Meat Analogs of Soy -- A summary of uses and labeling policy in meat products

Richard H. Alsmeyer, USDA, USA
Product Standards, Meat and Poultry Inspection Program

Soy analogs come in many sizes, shapes, colors, flavors and compositions. The more common items are the textured soy flour or textured vegetable protein, textured soy protein concentrate, and isolated soy protein fibers. The less common analogs are complete analog foods often made from isolated soy protein fibers and mixtures of other ingredients (Rakosky 1967). Some analogs are often colored and flavored to approximate the foods with which they will be used or foods which they can replace, eg. beef, ham, chicken, turkey or pork.

A brief summary of the basic soy components may be helpful. Soy flour or soy grit is the solid material remaining after removal of the oil from soy beans--it is 50 percent protein. This material can be textured by hydrating, heating, expanding, extruding, and drying the product. Soy protein concentrate is prepared from soy flour by removing many of the water soluble compounds -- it is 70% protein. Textured isolated soy protein is usually in the form of fibers that have been spun from a solution of isolated soy protein (90-95% protein). These fibers help add textural properties and structural integrity that are so necessary in simulating the mouth feel of meat and other established foods.

Textured soy analogs have been used in: meat patties, meat loaves, sauce with meat, chili con carne, meat balls, fillings for egg rolls, imitation frankfurters, toppings for pizza, Mexican foods, meat stews, meat spreads and meat salad spreads. Full analogs (hydrated, textured, colored, and flavored) can be mixed with meat and have been used in products such as: meat and gravy, and salads made with meat. Prefried bacon, soy-franks and soy-ham are examples of complete soy analogs.

Advances in food technology have encouraged the texturing, flavoring and coloring of analogs to allow their blending with meat products to the point that soy chunks are almost undiscernible from meat particles. Even though meat labels may indicate the soy analog as an ingredient, many consumers do not understand the structuring and other important characteristics of soy analogs. Analogs offer adequate quality protein (protein efficiency (PER) 1.8 to 2.3) and at a low cost. Analogs offer increased moisture and fat binding qualities, convenience, good palatability and improved stability.

The Food and Nutrition Service of the U. S. Dept. of Agriculture now supports the use of textured vegetable protein products in school feeding systems. The protein supplied by soy is now credited towards complying with the meat or meat alternate requirements of the federally supported school lunch program. (Lachance, 1972). Under this change, hydrated soy or soy analogs can comprise 30% of the ingredients of a meat product, e.g. meat patties.

The Federal Meat Inspection Act of 1906 authorized the Federal Meat Inspection Program of the United States Government. This meat inspection law states that products are adulterated "if any valuable constituent has been in whole or in part omitted; or if any substance has been substituted; or if damage or inferiority has been concealed in any manner; or if any substance has been added thereto so as to increase its bulk or weight, or reduce its quality or strength, or make it appear better or of greater value than it is." Since soy is not equivalent to meat in nutritional qualities, the substitution of soy analogs for meat could be a deceptive practice if the labeling does not adequately inform consumers of the presence of the soy analog.

A study was designed to evaluate the quantity of textured soy flour that significantly characterized "Chili Con Carne, with Beans." Textured soy flour (dry) was used at 1½%, 3%, 4½%, and 6% of the chili mixture using three (3) soy particle sizes. Results of this study indicated that levels of more than 3% of soy analog significantly characterized the "chili con carne with beans." It was apparent that it would be necessary to declare soy in the product name to inform consumers of the presence of this analog. Thus, the product name should be "Chili Con Carne with Beans, Textured Vegetable Protein Added." Informal observations by staff members over the last five years have also contributed to an equation of fresh meat to dry, textured analog to determine the meat product labeling policy needed to inform consumers of the presence of the textured analog. A ratio basis was developed and is currently being applied.

Category 1. Product with less than characterizing quantities of analog. Labels for product whose formula contains more than 13 parts of fresh meat to 1 part of dry soy analog would require listing the analog only in the ingredient statement.

Category 2. Product that contains characterizing quantities of analog and requires qualified product labeling. If the fresh meat to dry analog ratio is between 13:1 and 10:1, the food name on the label would show that analog had been added, for instance, "Chili Con Carne with Beans, Textured Soy Flour Added."

Category 3. Product that contains characterizing quantities of analog and requires full product labeling. If the ratio of fresh meat to dry analog is less than 10:1, the product would be labeled to equate the analog with the meat components, for instance, "Beef and Textured Vegetable Protein Stew."

Mixtures of meat and complete hydrated, fabricated analogs to form new foods has been slow to develop. This may be due partly to the relatively high cost of the complete fabricated analog. Complete analogs add special textural properties to the finished food product and are gaining in popularity.

What is the outlook for soy analog use in the United States? The National Livestock and Meat Board of the United States reported last March that "by 1980, soy bean products could replace 4 to 8% of the meat animals needed to

supply projected red meat requirements." This report further suggests that analogs are now equivalent to about 2% of the meat supply and the economic projection indicates that it could be 50 times greater than this by 1980. Most observers feel that analogs will be used primarily as extenders for meat products and other foods rather than as complete replacements. For many years, several religious and ethnic groups have used soy analogs as complete meat replacements in their diets. The experience gained in preparing these products for this segment of our population has benefited American manufacturers and the entire consuming public.

In summary, the use of textured soy analogs has progressed rapidly in the United States to a wide distribution of these items as ingredients in established food products.

Most gains in usage have and will be in the institutional food service area, rather than in the home. The meat patty is an example of the use of analogs--here the extender analog absorbs juices and rendered fat to make the product more palatable and juicy, helps hold the product together and reduces the product cost. These are the main reasons why textured analogs have become so popular. The labeling policy on meat products containing soy analogs is dependent upon the ratio of fresh meat to dry soy analog. As the ratio decreases, the prominence of soy required on the label increases.