

# Following your steak's history from pasture to plate

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The package on a supermarket steak may say "grass-fed" or "grass-finished," but how can a consumer know whether the cow spent its days grazing peacefully on meadow grass or actually gorged on feedlot corn? In ACS's *Journal of Agricultural and Food Chemistry*, scientists are now reporting the development of a method that can reconstruct the dietary history of cattle and authenticate the origins of beef.

Frank J. Monahan and colleagues note that consumers are increasingly concerned about the origins and labeling of meat, as they seek assurance about the meat's safety or prepare to pay premium prices for specialty meats that are raised locally or certified as organic. "An example of such a product is pasture-fed beef," they write, "often marketed as superior nutritionally as a result of increased levels of [omega-3 fatty acids](#) ...arising from the consumption of grass."

To reconstruct the diet of cattle, the researchers analyzed the proportions of different types of oxygen, nitrogen, hydrogen, and sulfur in the animals' [muscle tissue](#) and tail hair. Specific diets (for instance, a diet that switched from mostly grass to corn at the end of the cow's life) leave a distinctive "fingerprint" of these elements in cattle tissue. The fingerprint in muscle represents the animal's overall lifetime diet, while quicker-growing tissue in tail hair can reveal more recent dietary changes. Monahan and colleagues say the [fingerprints](#) "provide a powerful tool to reconstruct changes in feed components offered to animals over periods of over a year and thus a tool to verify farm production practices."

**More information:** “Beef Authentication and Retrospective Dietary Verification Using Stable Isotope Ratio Analysis of Bovine Muscle and Tail Hair” J. Agric. Food Chem., 2011, 59 (7), pp 3295–3305 [DOI: 10.1021/jf1040959](https://doi.org/10.1021/jf1040959)

### **Abstract**

Stable isotope ratio analysis (SIRA) was used as an analytical tool to verify the preslaughter diet of beef cattle. Muscle and tail hair samples were collected from animals fed either pasture (P), a barley-based concentrate (C), silage followed by pasture (SiP), or silage followed by pasture with concentrate (SiPC) for 1 year (n = 25 animals per treatment). The  $^{13}\text{C}/^{12}\text{C}$ ,  $^{15}\text{N}/^{14}\text{N}$ ,  $2\text{H}/1\text{H}$ , and  $^{34}\text{S}/^{32}\text{S}$  isotope ratios in muscle clearly reflected those of the diets consumed by the animals. By applying a stepwise canonical discriminant analysis, a good discrimination of bovine meat according to dietary regimen was obtained. On the basis of the classification success rate, the  $^{13}\text{C}/^{12}\text{C}$  and  $^{34}\text{S}/^{32}\text{S}$  ratios in muscle were the best indicators for authentication of beef from animals consuming the different diets. Analysis of  $^{13}\text{C}/^{12}\text{C}$  and  $^{15}\text{N}/^{14}\text{N}$  in tail hair sections provided an archival record of changes to the diet of the cattle for periods of over 1 year preslaughter.

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