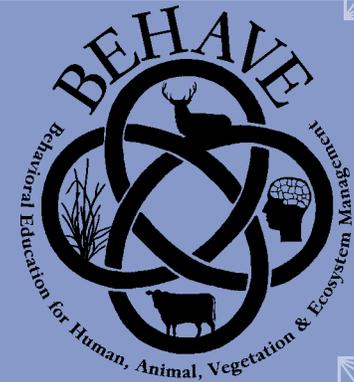


# Palatability—More Than a Matter of Taste



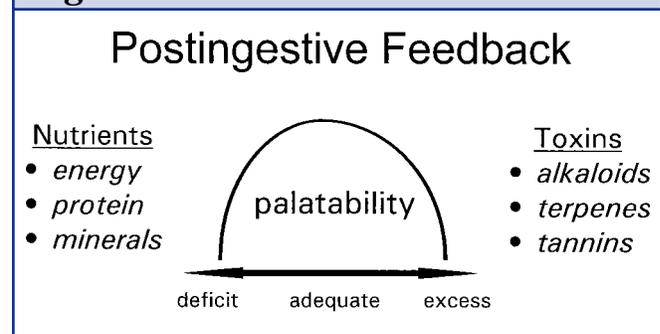
Preferences for foods are thought to be influenced by palatability. But palatability has many meanings. Webster defines palatable as pleasant or acceptable to the taste and hence fit to be eaten or drunk. Animal scientists usually explain palatability as the pleasurable feelings associated with eating that depend on a food's flavor and texture, or how much animals like a food or ration. Plant scientists describe palatability in terms of plant qualities, such as chemical composition, growth stage, and associated plants, availability of other plant species. These definitions of palatability focus on a food's flavor or its chemical and physical characteristics, but fail to integrate these variables.

**Redefining palatability.** Research suggests that palatability is more than a matter of taste. Instead, it is the interrelationship between a food's flavor and its postingestive effects. Flavor is the combination of odor, taste, and texture. Postingestive effects result from feedback from the cells and organs. Feedback is positive (increases palatability) if the food meets nutritional needs. Feedback is negative (decreases palatability) if the food is inadequate or excessive relative to nutritional needs or contains high levels of toxins. Thus, flavor-feedback interactions are influenced by the nutrient and toxin content of the food, the nutritional needs of the animal, and the animal's past experiences with the food. The senses—smell, taste, sight—enable animals to select among foods and provide pleasant or unpleasant sensations associated with eating. Postingestive feedback influences an animal's liking or disliking for a food—palatability—and that depends on how well a food meets the needs of the body.

If palatability is more than a matter of taste, and it is, then how during a meal does the body discriminate among different foods—lettuce, potatoes, steak, cake—based on flavor-feedback interactions? The enteric (gut) and central nervous (brain) systems continually interact with one another, and with the rest of the body, to integrate a food's flavor with its postingestive effects.

**Palatability is dynamic.** Palatability operates along a continuum to influence preference (Figure 1). When nutrients are eaten in correct amounts, animals experience satiety and a liking for the flavor of the food. Conversely, when animals over-ingest nutrients or toxins, they experience discomfort and a disliking for the flavor of the food. Palatability operates along a continuum because virtually everything, if ingested in high enough doses, is toxic, including oxygen and water. Paracelsus observed: "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy."

Figure 1.



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Nutrients and toxins limit the amount of a food an animal can eat. Ruminants show little preference for foods low in nutrients, and they eat only limited amounts of foods high in nutrients. People experience the excessive-nutrient effect when we eat high-calorie foods that are too rich or foods high in salt. Ruminants limit their intake of foods that are too high in energy, protein, or minerals. For example, protein is required in moderate amounts every day. But too much protein causes excessive production of ammonia in the rumen, which is toxic in high concentrations and reduces palatability. Energy is also a major nutrient but too much energy from readily available sources of carbohydrates in foods like grains can cause illness—acidosis—and reduce palatability. The ratio of protein to energy also has a strong influence on palatability. Palatability declines if there is too much protein relative to energy or if the protein and energy ferment at different rates.

Over-ingesting toxins, such as terpenes, alkaloids, and cyanogenic glycosides, causes palatability to decrease. Research with different toxins shows that giving animals a sub-lethal dose of toxins via a stomach tube after eating an otherwise nutritious food causes a strong aversion to the food. When herbivores forage, over-ingestion of toxins is rarely a problem because rapid postingestive feedback from toxins enables animals to limit the amount of toxic food eaten. Thus, the amount of toxins in foods sets limits on the quantity of a particular food an animal can eat. As toxin concentrations in a plant decline, intake of the plant increases. That's why, given a choice, herbivores are able to select plants that are higher in macronutrients and lower in toxins than the average of the plants available in a community.

Positive feedback improves the palatability of a food. Many people dislike certain foods the first time they eat them because the foods—such as avocados, beer or coffee—possess strong new flavors. But calories, alcohol and caffeine can all be positively reinforcing. If we continue to consume those foods, often because of social pressures, we come to like the flavor. Animals react the same way. They often avoid nutritious new foods, especially those with strong flavors. If they continue to eat those foods because they need additional nutrients or because peers are eating them, they are likely to acquire preferences for the foods.

## Changes in palatability are auto-

**matic.** Changes in palatability occur automatically through flavor-feedback interactions. Animals don't need to think about or remember the feedback event. Even when animals are anesthetized or tranquilized, postingestive feedback still changes palatability. When sheep eat a food and then receive a toxin dose during deep anesthesia, they become averse to the food because the negative feedback of the toxin occurs even when the animals are deeply asleep. Thus, feedback operates automatically, and often in the absence of rationality, to change palatability. For example, a person often acquires strong aversions to foods eaten just prior to getting nauseated even if the person knows that the flu or seasickness—not the food—was responsible for the nausea.

The body is typically subtle in instructing individuals what and what not to eat. People consciously remember only those feedback events that were traumatic, such as getting violently ill from food poisoning. In such cases the body tells us in no uncertain terms, through intense nausea and vomiting, not to eat the food again. But the body typically works subtly and at a non-cognitive level to indicate its needs. If it didn't, animals would spend all their time just trying to figure out what to eat, how to digest it, and how to change preferences based on the body's changing needs. It is remarkable to consider that so many complex interactions occur without a bit of thought.

### Additional Readings:

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

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