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Special-Fed Veal: Separable components, proximate composition, and nutrient analysis of selected raw and cooked, wholesale and retail cuts☆

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ABSTRACT

Nutrition research continues to be important for consumers to make informed food purchasing decisions and is used in nutrition policy decisions. The objective of this study was to analyze the nutrient concentration of raw and cooked cuts from special-fed veal calves to update nutrient data in the USDA National Nutrient Database for Standard Reference (SR) Release 27. Packages of wholesale (whole loin roasts, center-cut hindshanks and ground veal) and retail veal cuts (osso buco foreshanks, loin chops, leg cutlets and shoulder blade chops) were randomly collected in original vacuum packaging from six U.S. suppliers. Packages were shipped to the Colorado State University Meat Laboratory for cut dissection, cooking, and nutrient analysis. Composites of lean, external fat and seam fat were formed for analysis of proximate, fatty acid, vitamin and mineral composition. Results from this study identified additional fatty acids, established choline concentration, and provided updated veal nutrient composition information for inclusion in USDA SR 27.

1. Introduction

Consumer interest in nutrient composition of foods has continued to increase due to heightened health awareness through news media and health professional recommendations. The American obesity epidemic and resulting health recommendations to decrease the consumption of foods with high fat and sodium concentration resulted in consumers making more health-conscious food choices. The 2015 Dietary Guidelines for Americans recommended reducing consumption of total fat, saturated fat, *trans* fat, and sodium (USDA & USDHHS, 2015). Of the total protein food purchases made by consumers, there is a disfavor for red meat due to generalization of red meat being viewed as "unhealthy" as a result of total fat and saturated fat concentration (IFICF, 2009). However, recent data show that over 20 USDA-classified "lean" cuts of beef are readily available to consumers for purchase at retail stores. (NCBA, 2014a; USDA-ARS, 2016c).

Nutritional data have been disseminated by the USDA-ARS Nutrient Data Laboratory (NDL) through the USDA National Nutrient Database for Standard Reference. This publicly accessible online database is used globally to develop nutritional guidelines, provide nutrition information for on-pack labeling claims, develop meal calculations and make nutritional statements (Ahuja, Moshfegh, Holden, & Harris, 2013). Nutrient data for veal were originally published in the USDA's Handbook No. 8, Composition of Foods–Raw, Processed, Prepared Chapter 17, and the most updated publication was in 1989 (USDA-ARS, 2013a). The handbook contained veal data from the work of Ono, Berry, and Douglass (1986), and was the last journal-published research on veal nutrient composition. Handbook No. 8 data were incorporated into the USDA National Nutrient Database for Standard Reference (SR) Release 11 in 1996 (USDA-ARS, 2016a). The most recent, (unpublished in the scientific literature) veal nutrient information included only breast and shank cuts. This research was conducted by Dr. Dennis Buege at the University of Wisconsin which was submitted for contribution to the SR Release 12 in 1998 (USDA-ARS, 2016b). The information in the present work was needed because these data reflect the current veal supply chain.

There are three types of veal: bob veal, special-fed, and "non-special-fed" or pasture-raised veal. Special-fed veal calves receive a milk-

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replacer formula diet, that is comprised of either soy or milk products until they reach a live weight of approximately 226 kg (500 pounds) and are usually 20 to 22 weeks of age (AVA, 2011). According to the National Cattlemen's Beef Association (2014b), special-fed veal occupies approximately 75% of the U.S. veal market. Additionally, this type is the most common type of veal sold to general consumers. In order to provide current nutritional information in the USDA database to reflect the current supply of veal, The Beef Checkoff and the NDL collaborated with Colorado State University to obtain nutrient data for special-fed veal. The objective of this study was to analyze the nutrient composition of raw and cooked cuts from special-fed veal calves for the purpose of updating nutrient data, and for inclusion in the USDA Food Composition Database.

2. Materials and methods

2.1. Experimental design and product procurement

Special-fed veal sampling was designed to be representative of the majority of veal cuts merchandized in U.S. retail stores. During the study design, USDA-NDL was consulted for collaboration on this study. Veal cuts (IMPS # 332, 1312, 1332, 337A, 1336, 1309A, and 396; North American Meat Processors Association, 2010) were supplied from six separate U.S. harvest facilities or suppliers that represented a national composite of special-fed (non-bob) veal calves. Packages of each cut were collected from each harvest facility for both raw and cooked designation by personnel from Colorado State University randomly selecting product from the production line after packaging in original, vacuum packaging occurred. An equal number of packages were collected from each supplier resulting in a total of 24 packages (leg cutlets designated for both raw and cooked analysis and loin chops) or 12 packages (all other cuts included in the study) per cut and per preparation designation (raw/cooked) being included in the study. Grade of veal was not considered during collection since 98% of veal sold at retail is graded “Good” as described by American Veal Association (2011). Retail cuts collected were osso buco foreshanks (IMPS 1312); loin chops (IMPS 1332); leg cutlets (IMPS 1336); and shoulder blade chops (IMPS 1309A). Wholesale cuts collected were whole loin roasts (IMPS 332); center-cut hindshanks (IMPS 337A); and ground veal (IMPS 396). Wholesale whole loin roasts and center-cut hindshanks packaged individually from each supplier were designated to raw analysis only. Packages of loin chops and osso buco foreshanks were designated for cooked analysis only. Additional packages of leg cutlets, shoulder blade chops, and ground veal were collected since these cuts were designated for both raw and cooked analysis. All packages of veal cuts were frozen at −20 °C until dissection following standardized protocols used in previous research (Acheson et al., 2015; Martin et al., 2013; West et al., 2014).

