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Pork Industry Handbook: Composition and Nutritive Value of Pork

Michigan State University

Cooperative Extension Service

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Major Revision September 1998

8 pages

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pork industry handbook

Michigan State University Extension

Composition and Nutritive Value of Pork Products (Key words: Nutrients, Retail Pork, Composition)

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The use of pork as a human food source dates back to prehistoric times. Drawings on cave walls in Europe portray wild pigs being hunted before the development of a written language. As civilization advanced, animals were domesticated to provide a more predictable and consistent food supply, and the pig was highly valued as a source of very palatable human food. For the ensuing centuries, a number of societies placed a heavy reliance on pork as a major dietary component, and it has served them well as a source of major nutrients.

Meat Consumption

Table 1 describes current consumption of pork, beef, and chicken in selected countries around the world, and where pork ranks in each country's current meat consumption pattern. This information suggests that pork is the "meat of choice" on a global basis. It likely has held this rank for hundreds of years.

Figure 1 presents per capita consumption of meat, poultry, and fish in the United States since 1970. The information is expressed on a "raw boneless equivalent" basis, which accurately describes amounts of these products available for consumption. The values represent raw product, and cooking loss would further reduce the amounts consumed by about 25%. During this time period, pork consumption per person has remained fairly constant, while beef consumption decreased by 20%, and poultry consumption increased by 93%. Total meat, poultry, and fish consumption increased by 9% over this 25-year period.

Table 1. Annual Per Capita Disappearance of Pork, Beef, and Chicken in Selected Countries (1996).

Country	Pounds Per Person – Carcass Weight Basis			
	Pork's Rank	Pork	Beef & Veal	Chicken
North America				
United States	3	63	99	71
Canada	2	73	76	57
South America				
Brazil	3	20	64	49
Europe				
Denmark	1	149	45	26
France	1	81	55	26
Germany	1	102	32	16
Italy	1	77	45	26
United Kingdom	1	52	32	42
Austria	1	127	43	N.A.
Hungary	1	133	N.A.	36
Poland	1	88	23	12
Asia				
China	1	66	8	9
Japan	1	37	27	30
Taiwan	1	95	8	N.A.
Oceania				
Australia	3	41	82	54

Source: U.S. Department of Agriculture (Presented in *Meat & Poultry Facts: 1997*, American Meat Institute).

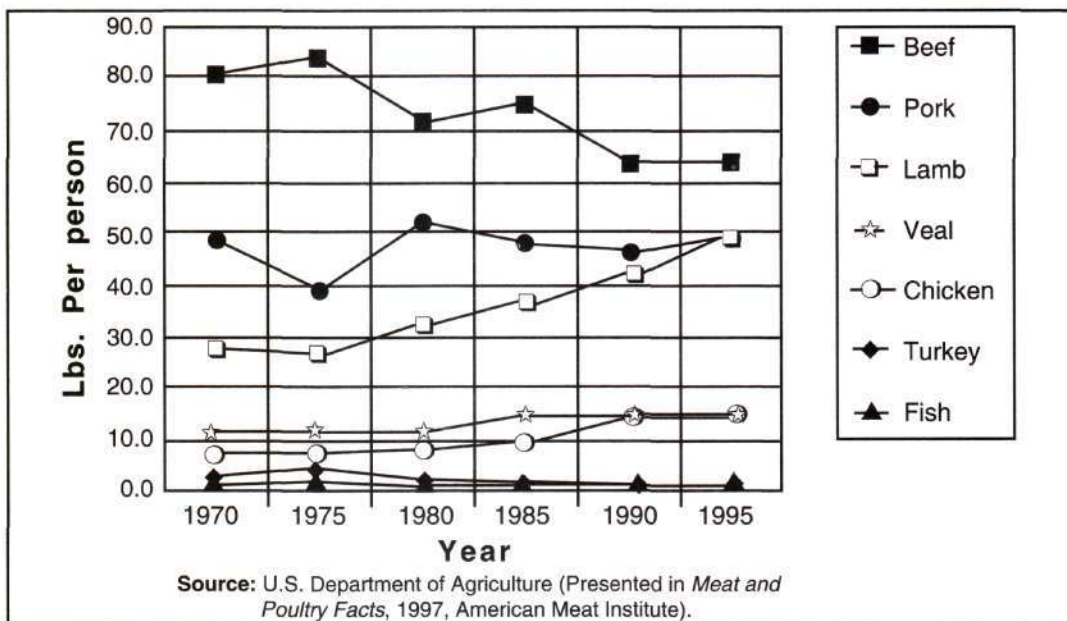


Figure 1. Annual Per Capita Consumption of Meat, Poultry, and Fish (Boneless Equivalent Basis).

