



*The Newsletter for  
the BEHAVE Research  
and Outreach Program*

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### Offering Different Flavors Improves Lamb Productivity

Last summer Juan Villalba studied whether early experience eating a ration with a single flavor or rations offered in multiple flavors, would affect feed intake, the hormones regulating intake, and acceptability of new feeds.

Two-month-old lambs were assigned to one of five treatments for 60 days. Lambs received a ration flavored with: 1) no

## The Body Is Really Smart

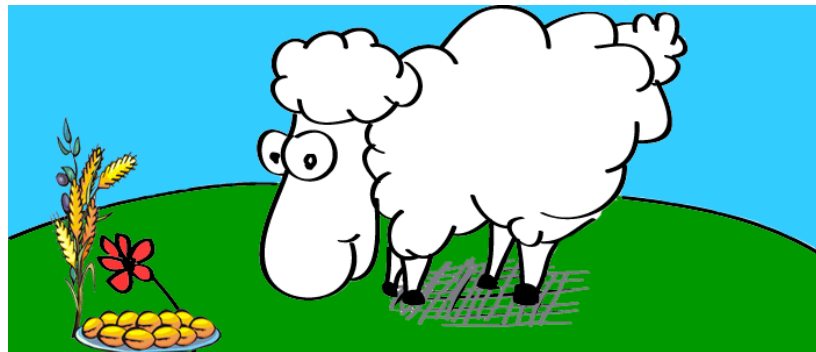
In a previous newsletter, I discussed that animals have receptors for a flavor called umami. Umami is the flavor of protein. Alex Bach investigated the relationship between intake of protein and flavor preferences in ruminants.

### Experiment 1: Protein-Deficient Lambs Prefer Umami

Lambs were fed either a low-protein (LP) or high-protein (HP) diet for 21 days then given a choice between the unflavored diet and the same diet flavored with umami (U). Lambs on HP preferred the unflavored diet. Lambs fed LP preferred U and they preferred it the first day it was offered even though U was a new flavor. Animals usually avoid new flavors. Preference for U by lambs on the LP diet didn't last though. It declined as the trial progressed because U didn't provide more protein even though it tasted as if it did. Apparently, lambs detected umami flavor in feed, associated it with protein, and increased intake and preference for that feed, but when U did not have a higher level of protein, lambs decreased intake of U.

### Experiment 2: Lambs Can Rectify Protein Imbalances

Lambs fed either LP or HP for 42 days were offered a choice between LP and HP. By day 7 preference for each diet stabilized and all lambs ate equal amounts of each diet. Their new diet contained 15.7% CP, which is close to the recommended dietary protein level for lambs used in this study.



Sheep make the right choice

### Experiment 3: Lambs on Protein-Restricted Diets Avoid Sweet

Lambs on either LP or HP rations were offered a choice between three diets flavored with: 1) unflavored, 2) sucrose or 3) a non-caloric sweetener. Preference of lambs eating LP was unflavored > sucrose >

added flavor, 2) sweet, 3) umami, 4) bitter or 5) a choice of the four flavored rations.

Lambs offered a choice of flavors ate more feed and grew faster than lambs fed a ration with a single flavor. Lambs offered a choice ate similar amounts of plain and umami and less of bitter and sweet, even though the rations contained the same amount of nutrients.

Intake of lambs fed a single ration was more variable during the day than intake of lambs given a choice of flavored rations. Choice animals also produced the lowest concentrations of several plasma metabolites causing increases in feed intake during periods of low intake and decreases in intake during periods of high intake.

Reducing daily fluctuations in intake could minimize changes in rumen pH and potentially improve the supply of nutrients to the animal.

sweetener. Lambs fed HP preferred sweet to unflavored diets. Animals make dietary choices that minimize discomfort. Lambs eating LP likely avoided sweet diets because eating sugar would increase the imbalance between energy and protein in their diet. HP diets provided excess protein, so lambs ate more of HP flavored with either sucrose or sweetener in an attempt to correct the imbalance of protein and energy. Preferences did not change over time.

**Experiment 4: Lambs on Protein-Restricted Diets Avoid Bitter**  
Lambs fed either LP or HP for 42 days were offered a choice between unflavored and bitter-flavored diets. At first, lambs had no preference for either diet, eating about 50% of each. Over time, LP lambs reduced their preference for bitter from 53 to 34%, while HP lambs continued to show no preference for either diet. Lambs usually don't show a preference for or an aversion to bitter flavor. It is likely that a reduced preference for bitter by protein-restricted lambs represents the usual negative effects of bitter flavor and its link to foods high in toxins. Animals usually need additional protein to excrete toxins from the body.

#### Implications

The addition of umami flavor to feeds may help protein-deficient animals overcome neophobia and quickly increase intake of high-protein foods that are novel. Ruminants can rectify dietary protein imbalances provided they are offered appropriate choices of foods. Protein-deficient animals are less likely to eat new foods that are either bitter or sweet.

#### References

Bach, A., J.J. Villalba, and I. R. Ipharraguerre. 2011. Interactions between mild nutrient imbalance and taste preferences in young ruminants. *Journal of Animal Science*. In Press.

Villalba, J.J., A. Bach, and I. R. Ipharraguerre. 2011. Feeding behavior and performance of lambs are influenced by flavor diversity. *Journal of Animal Science*. 89:2571-2581.

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Let me know what I can do to improve the newsletter!!

Sincerely,



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