



How Well Are They Growing

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In an earlier period of my life, I was preoccupied with raising two growing boys. At every visit to the pediatrician they would be weighed and measured for height to assess their growth rate (my animal science background showing through). These measurements in conjunction with their age were compared to standardized growth curves to determine if our “feeding program” was up to par. Standardized growth charts provide a series of lines depicting low, median (average) and high percentile growth performance. Ideally, growth is maintained at or near the median curve over time. Very low or high values, especially for a population of animals, indicate a potential concern and may need to be investigated. Standardized growth curves can help you better manage your nutritional program and develop better quality animals.

Fortunately in growing children you don’t get paid by the pound, otherwise I would have gone broke with all the feed I provided for the observed rate of gain. Comparatively, human growth is a sort of like watching molasses flow in winter relative to other animals. Dairy calves will easily grow at rates exceeding 1.5 to 2 lbs/day. Foals in their first month of life may grow at rates exceeding 3 lbs/day. Goat kids were expected to grow at rates between 50 and 150 grams/day, but meat goat breeds can grow as fast as 250 grams/day. Although still a goat kid, this animal is very different from other goat kids growing at slower rates and would require very different nutrition. My objectives for this column are to review nutritional support of animal growth and solicit readers for data relative to grow of

their crias in an effort to establish “standardized” growth curves for llamas and alpacas. Having more data on growth parameters for llamas and alpacas will greatly improve our ability to better define nutritional requirements for the growing cria to ensure proper body development and quality fiber.

What is Growth?

This seems like a simplistic question; growth is the accumulation of body tissue or increase in body mass (weight). However, is all growth the same? All parts of the body grow, but often at different rates and developmental stages. This phenomenon is termed “allometric” growth. Growth is ultimately controlled by genetics, as I witnessed in the differential pattern of growth in my two sons, but growth rate and quality is modified by nutritional status. What is meant by quality of growth? This is a descriptor used to address how growth is being accomplished. The end point of growth is reached when the organism achieves is genetically programmed interrelationship between mature weight and height. Humans, unfortunately, seem to exceed that programmed weight end point illustrating the potential role of nutrition modifying growth.

Animals can also experience problems of overachieving weight thresholds. Quality growth occurs when body weight is properly matched to body frame size typically measured as height. An example is the body mass index measurement currently used in people to

assess body weight. Body weight can be easily increased by consuming large quantities of dietary energy resulting in an increasing fat mass. Body frame requires more than energy to grow as bones and muscles need to grow, thus protein and minerals in addition to energy are required. Growth needs to be characterized by the composition of gain. Younger animals grow predominately muscle and bone with minimal fat, whereas animals (and humans) closer to mature size will gain predominately fat. Therefore, growth is characterized not only by its rate (grams or pounds per day), but by the composition of gain.

With these concepts in place, one can appreciate the modifying effect nutrition can have on both rate and quality of gain. Diets improperly balanced with greater available energy relative to protein will affect rate and composition of gain. I have seen many instances with growing dairy calves where they met or exceeded body weight benchmarks for their age, but were short in stature. Research studies have shown an inappropriate ratio between dietary energy and protein, typically inadequate protein, will compromise frame size growth yet maintain body weight gain. For rapidly growing animals like foals, imbalances in dietary energy and protein will result in rapid rates of gain with poor bone development leading to poor conformation at a mature age. Feeding for quality growth achieves proper body development and good conformation, which can potentially improve function and longevity.

Growth Requirements

A growth requirement is defined as the amount of nutrient needed over and above that required for body maintenance to support tissue accretion or gain. Typically

growth requirements are defined as nutrients required per gram or pound of gain. Two factors, rate and composition of gain, determine the nutrients required to support growth. Primary nutrients required to support growth are energy and protein, though all other minerals and vitamins are also required to support the metabolic activity of growing. Minerals are also required in support of bone growth prior to maturity. Animal age, which defines stage of maturity, defines proportion of fat, protein and mineral in the deposited tissue and efficiency of converting dietary nutrients into accreted tissue. Rate of gain is genetically programmed, related to stage of maturity (age) and greatly influenced by nutrition.

Unfortunately, we have no data characterizing composition of gain and limited data on rate of gain for llamas and alpacas. This situation greatly limits our ability to generate models capable of estimating amounts of nutrients required in support of growth. Tissue composition is not that different between our agricultural species, therefore information from sheep and goats might provide sufficient information on which to develop some initial guidelines. The new National Research Council (NRC) publication (NRC, 2007) defining nutrient requirements for small ruminants, including llamas and alpacas, has utilized growth requirement for goats as a basis to define requirements for llamas and alpacas. Energy required to support growth is 7.25 kcal of metabolizable energy (ME) per gram of gain. Protein required to support gain is 0.284 g crude protein per gram of gain. This is equivalent to feeding 0.5 lb of corn and 2 oz of soybean meal to meet the energy and protein requirements to support 100 grams of gain. These values are most likely on the high side in supporting growth as the new NRC requirements for growth in goats had been

reduced. Clearly more information is needed to help us better define requirements to support good growth of llama and alpaca crias.

Generating Camelid Growth Curves

There is one published survey that has characterized llama growth in animals raised in the United States (Smith et. al., 1992). The data from this study showed a generalized growth curve for llamas (Figure 1), but no percentile rankings of the data were described. Although these are useful data to describe llama growth, percentile ranges are needed to facilitate diagnostic interpretation of growth characteristics in individual animals. Published data characterizing alpaca growth could not be found. In Figure 1, I scaled the llama data to estimate an alpaca growth curve. We need some real data to generate a better growth curve for alpacas.

