

On Energy Policies in Animal Production: Avoiding Starchy Explosions

Chief Highly Distinguished Professor Akbar Nikkhah*

Department of Animal Sciences, Faculty of Agricultural Sciences, University of Zanjan, Zanjan, Iran

This editorial warns the industrialized animal agriculture of overmodernizing production systems based on over feeding of energy-producing starchy grains. Feeding high levels of extensively processed cereal grains increases risks of subacute rumen acidosis (SARA) and rumen malfunction [1]. As a result, likelihood for asynchronous ATP, carbon skeleton and nitrogen compounds release increases in a perturbed environment. High rumen volatile fatty acids (VFA) absorption rates by feeding much rapidly fermentable starch may raise blood insulin and depress milk production [2-5].

There have been major confusions in defining 'extensive fermentation' and how that relates to rumen acidosis and reduced productivity. It is traditionally believed that finely ground grains are very likely to depress feed intake by increasing ration dustiness and starch exposure to microbial adherence. Although, grinding has never been considered alongside more important factors, such as dietary grain inclusion rate, forage sources, and animal intake and production levels. Results suggest that at medium and even high barley inclusion rates in total mixed rations, lactating cows perform similar on ground versus steam-rolled barleys. Grinding is a reasonably priced technique widely accessible to many dairy producers. In many regions, the majority of dairies have rather medium and small size. Establishing expensive steam-processing equipment with large maintenance costs is not feasible for such small and medium holders [3,4].

The dietary inclusion rate of starchy grains is rather intuited to be more critical for reducing the risk of SARA, optimum immune function, and economical milk production than the processing method per se. Recent findings on the similar cow response to finely versus coarsely steam-rolling, and to grinding versus steam-rolling, compellingly support this intuition. Thus, it is rather high starch and low effective fiber diets that are likely to lower intake and rumen pH, disturb peripheral energy metabolism, and trigger pro-inflammatory responses. The opinion that steam-rolling vs. grinding may alleviate adverse effects of feeding starchy grains on rumen and cow health stems from *in situ* rumen studies [4,6,7].

Barley kernel treatment with moist heat during steam-rolling is thought to reinforce protein-starch and lipid-starch bonds and reduce rumen fermentation rate shortly after feed delivery. Moreover, coarser steam-rolled barley particles could potentially decrease starch degradation rate. These *in situ* based theories have been far from proving in reality under *in vivo* scenarios.

As such, finely and coarsely steam-rolled barley grains may not differ in affecting feed intake and productivity of mid and late lactation cows. Similar feed intake and rumen fermentation between cows on ground versus steam-rolled barleys suggest similar effects of processed techniques on at least short-term intake regulation factors e.g., VFA and ammonia. What needs special attention is the fact that extent, unlike rate, of starch degradation in barley grain is very likely unaltered by steam-rolling. Furthermore, any effect on reducing degradation rate would be limited to initial hours post-feeding, since barley, even with minimum physical processing, is already highly fermentable. Thus, it is reasonable to observe no differences in intake and productivity between cows fed ground and steam-rolled grains. Similarly, no effects on nutrient intake of feedlot cattle fed dry-rolled, steam-rolled and

whole barley grains were found in several studies [1].

The conventional belief that fine grinding produces dust, overly increases rumen fermentation rate, and depresses feed intake, has been based mainly upon results from beef studies. Despite greater feed intake of lactating cows than of finishing beef cattle, dairy diets contain well greater amounts of dry and ensiled roughages, and lower amounts of concentrate. Such differences will alter physical properties of the ration, challenging the beef data to be adequately applicable to dairy cows.

To put simply, creating problems and then finding solutions is not a wise approach. Problems must be avoided or at least be minimized in magnitude and impact. That will not trouble the economics and will save efforts, finance and time towards seeking and discerning solutions. A brief critical view of the literature will prove vainness in feeding diets with up to 40-50% barley grain [8,9]. That means a minimum of 24-30% starch only from grains with ineffective fibers. An elongated occurrence of SARA would be one of the most accurately predictable consequences [10,11]. Such an over-modernization in energy policies of animal agriculture must cease.

Do farmers really need to feed overly high amount of starch for optimal animal production and health? Except for unique conditions, under standard global programs, it is not feed that pushes animal productivity, but it is rather animal physiological state and backgrounds that determine responses to feeding strategies. Contemplating the above question should provide farmers and scientists with sage advice for feeding differently processed starchy cereal grains to avoid over-modernization in energy policies of the new time's animal agriculture. It is time to strengthen and not weaken the SciTech foundations of the global animal industry [12].

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*Corresponding author: Akbar Nikkhah, Chief Highly Distinguished Professor, Department of Animal Sciences, Faculty of Agricultural Sciences, University of Zanjan, Zanjan, Iran, Tel: +98-24-33052801; Fax: +98-24-33053202; E-mail: nikkhah@znu.ac.ir, anikka@yahoo.com

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