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NEWS SCAN

FOOD SAFETY

Protein Pretense

Cheating the standard protein tests is easy, but industry hesitates on alternatives BY ALISON SNYDER

After hundreds of dogs and cats fell ill this past spring, government officials traced the source to melamine, a nitrogen-rich compound found in plastics and fertilizer that, when ingested by the animals, crystallized in their kidneys and caused renal failure. The U.S. Food and Drug Administration later announced that producers may have deliberately added the compound to wheat gluten and rice protein concentrates to inflate the measured amount of protein. The greater the protein level in the concentrates, the higher the market price the products fetch. Regardless of whether its addition was deliberate or accidental, melamine snuck past standard industry protein analysis, suggesting that the century-old test methods should be reevaluated. Several alternatives exist, but the food industry has yet to make a switch.

NOT FIT FOR A DOG: Melamine added to pet food created false measures of protein content, fooling standard tests that look for nitrogen as a protein signal.

LARRY WILLIAMS Corbis

Traditionally, food protein is measured by a method developed by Danish brewer Johann Kjeldahl in the late 1800s. In this analytical technique, a strong acid digests a sample, breaking down the organic matter and releasing nitrogen, which is then converted to ammonia. The amount of ammonia indicates how much nitrogen was in the original sample and, hence, the amount of protein. This "proved to be a robust, precise method," says Julian McClements, a food scientist at the University of Massachusetts Amherst. It is attractive because it can be used for a variety of products and protein types. Another, similar nitrogen-based technique, called the Dumas test, is also popular with industry. It relies on burning the sample to release nitrogen. The Association of Analytical Communities (AOAC) International, a scientific association that sets standards for analytical methods, lists the Kjeldahl and Dumas techniques as the standard methods for measuring protein in food.

The nitrogen-based methods may be tried, but they are not entirely true. They assume that the source of all nitrogen in food is protein constructed from nitrogen-based amino acids. This assumption is reasonable if unadulterated food is being analyzed, because the other major components of food—carbohydrates and fats—do not contain nitrogen. But because the tests detect total nitrogen, from both protein and nonprotein alike, they do not truly measure protein.

Hence, any chemical rich in nitrogen can potentially trick the Kjeldahl or Dumas test. In the pet food scandal, nitrogen from melamine was indistinguishable from amino-acid nitrogen and contribut-

ed to the tally used to calculate the protein in the sample.

Several alternative, non-nitrogen-based protein tests exist, such as laboratory chromatography and ultraviolet spectrophotometry, but they are expensive and time-consuming and require extracting protein from food, a process that differs depending on the type of food. For rapidly analyzing food protein, "probably the best technique," McClements says, is infrared spectroscopy, which relies on the peptide bonds in proteins absorbing infrared light in distinguishable ways. The method demands that each chemical to be screened first be run to calibrate the machine; if researchers are not looking for a particular chemical, they will not find it using infrared spectroscopy. The appearance of a nonprotein spike would indicate a possible contaminant in the sample that could then be identified through other tests.

The Canadian Grain Commission adopted near-infrared reflectance (NIR) technology, a type of infrared spectroscopy, for screening its grain supply some 30 years ago. Since then, the U.K., Australia, Russia and Argentina, among others, have also switched to NIR. More than 90 percent of wheat worldwide is screened with NIR, according to Phil Williams, a consultant at PDK Grain in British Columbia and an early adopter of the technology for use in the grain industry. In principle, NIR could measure protein in a variety of food types, including wheat gluten and rice protein concentrates.

Still, some doubt that NIR could economically replace the nitrogen-based tests. Carl Schulze, president of New Jersey Feed Lab, a Trenton-based company that analyzes food for industry, states that NIR works best when one type of feed is being tested repeatedly. But the high initial cost of setting up the machine and running samples that are similar to the products being tested means that the technique may not be a viable alternative for the independent laboratories that test the food supply.

Thus far pet food makers and other processors have not decided whether to adopt new methods. "We're in the process of building a feed safety protocol," says Ron Salter, a vice president at feed distribution company Wilbur-Ellis in San Francisco. He adds that the company will be looking into feed sampling and testing procedures. In the meantime, nitrogen-based methods will likely remain top dog among protein-testing techniques.

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