Product Yields from the Pork Carcass

Many procedures are applied to pigs in converting them to human food products. In the slaughter process, blood, hair, and the gastrointestinal tract are removed, and other carcass parts such as skin, head, and feet may be taken off. The resulting carcass comprises 66% to 76% of the weight of the live pig (dressing percentage), depending on the dressing method used.

Carcasses and carcass parts are composed of lean (muscle), bone, trimmable fat, and skin. The percentages of these four tissues vary widely, depending on carcass muscling and fatness. A 250-pound pig with a 73.5% dressing percentage (184-pound carcass), 0.8 inch of fat depth at the 10th rib and 5.5 square inches of loin muscle area would contain approximately 94 pounds of trimmed muscle. This separable lean would represent 51% of the carcass weight, and 38% of the live pig weight. Table 2 presents the composition of such a pig, and its primal cuts.

A wide array of meat products are available from pork carcasses. Table 3 outlines expected quantities of products obtained from a 250-pound pig, yielding a 184-pound carcass. In this example, 75% of the carcass (55% of the live pig) was converted into trimmed, semi-boneless pork products.

In the United States, pork is the leader among further processed (value-added) meat and poultry products, with about 70% of the pork supply being manufactured into products such as sausages, ham, and bacon. These value-adding steps increase variety in tastes and textures, build in time-saving convenience, provide better composition control, and add name-brand identity.

Today's consumers have an increased awareness of fat in the diet, and many are seeking to reduce their fat consumption. Over the past 50 years, pork producers have continuously improved the composition of pork carcasses, increasing the lean percentage and decreasing the trimmable fat. During the 80's and 90's, accelerated improvements in genetics and management practices, along with stronger price incentives paid by packers to encourage producing leaner hogs, have brought about a substantial reduction in pork carcass fat content. In addition, processors and retailers are more closely trim-

Table 2. Lean, fat, bone, and skin of primal cuts expressed as a percentage of total carcass lean, fat, bone and skin, respectively.*

	Lean	Fat	Bone	Skin	Total primal cut
Leg (ham)	28.8	14.5	17.6	12.0	21.5
Loin	24.2	6.7	25.6	—	17.0
Blade Boston	13.9	5.1	4.2	—	8.7
Arm picnic	11.4	6.0	11.6	8.8	9.5
Belly	9.7	16.0	—	15.0	10.6
Jowl, spareribs, neck bones, feet and tail	7.4	6.5	41.0	15.5	11.6
Non-specific Cut/trim	4.7	45.2	—	48.8	21.1
TOTALS	100.1	100.0	100.0	100.1	100.0

*Source: Forrest (1989).

NOTE: Updated information is due to be released from the National Pork Producer's Council in April 1998.

ming external fat and seam fat from fresh pork products. In the early 1980's, a one-quarter-inch external fat trim was recommended and considered desirable for pork cuts. The pork industry's response to consumer desires for less fat was documented in nationwide market basket surveys in 1989 and 1996, which determined the average external fat trim on fresh pork products to be 0.10 inch and 0.06 inch, respectively. This information demonstrates a continuing industry trend to reduce the trimmable fat content of pork cuts.

Because of increased muscle content of pigs and closer fat trimming by processors and retailers, the average yield of trimmed lean from loin retail cuts increased from 75% in the 1989 Market Basket Study to 81% in the 1996 Study. Table 4 presents the average yield of trimmed lean determined for pork and chicken cuts collected from 24 stores in five cities in 1996.

Table 3. Expected Yield of Products from a 250-Pound Live Pig (184 pound carcass).

