Effect of Meat Type and Cooking Method on Cooking Yields

INTRODUCTION

The Nutrient Data Laboratory (NDL) of the USDA conducts food composition research to develop accurate, unbiased, and representative food and nutrient composition data which are released as the USDA National Nutrient Database for Standard Reference (SR).

The SR is used as the foundation of most other food-composition databases in the U.S. and worldwide to monitor food and nutrient intake, conduct human nutrition research, label foods, and develop nutrition policy.

USDA food composition data support efforts of the USDA Food Safety and Information Service (FSIS) and the retail meat industry to initiate single ingredient meat labeling (1) which became mandatory in March 2012.

Since the 1950s, USDA has also released cooking yield tables that describe changes in food weight due to moisture loss (e.g. evaporation, moisture drip), water absorption, or fat gain/loss during food preparation. Cooking yields are used in food formulations and recipes to convert nutrient values for uncooked foods into nutrient values for cooked foods.

NLD has conducted several collaborative studies with scientists in the meat industry and universities to update values on cooking yields in meats. These studies are used to develop nutrient values for moisture, fat, vitamin and minerals. To maintain the quality of cooking yield data, it is essential to review and update existing data and acquire new data as needed.

This report summarizes the results of multiple studies which indicate the impact of meat type, cooking method, and fat content on the amount of cooking yield and the extent of moisture and fat changes that occur during cooking.

http://www.ars.usda.gov/nutrientdata

MATERIALS & METHODS

Sampling:
Port cuts and ground beef were purchased from 12 to 24 retail outlets (0-20), using sampling plans developed for the National Food and Nutrient Analysis Program (2). Beef cuts, ground pork and game meats were obtained from US commercial processing plants or feedlots. Statistical sampling plans were designed to provide nationally representative data.

Preparation:
Beef port cuts were browned, then simmered in water to tightly covered pan in oven. Cooking liquid volume was documented.

Pork shoulders were placed on rack in roasting pan for broiling, with water added. Cuts were broiled in covered pan in oven until tender, cooled for 5 minutes, then weighed.

Beef steaks were grilled to final internal temperatures of 70°C and weighed when removed from grill.

Pork chops and loin roast cuts were cooked in uncovered pans with no oil or water added.

Unless otherwise noted above, samples were allowed to stand after cooking while monitoring the rise in internal temperature in order to attain a peak temperature, which was considered the final internal temperature (Table 1A).

Weights were obtained for both raw and cooked samples.

Nutritional analysis:
Raw and cooked meat samples were chemically analyzed. Moisture, fat, and protein values determined using AOAC method 992.33 [6]. Fat was determined using the acid-hydrolysis method (AOAC 954.02) [4] or chloroform/methanol method (Kooh mortiz [5]).

Quality control:
Analytical quality control was assured using standard reference control materials.

Calculations:
Cooking yields were calculated from the initial (raw) and final hot cooked (skillets) weights according to the following formula:

Yield % = cooked sample old weight / 100 cooked sample raw weight

The change in nutrient content between raw and cooked products was used to estimate moisture loss and fat loss during cooking. The equation below was used to calculate % moisture change, where EP is edible portion. The equation used for % fat change was the same except that final values were subtracted for substrate values.

% water vol EP - % g dry vol EP * 100
% water vol raw EP

Note: To calculate % moisture and fat change for pork cuts in this report, EP consisted of the lean portions. EP for beef cuts and ground products comprised of lean and fat portions.

RESULTS & DISCUSSION

Cooking yields, moisture and fat changes for beef cuts differed according to cooking method used (p<0.001; Table 1A).

Cooking yields for comparable beef and pork cuts varied according to cooking method (p<0.001) (Table 1B). For beef, cooking yields and moisture changes differed according to cooking method within each meat type. There was no difference in fat change. Regardless of cooking method, pork cuts had increased fat content.

Cooking yields were inversely related to fat levels in ground beef products studied (p<0.0001; Table 1B).

No significant differences in ground pork yields were seen among the 3 fat levels (Figure 1).

Among 7 types of ground meats, ground pork had the lowest cooking yield, which was significantly different when compared to all the other ground meat sources (p<0.0001), except ground beef (Figure 3).

SUMMARY & CONCLUSIONS

The data from these studies can be used for developing nutrient estimates for foods, as well as for making decisions where maximizing cooking yields is a desired outcome. These cooking yield data provide valuable information regarding the impact of cooking methods, meat type, and fat content on total cooking yield as well as moisture and fat gain or loss.

Cooking yield data from these studies will be released in USDA's Meat Cooking Yields table at http://www.ars.usda.gov/nutrientdata.

USDA yield data provide researchers, nutrition professionals, industry officials, and consumers with important information and for making decisions regarding food plans and food preparation.

REFERENCES


