Standard test may miss food ingredients that cause milk allergy

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The standard test used to detect milk-protein residues in processed foods may not work as well as previously believed in all applications, sometimes missing ingredients that can cause milk allergy, the most common childhood food allergy, which affects millions of children under age 3, a scientist reported here today at the 243rd National Meeting & Exposition of the American Chemical Society's (ACS).

Joseph L. Baumert, Ph.D., who headed the study, explained that thermal and non-thermal processing of foods can change the proteins responsible for milk allergy in ways that make the proteins harder to detect using the standard test, termed the enzyme-linked immunosorbent assay (ELISA). Processing, however, may still leave the milk proteins capable of causing itchy skin, runny eyes, wheezing and other sometimes more-serious symptoms of milk allergy, despite the inability to detect the milk residue.

"The results of these studies could be utilized by commercial ELISA kit manufacturers to aid in improving ELISAs for detection of milk residue in processed food products. These improved tests can be adopted by the food industry, if necessary, to allow for reliable detection of milk residue regardless of the type of processing that is used," he said. "These improvements should not result in commercial tests that are more expensive or difficult for food processors to use."

Food processors use the ELISA to assure that processed foods that do not contain milk and processing equipment in facilities that process milk

products are free of milk allergens, the substances that can trigger milk allergy.

Milk allergy is not the same as lactose intolerance, a condition in which people lack adequate amounts of the enzyme needed to digest lactose, the main sugar in milk. Lactose intolerance involves the digestive system, with symptoms like bloating, stomach cramps and diarrhea, after consuming milk or milk products. Milk allergy affects the immune system and can cause swelling of the throat, which makes it difficult to breath, and other symptoms that require immediate medical help.

Baumert explained that manufacturers and food-safety agencies use ELISAs to ensure that food-processing equipment and finished products are free of allergens or labeled with appropriate warnings. ELISAs are one of the most widely used diagnostic tests in the world today, a mainstay in everything from diagnosing pregnancy and detecting the AIDS virus in human blood to diagnosing a range of other diseases in plants and animals. The tests leverage the amazing ability of antibodies, proteins formed by the body's immune system, to attach to and mark for destruction bacteria, viruses and other foreign substances. An ELISA kit for milk proteins contains antibodies that bind to milk proteins that may be in a finished food product or on the surface of shared manufacturing equipment. If a sample taken from a finished product or from the surface of food-processing equipment contains milk residue, a color change will occur in the test, indicating a positive result for contamination with milk proteins.

Baumert, who is with the University of Nebraska-Lincoln, explained that heating and other processing of foods can make milk proteins aggregate together so it is difficult to get the milk proteins into solution, which enables them to be detected by the antibodies in ELISAs. The clumping, however, does not necessarily destroy the protein's ability to trigger an allergic reaction in sensitive people. Clumped-together proteins also

would be likely to maintain their potency once they reached the human body, he added. Heating and other processing can also alter the structure of the protein, which can affect the ability of the antibody to bind to the milk proteins. Alteration in the protein structure does not necessarily mean that the milk proteins become non-allergenic for the majority of milk-allergic individuals.

His team studied and documented how ELISAs perform on several measures of accuracy when milk proteins undergo changes in foods that are boiled, baked, fried or heated in other ways. The results could help the food-processing industry and ELISA manufacturers make changes that better protect consumers with milk allergies, he said, noting that other scientists are doing similar research on foods that contain eggs and peanuts — both common causes of food allergy.

More information:

Abstract

Commercial enzyme-linked immunosorbent assays (ELISAs) are commonly used by food industry for validating removal of allergenic residue from food contact surfaces and detection of allergenic residue in finished products. ELISAs are the method of choice due to their specificity, sensitivity, and ease of use in an industrial setting, however, limited validation of ELISA kits has been conducted on food matrices that have undergone thermal processing. This is important to note when selecting a commercial milk ELISA for monitoring allergenic residues as several variations in formats (qualitative and quantitative assays), specificity (detection of total milk protein, casein, or beta-lactoglobulin), sensitivity, and reporting units (NFDM, skim milk powder, casein, beta-lactoglobulin) exist. Milk proteins can be differentially affected by thermal processing thus limiting detection and affecting overall risk-assessment decisions. The effects of common processing techniques (boiling, baking, frying, retorting, and UHT) on detection of milk residue using commercial ELISAs will be discussed.