	Retail Pork, LB	Percent of Carcass
Ham (45.0 lb)		24.4
Cured Ham	25.5	13.8
Fresh Ham	2.3	1.2
Trimming	5.8	3.1
Skin, Fat, Bone	(11.4)	(6.2)
Loin (33.8 lb)		18.3
Back Ribs	3.2	1.7
Boneless Loin	10.7	5.8
Country Style Ribs	7.6	4.1
Sirloin Roast	5.7	3.1
Tenderloin	1.6	0.9
Trimming	1.6	0.9
Fat & Bone	(3.4)	(1.8)
Side (34.9 lb)		18.9
Cured Bacon	19.0	10.3
Spareribs	5.8	3.1
Trimming	9.1	4.9
Fat	(1.0)	(0.5)
Shoulder (14.7 lb)		8.0
Blade Steaks	4.4	2.4
Blade Roast	7.8	4.2
Trimming	1.7	0.9
Fat	(0.8)	(0.4)
Picnic (16.6 lb)		9.0
Boneless Picnic Meat	12.6	6.8
Skin, Fat, Bone	(4.0)	(2.2)
Miscellaneous (39.2 lb)		21.3
Jowls, Feet, Tail Neckbones, etc.	15.4	8.4
Fat, Skin, Bone	(22.0)	(11.9)
Shrink and Loss	(1.8)	(1.0)
Saleable Retail Products	139.8	75.9
Skin, Fat, Bone, Shrink	(44.4)	(24.1)

Source: National Pork Producers Council, Purdue University, and Texas A&M University (presented in *Meat and Poultry Facts: 1997*, American Meat Institute).

Dietary Recommendations

Dietary recommendations to promote human health suggest consumption of a wide variety of foodstuffs (since no one food contains all the nutrients needed to sustain life) while consuming all foods in moderation (including total calories to maintain desirable body weight). The long standing advice to use "variety and moderation" in dietary practices has stood well the test of time.

Pork and other foods of muscle origin have an important role in human nutrition, but how do they fit into the perspective of a healthy diet? Many government and non-government sources publish dietary recommendations, which vary in their messages. Those with the most credibility come from various government agencies and mainline health organizations. "Dietary Guidelines for Americans" was first published in 1980 by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services. These recommendations are reviewed and revised (if necessary) every five years. The 1995 revised edition stressed the following seven dietary elements for all Americans over the age of two years:

- Eat a variety of foods.
- Balance the food you eat with physical activity — maintain or improve your weight.
- Choose a diet with plenty of grain products, vegetables, and fruits.
- Choose a diet low in fat, saturated fat, and cholesterol.
- Choose a diet moderate in sugars.
- Choose a diet moderate in salt and sodium.
- If you drink alcoholic beverages, do so in moderation.

Supplemental explanations accompany the seven general dietary recommendations. The advice concerning moderating consumption of fat, saturated fat, and cholesterol addresses many foods, including meat, poultry, and fish. It recommends choosing lean meats, poultry, or fish products; removing trimmable fat or poultry skin; and limiting intake of high-fat processed products, choosing lower fat varieties when available. Removing poultry skin or trimming external or seam fat reduces the fat content of most poultry or meat products by about 50%.

The encouragement to include a wide variety of foods in the diet is reinforced through the Food Guide Pyramid, which suggests the number of servings to include in the daily diet from the five major food groups (Figure 2). The pyramid recommends two to three servings daily from the meat, poultry, fish, and alternates (beans, eggs, nuts) group. The usual definition of a "serving" of meat is three ounces of cooked, trimmed lean. The daily recommendation is to include five to seven ounces of cooked meat or its equivalent meat alternate from this group. What is the size of a three-ounce serving? An inch thick, eight-ounce bone-in pork loin chop will yield about one three-ounce serving of lean following cooking, trimming of fat, and removal of bone. A "quarter-pound" pork burger will yield a three-ounce serving after cooking. In general, three ounces of cooked, trimmed lean will be about the size of a standard-size deck of playing cards.

Table 4. Yield of Trimmed Lean from Raw Pork and Chicken Cuts Purchased at Retail.¹

Pork	Percent Lean	Chicken²	Percent Lean
Tenderloin	92.7	Drum	58.2
Bnls Sirloin Chops	91.2	Thigh	57.9
Bnls Loin Chops	89.4	Breast	56.6
Bnls Rib Roast	86.8	Wing	34.6
Bnls Loin Roast	85.8		
Sirloin Roast	70.3		
Loin Chops	69.3		
Blade Steaks ³	64.8		
Rib Chops	62.5		
Back Ribs ³	60.9		

¹Except where indicated, information is from Buege *et al.*, 1997.

