Introduction

Animals are not born knowing what to eat. Rather, they learn what and where to eat based on individual experience, by watching their mothers and peers, and in response to pressure. By understanding their behavior, you can effectively modify it and manage your livestock as an economical alternative to chemicals to reduce fire danger, control weeds, improve pastures, rangelands, and wildlife habitat, and enhance your bottom line.

The Consequences of Nutrients and Toxins in Foods

Research indicates that an animal chooses what to eat based on consequences. Nutrients in foods give positive consequences and the animal will choose that food again. Toxins in the food give negative consequences, reducing the amount the animal will eat. All plants contain some level of nutrients and toxins and these levels can change in the course of the growing season. This means that animals are constantly adjusting their diets based on the feedback they experience. In most cases, they can regulate their intake of toxins and do not over-ingest and poison themselves.

Different species (goats, sheep, cattle, horses) have different abilities to tolerate toxins, and have different dietary preferences. If allowed to eat only the most preferred plants, they are unlikely to learn how to mix foods high in nutrients with foods high in toxins. In contrast, herbivores repeatedly pressured to forage on all plants learn to eat mixtures that mitigate toxicity, assuming appropriate choices are available or supplements are provided. In a recent feeding trial sheep given low percentage preferred forage in combination with forages containing toxins appeared to learn to eat mixtures of nutritious and toxic foods to mitigate toxicity (Provenza et al., 2002, 2003; Villalba et al., 2003). Those animals learning to mix their foods gained more weight than animals given a maintenance diet of their preferred forage in combination with low percentages of toxin foods (Shaw, Villalba, and Provenza, unpublished data). This ability to learn to eat combinations of palatable and toxic foods is passed from mother to young, from peer to peer, and is enhanced in younger animals thanks to their greater willingness to try new things.

These feeding trials indicate the importance of complimentary forages and foods to help animals to learn to select new forages. Ongoing research is now identifying supplements that producers can provide their animals to aid in toxin mitigation, and how to teach animals to self-medicate. Examples of supplements include polyethylene glycol (PEG) which allows animals to double the amount of tannin containing foods they eat, and foods high in protein to offset the effects of terpenes in sagebrush and pine. Likewise, molasses or corn in the rumen can aid in preventing nitrate poisoning (Knight and Walter, 2001).

As indicated by this research, animals tend not to try new things unless there is some kind of pressure to do so. Pressure might be due to a particular species’ ability to tolerate toxins, or caused by reduction in vegetation due to drought or fire. It can also be a result of "satiety" or just being tired of the same old thing. We increase pressure by moving animals to an unfamiliar location, or by fencing them.
We hypothesize that grazing management systems reduce or increase pressure and cause animals to forage in different ways. Low stock densities for extended periods encourage selective foraging and re-grazing of individual plants, whereas high stock densities for short periods encourage diet mixing. This means that what was traditionally considered proper grazing management, rotational grazing at low stock densities, may have trained generations of livestock to use foods and habitats selectively – eat the best and leave the rest – thus inadvertently accelerating a decline in plant diversity and an increase in abundance of less desirable plant species. Conversely, high stock densities for short periods may be used as a tool to train animals to use a broader array of foods and habitats.

Learning to eat a variety of foods means an increase in biodiversity on the range because livestock are no longer selecting only a few, preferred species. More even utilization of all plants for short periods enhances the ability of plants to regrow and minimizes the competitive advantages that occur for plants not grazed (Briske and Richards, 1995). These results have been born out by an eastern Montana rancher, Ray Bannister. He altered his grazing management to encourage cattle to utilize unpalatable and palatable species simultaneously to mitigate aversive effects of toxins. Pastures are intensively grazed and then rested for 2 years. The result of this change in Bannister’s grazing management is that his 7,200 acres has some of the highest vegetation cover and diversity in the state. The opposite can be seen across the west (Provenza, 2003)

Helping Animals Learn

Understanding how to use pressure in combination with food mixing and supplements can help us encourage animals to learn to eat a broader variety of foods. There is no textbook that outlines the steps and procedures one might use. However, here are some suggestions for beginning on your own. These are the steps we are using this year in a pilot project at Grant-Kohrs Ranch National Historic Site in Deer Lodge, Montana.

Begin With Young Animals

Young animals are less neophobic and more apt to sample and learn to eat a variety of foods. You might also look for animals whose mothers have experience eating a broad array of foods are less. Finally, animals have demonstrated peer-to-peer learning. By mixing experienced animals with inexperienced you increase the ability of novices to quickly learn.

Provide Experience

Experience with mixing foods increases an animal’s tendency to sample a variety of foods. Consider providing your livestock opportunities to test a variety of nutritious foods, thus decreasing their willingness to experiment. This may involve using unfamiliar flavors on familiar foods (green apple and coconut are both commercially available and have been used as research tools), introducing them to molasses so that molasses covered foods will seem familiar, or providing them other supplements in unfamiliar forms (protein blocks, alfalfa pellets).

Create Expectations

Feeding a nutritious supplement at the same time daily in a recognizable food container may help when it comes time to introduce a food with a toxin. They may well come to the bucket expecting their treat, and try the new food.

Make Mixers Available

It is important that the availability of foods is such that animals can eat foods that are biochemically complementary, and thus mix their diets in ways that facilitate eating plants that contain toxins. Do not expect your animals to be successful in monocultures of weeds. Adequate diversity
allows livestock to successfully mix foods and mitigate for toxicity.

Pay Attention to Body Condition

Healthy animals, not starving animals, are more capable of mixing foods and processing toxins. At the same time, if they have a maintenance ration of preferred foods, they are unlikely to learn to mix their forages. Limited quantities of supplements (i.e., alfalfa pellets, protein blocks, molasses applied to thistle) can allow you to maintain pressure, while helping animals maintain good nutrition and assist them in their learning process. Consider using supplements as appropriate to enhance health and learning throughout the grazing season.

Use the Appropriate Stocking Density

Pressuring animals to eat all of the foods involves using high stocking density to reduce their ability to pick through and eat only what they like. You can use portable electric fencing to concentrate animals on their task of learning. Through trial and error, researchers have found that your teaching pen should include only as much forage as your animals can eat in one day.

You need three things to decide on pen size. In ascending order of difficulty they are: how many animals you’ll be working with, how much they eat per day, and how much forage is available. I recommend you start with a small number of animals. As a producer you are probably familiar with your animals’ consumption rates. For goats it averages 4 to 5% of their body weight per day.

Estimating forage production can be quite time consuming if you are doing it for research or legal reasons. For adaptive management, you don’t need to be as precise or rigorous. Those of you attending this session will receive handouts describing relatively simple methods you can use to estimate forage production. You might also consider working partnering with your local extension agent, NRCS office, the Bureau of Land Management or Forest Service. At a minimum this can help you calibrate your own estimates.

Conclusions

By paying close attention to your animals, and being flexible and adaptive, you can have some success. You can use this ability to enhance your own operation or to provide services to your community and neighbors. If you plan to use your animals to provide weed or fire control services, the Handbook on CD “Goats! For Firesafe Homes in Wildland Areas” includes a “goat calculator” that can help you estimate labor, fencing and watering costs, and the time it will take to clear your pasture or create a fuel break (Voth, 2003). For more information on using behavior to manage animals and vegetation, visit http://www.behave.net.

References


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