Processing Low-Fat/No-Fat Products

Modifications of Connective Tissue Proteins for Low-Fat Processing Applications.

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Research conducted at the University of Nebraska has investigated various modification techniques to improve the functionality of connective tissue proteins, particularly collagen. Connective tissues obtained from beef and pork desinewing operations were mechanically modified by freezing, grinding and flaking (MCT). This process improved the functionality (water binding ability) of connective tissue collagen. Incorporation of this raw connective tissue material improved the sensory attributes of low fat beef patties, yield and purge of beef and pork frankfurters, respectively. Investigations of dehydrated beef cattle hide corium collagen fibers found that adding 2% collagen fibers at a rehydration ratio of 4:1 (water: collagen fiber) was optimum for enhancing the sensory attributes of low fat beef patties. Preblending beef MCT with a 3.5% solution of phosphate (w/w) improved collagen solubility (acidic phosphate) and collagen hydration (alkaline phosphate). Frankfurters manufactured with either acidic or alkaline phosphate beef MCT preblends were similar in sensory and textural attributes compared to controls (no phosphate or connective tissue). Gelatinization of desinewed beef shank, chicken skin and pork skin connective tissues resulted in the formation of gels that could bind from 100 to as much as 600% added water. Reduced-fat bologna manufactured with a percentage of these gels exhibited acceptable yields, color, sensory and textural attributes. Modification of connective tissue to increase its water binding ability is a viable processing technology for low-fat product applications.

Key words: Connective tissue, Collagen, Low-fat

Development and Sensory Evaluation of the Beef-Barley Burger.

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Following extensive testing, it was determined that cracked waxy hull-less barley incorporated into 90/10 (% lean/% fat) gound beef produced patties that were as acceptable to adult and youth consumers in appearance, flavor and texture as 80/20 ground beef control patties. Adult consumers found the beef-barley patties to be more acceptable than the 90/10 control, while youth consumers rated them equal. The beef-barley burger had substantially higher cook yields and water retention than either of the controls. Tenderness values, measured by Warner-Bratzler shear, were similar between the 80/20 control and the lower fat (10-11%) beef-barley burger, indicating that the barley had a tenderizing effect on 90/10 ground beef. Proximate analysis revealed that the beef-barley burger was no different than the controls in protein content. Ash, carbohydrate, and water increased proportional to fat decreases in patties with waxy barley. Mineral composition was not substantially different among the control and beef-barley patties, with the exception of increased sodium in the beef-barley burger. This was due to the addition of beef-flavored bouillon during hydration of the barley. Aerobic plate counts indicated that, after 6 days of refrigerated storage, the beef-barley patty did not spoil any faster than controls. Thiobarbituric acid numbers (an indication of lipid oxidation) indicated that waxy barley incorporated into ground beef may have an antioxidant effect when patties are stored for 90 days or more.

Key words: Ground beef, Low-fat, Sensory

Utilizing the Functionality of Protein Components From Lean Finely Textured Beef and Pork for Low-Fat Products

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Lean finely-textured beef (LFTB) and pork (LFTP) are lean meat ingredients recovered from high-fat trimmings. A high moisture (≈75%) and protein (≈18%) content plus low-fat (≈6%) made these attractive ingredients for low-fat formulations. Consequently, the objective of our investigations has been to determine the functional characteristics of these ingredients to facilitate the most appropriate applications. Protein gelation measurements showed gels from these ingredients to be very soft despite the high protein content. Protein extraction at various ionic strengths followed by separation and analysis using sodium dodecyl sulfate-polyacrylamide gel electrophoresis showed LFTB and LFTP to be relatively low in content of the strong-gelling, high-ionic stength soluble proteins. The actomyosin and other myofibrillar proteins present in LFTB and LFTP were fully functional in gelation but represented less than 10% of the total protein fraction (compared to some 50% + in muscle). Insoluble proteins made up the largest share (65% or more) of the protein fractions from LFTB and LFTP. Collagen was found to comprise 20% or more of the total protein content. As might be expected, gels made from LFTB and LFTP showed reduced capacity to retain moisture relative to typical muscle from beef and pork. However, addition of increased levels of water-binding agents (salt, phosphates, carrageenans, soy isolate) to the LFTB and LFTP improved moisture retention. The softer heat-set protein gels which occur from use of these ingredients have been shown to result in textural improvement in low-fat products, particularly coarse-ground products such as ground beef and pork sausage.

Key words: Protein gelation, Texture

The Use of Isolated Soy Protein Gels in Reduced Fat Pepperoni.

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The objectives of this study were to determine the sensory acceptance, functional performance, and cost effectiveness of using isolated soy protein gels (ISPG) for partial meat replacement and fat reduction in pepperoni. Two 27% fat pizza pepperoni products were formulated with an ISPG hydrated 1:3 (protein:water) with 25% and 33% ISPG inclusion in the meat block. These were compared to a 39% fat all meat control on pizzas for hedonic acceptance and rated for performance attributes by a 36 member panel. The reduced fat pizza pepperoni samples and all meat control were not significantly different for appearance, flavor, texture, oiliness/greasiness, and overall acceptance ($P < 0.05$). The products were all rated functionally similar with only slight amounts of cupping, charring and visible oil pooling. The use of ISPG for fat reduction with similar or reduced costs, maintenance of traditional eating quality and similar functional performance was achieved. The costing is highly dependent on the U.S. pork trim market but shows that reduced fat pepperoni with ISPG can be formulated more economically than all meat reduced fat pepperoni and about the same or sometimes less than the traditional all meat full fat product.

Key words: Isolated soy protein, Reduced fat, Pepperoni