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Nutrient Values for Ground Beef Products Ranging from 3 to 30% Fat for 4 Cooking Methods, from USDA Research Study

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Objectives

A research study was designed by the USDA Nutrient Data Laboratory (NDL) to obtain nutrient data for ground beef over a range of fat levels and to establish the relationship between the total fat and various nutrients, to update the USDA National Nutrient Database for Standard Reference (SR).

Materials and Methods

Ground beef samples (n = 72) labeled from 3 to 30% fat, covering the range available in the retail market, were purchased from outlets throughout the U.S. according to a sampling plan developed for the National Food and Nutrient Analysis Program by NDL. Ground beef samples were cooked as patties (broiled and pan-broiled), baked loaves, and pan-browned crumbles. Samples were chemically analyzed for 23 nutrient components (proximates, cholesterol, fatty acids, seven vitamins, and ten minerals) by qualified laboratories using approved AOAC methodology and certified reference materials. Data were evaluated using mixed model regression analysis to obtain mean estimates for each of the components. A set of estimates was developed for each nutrient for ground beef products from 3 to 30% analytical raw fat, relating analytical raw fat level to analytical nutrient value after cooking. Nutrient estimates were made for all 4 cooking methods.

Results

Values for each nutrient (g/100 g) varied by cooking method and fat content. For example, among cooking methods, protein values in crumbles ranged from 25.6 to 29.5 (for 3 to 30% analytical raw fat levels) and from 22.9 to 26.0 (for 3 to 30% analytical raw fat levels) in pan-broiled patty. Cooked fat levels among cooking methods, for ground beef with 3 to 30% analytical raw fat levels, ranged from 3.65 to 16.44 in pan-broiled patty and from 4.0 to 16.50 in loaf. Positive linear relationships between analytical raw fat and cooked nutrient values were observed for calcium, sodium, folate, and thiamin, although the only significant linear coefficients ($p < 0.05$) were for calcium in broiled patty, loaf, and crumbles and for sodium in broiled patty, pan-broiled patty, and loaf. Linear relationships between analytical raw fat and cooked nutrient values were observed for most nutrient components, while these nutrients showed a quadratic relationship between analytical raw fat and cooked values: total fat, moisture, vitamin K, total saturated fatty acids, total monounsaturated fatty acids, and total polyunsaturated fatty acids. The quadratic coefficients were significant ($p < 0.05$), except for vitamin K and for moisture in loaf. For a few nutrients in specific cooking methods, estimated values were constant across the range of fat levels.

Conclusion

The ratio of cooked moisture to cooked fat content differed at lower fat levels compared to higher fat levels, in a complex nonlinear manner. Meat scientists, nutrition professionals, and consumers can now obtain nutrient data for a wide range of cooked ground beef products for use in health research, nutrition policy, labeling, and food purchase and preparation decisions. Full nutrient profiles for retail ground beef for a range of values and cooking methods, which are based on regression analysis using data from these assays, are now available in SR. An interactive Ground Beef Calculator was developed to provide nutrient values for ground beef, raw and for the 4 specified cooking methods, for fat levels from 3 to 30%. These data are accessible at http://ndb.nal.usda.gov.