2.2. Cooking of retail cuts

Retail cuts designated for cooking included the following: shoulder blade chops, center-cut.

hindshanks, loin chops, leg cutlets and ground veal. Cuts for cooking were tempered in.

a single layer on wire racks at 0 to 4 °C for 24 or 48 h. Upon thawing, each individual cut was blotted to remove purge, weighed to the nearest 0.1 g, and raw temperature was recorded using a digital thermocouple thermometer (Digi-Sense; Cole Parmer, Vernon Hills, IL). Each of the cuts designated for cooking used one of three cooking methods: grilling, roasting or pan-grilling.

2.2.1. Grilling

Leg cutlets, loin chops, and shoulder blade chops were assigned to grilling and were cooked individually. Prior to grilling, a Salton two-sided electric grill (Model GRP99, Salton Inc., Lake Forest, IL) was pre-heated until a surface temperature of 195 °C was reached. Pre-heated surface temperatures were monitored using an infrared thermometer. Individual cuts were placed on the grill and the cooking start time of each was recorded. Leg cutlets were flipped after 30 s. to ensure even cooking. Similar to Acheson et al. (2015), individual loin chops and blade chops were flipped after four minutes of cooking time or once an internal temperature of 35 °C (if temperature reached 35 °C before 4 min of cooking time occurred) was reached to guarantee even cooking. Digital thermocouple thermometers (Digi-Sense; Cole Parmer, Vernon Hills, IL) were used for temperature monitoring of cuts. Once internal temperature reached 70 °C, each cut was removed from the grill and final internal temperature and cooked weight (to the nearest 0.1 g) were recorded. Immediately following cooking, all steaks were placed on wire racks and chilled uncovered at refrigeration temperatures (0 to 4 °C) for at least 12 h prior to dissection.

2.2.2. Braising

Braising was used to cook osso buco foreshanks. A six-quart covered non-stick Dutch oven (Calphalon Corp., Toledo, OH) was used to hold each individual cut during cooking. Distilled, deionized water was added until the cut was covered, and the volume was recorded. The Dutch oven was lidded prior to being placed into a conventional oven preheated to 120 °C. Entry and exit cook time was recorded for each individual sample, and samples were cooked for a set time of 2.5 h or 150 min (calculated end temperature of 80.7 ± 3.7 °C). Stainless steel tongs were used to transfer cuts to a colander following exit cook time and allowed to cool for 10 min. The remaining liquid was collected for measurement and recorded (to the nearest 0.1 g). Weights of all recovered meat were recorded. All cooked cuts were placed on wire racks after weighing and chilled uncovered at refrigeration temperatures (0 to 4 °C) for at least 12 h before dissection.

2.2.3. Pan-grilling

Ground veal was cooked by pan-grilling. Loaves of ground veal were formed and packaged by each supplier during product collection. Contents of each retail package was cooked individually on a non-stick anodized aluminum skillet (Calphalon Corp., Toledo, OH). Skillets were pre-heated to a surface temperature of 195 °C and monitored with an infrared thermometer. A stainless-steel spatula was used to separate ground veal into crumbles to ensure even cooking and an infrared thermometer was used to monitor product temperature during cooking (Mastercool, Model 52,224-SP, Randolph, NJ). Once the internal temperature reached a minimum of 71 °C, ground veal was removed from the heat source and the product was placed into a stainless-steel colander to cool for 10 min. Final weights were recorded (to the nearest 0.1 g) and samples were chilled uncovered at refrigerated temperatures (0 to 4 °C) for 12–24 h prior to homogenization.

2.3. Retail cut dissections

Dissection of raw and cooked retail cuts into separable components was conducted following standardized protocol. Separable components were defined as follows: refuse included waste comprised of all bone and inedible heavy connective tissue; separable lean included all muscle, intramuscular fat, and any light connective tissue deemed edible; external fat included all adipose tissue located on the outer surface of the cut; and seam fat (intermuscular fat) included all seam fat deposited between muscles within a cut. Prior to dissection, raw cuts were tempered in a single layer at 0 to 4 °C for 24 to 48 h. Dissections were completed in the absence of direct light and with the use of powder-free nitrile gloves at all times to prevent contamination or degradation of nutrients. Individual sample weights were recorded to the nearest 0.1 g for the following components: initial retail cut weight, separable lean, refuse, external fat, and seam fat. If the total weight of separable components was outside a set yield tolerance range of 97 to 101% of the initial cut weight, then the sample was removed from the study and