

Does Variety Matter?



The old adage “variety is the spice of life” applies to people, but might it pertain to animals as well? Variety rarely is advised when formulating rations or planting pastures but consider this scenario. Sheep grazing a grass-clover pasture prefer clover in the morning but switch to grass in the afternoon, even though clover is more digestible and higher in protein than grass. Why do they switch and what are the implications for food intake and animal performance?

Variety of theories. Large herbivores eat a wide variety of foods. But why? Some experts contend variety reduces the likelihood an animal will over-ingest toxins. They believe that animals can only tolerate limited amounts of certain foods that contain toxins. To meet nutritional needs, animals must consume small amounts of a variety of foods with different toxins, each presumably detoxified by different means. Others believe animals eat a variety of foods to meet nutritional needs. No single food contains the required mix of energy, protein, minerals, and vitamins. Both theories are valid, but neither explains why animals eat an assortment of foods even when toxins are not a concern and nutritional needs are met.

Why animals search for variety. Our research suggests that the palatability of a food declines automatically as it is eaten because of interactions between the senses and the body as influenced by an animal’s nutritional needs and the nutritional content of the food. Animals fed a nutritionally balanced food in one flavor for a day prefer to eat the food with another flavor the following day. This change in preference lasts longer when a food has too many or too few needed nutrients. Aversions may be more

pronounced when foods contain excess toxins or rapidly digestible nutrients. Aversions also occur when foods are deficient in specific nutrients. They can even occur when animals eat nutritionally balanced foods, particularly if those foods are eaten too often or in too great an amount.

Thus, eating any food to satiety causes a temporary aversion to the flavor of that food. That’s the reason people cook familiar foods in a variety of flavors: How many ways can you cook hamburger? Understanding that foods eaten too often or excessively cause food aversions brings new meaning to the remark “I’m sick of it,” often voiced by those forced to eat the same foods day after day.

Postingestive Feedback. Animal preferences for foods change automatically within a meal or from meal to meal because of interactions among the senses of taste, smell and touch and postingestive feedback. Postingestive feedback—the positive and negative consequences of eating—occurs when cells and organs respond to nutrients and toxins released during digestion. Flavor receptors in the mouth respond to taste (sweet, salty, sour, bitter), smell, and touch (astringency, pain, temperature). Flavor receptors interact with receptors in the body (liver, gut, brain and elsewhere) that respond to nutrients and toxins (chemo-receptors), concentrations of salts (osmo-receptors), and gut distension (mechano-receptors).

The terms flavor-, nutrient-, and toxin-specific satiety are used to describe the decrease in

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preference for a food during or after eating. Animals satiate on foods and search for alternatives when eating a food causes excesses, deficits, or imbalances in nutrients (nutrient-specific satiety), excess toxins to accumulate in the body (toxin-specific satiety), or after eating the same flavor, meal after meal (flavor-specific satiety).

Satiety explains why sheep in the United Kingdom eat clover in the morning and grass in the afternoon. In the morning, hungry sheep initially prefer clover because it is highly digestible compared with grass. As they continue to eat clover, however, sheep satiate—acquire a mild aversion—from the effects of nutrients like soluble carbohydrates and proteins, from the effects of toxic cyanide compounds, and from eating the same flavor. The mild aversion prompts them to switch to grass in the afternoon. During the afternoon and evening, the sheep recuperate from eating clover, and the aversion subsides. By morning, they are ready for more clover. The combination of clover and grass likely enables sheep to eat more each day than if only one were available.

Variety meets needs. The principles of satiety are important in understanding feeding behavior. Long before we understood the importance of a balanced diet, humans learned to combine foods to meet nutritional needs. Corn and beans, for example, are staples in the diets of many Native American cultures. Corn and beans are each inadequate in some essential amino acids, but eaten in combination they provide all the needed amino acids and are a great source of energy.

Herders in France use these principles to stimulate food intake and make better use of the plants available by herding in grazing circuits. The grazing circuit includes a moderation phase, which provides sheep access to plants that are abundant but not highly preferred to calm a hungry flock; the next phase is a main course for the bulk of the meal with plants of moderate abundance and preference; then comes a booster phase of highly preferred plants for added diversity; and finally a dessert phase of abundant and palatable plants that complement previously eaten forages. By using grazing circuits, herders enable individual animals to meet needs for nutrients, avoid over-ingesting toxins, and achieve uniform use of plants in an area.

Conclusions. Livestock meet needs by eating a mixed diet. Providing animals with a variety of foods whether in confinement or on pastures may provide animals with a more balanced diet, increase intake, reduce stress, and increase efficiency. For example, feed efficiency was improved by 19% in cattle fed a choice of corn, alfalfa, barley and corn silage compared with cattle fed a nutritionally balanced mixed-ration of those ingredients.

Moving animals to fresh pastures or to new areas on rangelands is likely to have the same effect as offering variety. Livestock producers have learned how easy it is to train animals to move to new pastures. Once the animals learn the routine and experience the benefits, they practically move themselves.

Additional Readings

Provenza, F.D. 1996. Acquired aversions as the basis for varied diets of ruminants foraging on rangelands. *Journal of Animal Science* 74:2010-2020.

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