Using the data shown in Figure 1, average rates of gain for llama and alpaca crias were calculated as the slope between each point on the graph (Figure 2). This graph shows llama crias can gain at over 300 grams/day in the first few months of life and then slow down over time. A lower rate of gain is seen for alpaca crias. With different percentile growth curves, one could calculate different rate of gain curves that could be used diagnostically to assess herd nutritional program and animal health.

It has been my experience that most llama and alpaca breeders and owners routinely monitor cria weights as part of their management practices. This information needs to be compiled and analyzed to generate population-based growth curves and rate of gain curves for llamas and alpacas. This is a unique opportunity for research and the industry to mutually benefit without high priced proposals. I have solicited growth data from

a variety of camelid farms, but would like to extend this data collection process more broadly to obtain a better cross section of the llama and alpaca community.

Data Collection Process

To move forward with this project, I would ask for willing participants to compile the following information and send a spreadsheet file with their data to my email address (rjv10@psu.edu). I will oversee the organization and analysis of the data to generate growth and rate of gain curves for llamas and alpacas. The following minimal data need to be provided in establishing growth curves:

Farm Location (state), animal identification, sex, date of birth, birth weight and all other dates when body weight was determined.

If available, body weight of the dam either prior to breeding or soon after birthing would be useful information as I would like to calculate birth weight as a percent of maternal body weight. The more data collected the more robust and informational the growth curves will be. If you have any questions regarding data collection or submission, please contact me via email. I look forward to this opportunity and will share the results of the study when it has been completed.

References:

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Figure 1. Cumulative body weight growth curves for llamas and alpacas from 1 to 36 months of age based on the data from Smith et. al., 1992 (reproduced with permission from Van Saun, 2006).

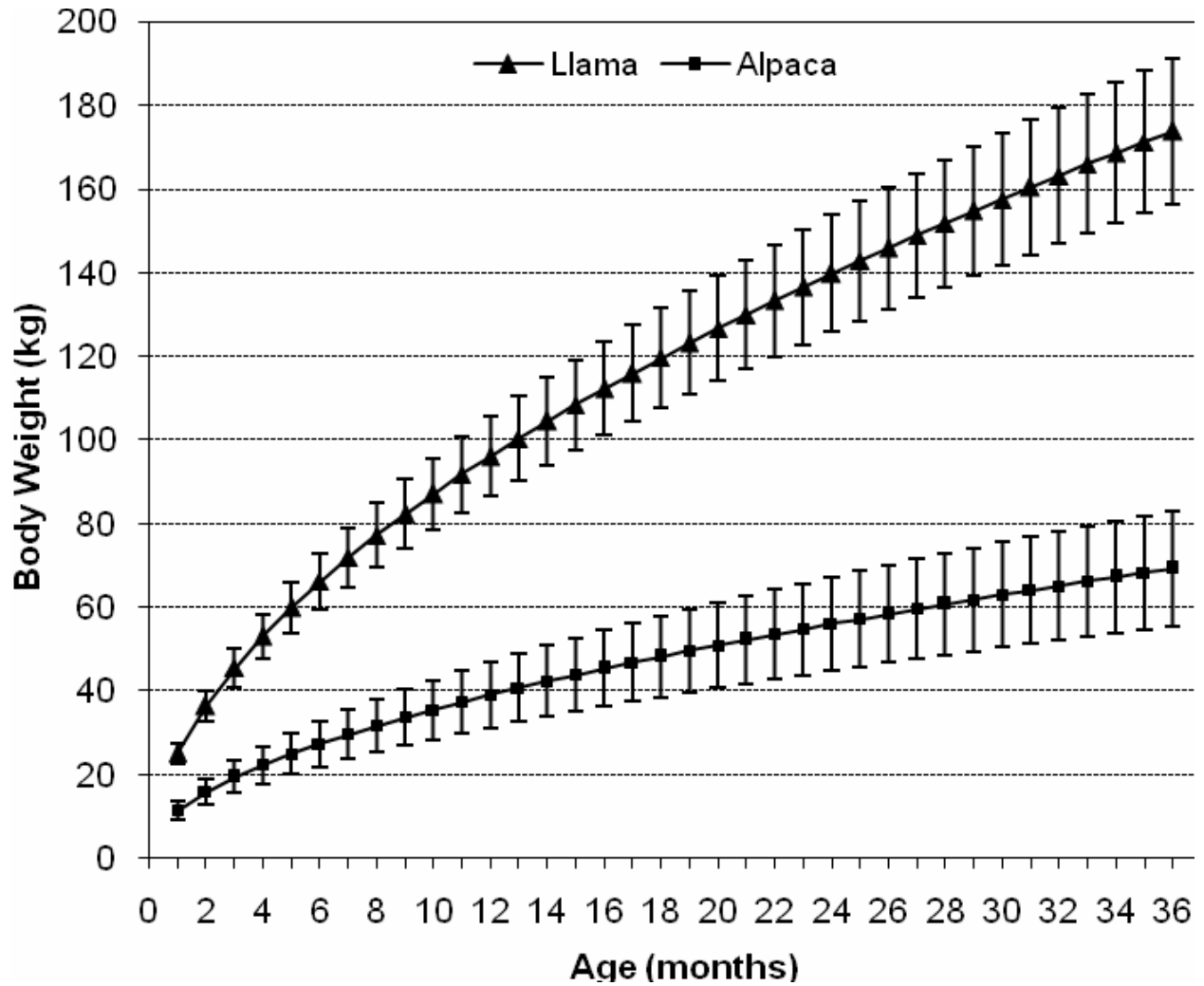


Figure 2. Averaged rate of gain for llama and alpacas from 1 to 36 months of age based on growth data from Smith et al., 1992 (reproduced with permission from Van Saun, 2006).

