint is either in hyperflexion, in hyperextension, or is angled in a plane in which it is not designed to normally move. The latter point deserves an explanation. In Ungulates, of which alpacas are members, the limbs display a number of modifications that adapt them for speed. There are essentially three modifications:

(i) elongation of the segments;
(ii) reduction of the number of bones in each segment to only one main bone;
(iii) transformation of the joints into pulley-like structures which greatly reduce or totally eliminate lateral movements.\textsuperscript{6}

Sometimes these joints are not formed properly and result in lateral movement or permanent lateral deviation. The names of the most common conformational faults affecting the limbs are found in Table 1.
Table 1 – Conformational faults affecting the limbs

<table>
<thead>
<tr>
<th>Joint</th>
<th>Hyperflexion</th>
<th>Hyperextension</th>
<th>External deviation *</th>
<th>Internal deviation *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder</td>
<td>Camped rearward in front</td>
<td>Camped forward in front</td>
<td>Base-wide (external deviation of the whole limb at the shoulder)</td>
<td>Base-narrow (internal deviation of the whole limb at the shoulder)</td>
</tr>
<tr>
<td>Elbow</td>
<td>Straight-legged (hyperextension of elbow and shoulder)</td>
<td>Out at the elbow</td>
<td>In at the elbow</td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>Buck-knee</td>
<td>Calf-knee, Sheep-knee</td>
<td>Bow-legged (carpal varus)</td>
<td>Knock-knee (carpal valgus)</td>
</tr>
<tr>
<td>Fetlock (front or rear)</td>
<td>Cocked ankle</td>
<td>Down on fetlock, dropped fetlock, weak pastern</td>
<td>Pigeon-toed, toe-in</td>
<td>Splay-footed, toe-out</td>
</tr>
<tr>
<td>Hip</td>
<td>Camped forward behind</td>
<td>Camped rearward behind</td>
<td>Base-wide (external deviation of the whole limb at the hip)</td>
<td>Base-narrow (internal deviation of the whole limb at the hip)</td>
</tr>
<tr>
<td>Stifle</td>
<td>Crouched (resulting in rear quarters lower than withers)</td>
<td>Post-legged</td>
<td>“Out at the stifle”</td>
<td>“In at the stifle”</td>
</tr>
<tr>
<td>Hock</td>
<td>Sickle-hocked</td>
<td>Bow-legged (tarsal varus)</td>
<td>Cow-hocked (tarsal valgus)</td>
<td></td>
</tr>
<tr>
<td>Knee cap</td>
<td></td>
<td>Lateral patella luxation</td>
<td>Medial patella luxation</td>
<td></td>
</tr>
</tbody>
</table>

* in the frontal plane
Yellow cells indicate serious faults.

**Discussion**

It is of the utmost importance to the health and well-being of alpacas that breeders know and understand the basic anatomy of their animals. It is only by knowing what is normal and desirable that one can recognize what is abnormal and undesirable. Knowing the term(s) used to describe a conformational fault is not as important as being able to identify it. Current standards focus too much on listing conformational faults and do not describe the ideal alpaca conformation in sufficient detail. Essential anatomical terms are not always defined. Moreover, these standards are sometimes incorrect or at least confusing, as illustrated by the following examples.
The chest is not broad, but deep and narrow. The rump is not broad either, but also narrow. In fact, Camelids are amongst the most narrow-chested and narrow-rumped Ungulates and this is one of the reasons why they can pace naturally: “Camelid limbs are set more closely to the midline than in other species, eliminating some of the side to side rolling that occurs when the center of body gravity is changed with each stride.” Other anatomic modifications found in Camelids which allow them to pace naturally include: long front and hind limbs of approximately equal length and longer than the trunk, absence of skin fold attaching the thigh to the flank, small abdomen (“tucked-in belly”), broad flat ribs, expanded iliac crests, large scapula, and a unique splayed two-toed padded foot. All these characteristics put together allow for a longer stride and increased lateral stability.

The height of the pinbone does not equal that of the shoulder. The pinbone (or point of the buttock) and hip are substantially higher than the shoulder. The term shoulder refers to a joint. Unfortunately shoulder is sometimes used to describe the entire shoulder blade area. In any case, the pinbone is higher than the shoulder joint and lower than the top of the shoulder blade (see Figure 3).

It is also generally assumed that the toes should be pointing forward, an especially useful indicator of correct conformation on heavily fleeced animals. For example, J. Ault states: “The toes should point forward. An indication of normal conformation would be toes that point forward. Toes that do not point forward may indicate poor conformation or poor toenail trimming. In either case, toes that point forward are important to structurally sound animals.” This is not entirely correct. Although the axis of the foot does point forward, the toes do not necessarily point forward but can form a slightly open V. The toes on each foot are not always parallel to each other, as the Camelid foot is splayed. This is more pronounced on the front foot than on the rear foot. Some authors recommend that the line dropped from the point of the buttock should touch the back of the hock and that the rear cannon should be vertical. Our observations lead us to believe that this is a llama characteristic. An alpaca with such a conformation would be considered as camped rearward in the hind legs. The drawings and descriptions found in other references certainly suggest that alpacas are “conformationally under themselves”, compared to llamas. The difference in angulation of the pelvis (50-60° in alpacas vs. 40° in llamas) and of the pastern (at least 65° in alpacas vs. 45-50° in llamas) certainly support this important difference in conformation.

**Conclusion**

Breeders should spend time studying and understanding the anatomy and observing the conformation of their shorn animals. Repeated observation and objective assessment are the best means for developing an “eye” for conformation and will help in the selection of superior animals. As recommended by Dr Karen Timm, “when choosing or evaluating alpacas, [...] leg conformation as close to ideal as possible should be a primary consideration.”
Acknowledgements

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