²From Buege *et al.*, 1990.

³Bone-in, skin-on products.

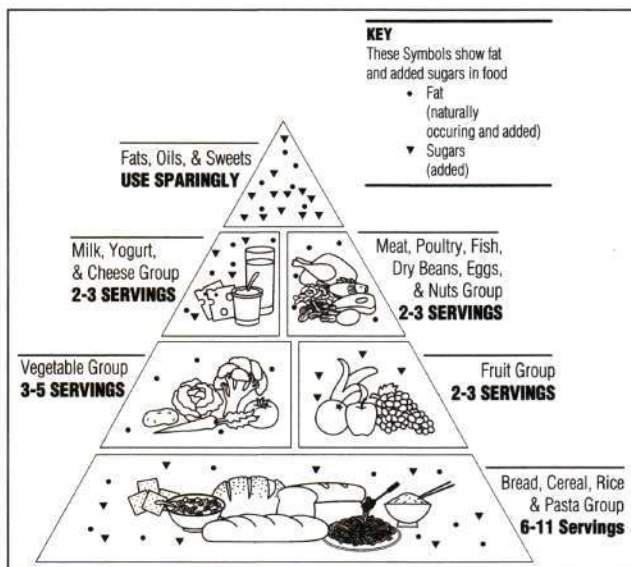


Figure 2. Food Guide Pyramid.

Pork's Nutrient Contribution to the Diet

Pork products contribute high quality protein, B-vitamins, and important minerals to the human diet. Figure 3 shows the contribution of three-ounce cooked, trimmed servings of pork and beef top loin chops/steaks, and chicken breast and thighs to the Reference Daily Intakes (RDIs) of selected nutrients. RDIs are minimum levels of important nutrients recommended daily for the healthy human body. One serving of pork provides about half of the body's daily requirement for protein and thiamin, and significant amounts of other B-vitamins. The iron provided by meat and poultry is primarily in the "heme" form, which is more readily available for absorption in the gastrointestinal tract than iron provided by most plant sources.

Fat, Saturated Fat, and Cholesterol

Pork and other meats, poultry, and fish are sources of fat and cholesterol in the diet. All fats and oils are made up of individual fatty acids. These can be categorized into the following three groups based upon their chemical structure: saturated fatty acids (no double bonds), monounsaturated fatty acids (one double bond), and polyunsaturated fatty acids (two or more double bonds). Saturated fatty acids receive special attention because when present at high levels in the diet, they can increase blood cholesterol levels in some people.

Table 5 shows the proportion of the three types of fatty acids in pork, beef, and chicken fat. Chicken fat contains the lowest percentage of saturated fat, and highest percentage of polyunsaturated fatty acids. The percentage of saturated fat in pork fat is only about 8% higher than in chicken fat. Research has shown that stearic acid, one of the saturated fatty acids in animal fats, does not negatively affect human blood cholesterol levels. Therefore, stearic acid does not function as other saturated fatty acids and could be deducted from the saturated fatty acid content. If stearic acid is not included with the saturated fatty acids, then pork, beef, and chicken fat are very similar in their content of remaining saturated fat. That result is shown at the bottom of Table 5.

Table 5. The Fatty Acid Composition of Raw Pork, Beef, and Chicken Fat.

	Pork Fat	Beef Fat	Chicken Fat
% Saturated FA	38.4	41.5	29.9
% Monounsaturated FA	42.6	43.6	46.4
% Polyunsaturated FA	10.6	3.6	15.0

Adjusted for Stearic Acid

% Saturated FA	25.5	29.1	24.2
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Source: Pork and Chicken (Buege *et al.*, 1997), Beef (USDA Handbook 8-13, 1990).

Note: Fatty acids typically make up 85-95% of meat and poultry fats. Other lipid components make up the remainder of the fat content.

Table 6. Recommended daily maximum intake of total fat, saturated fat, and cholesterol as affected by calories consumed.*

Calories Consumed	Grams of Total Fat	Grams of Saturated Fat	Milligrams of Cholesterol
1600	53	18	300
2000	67	22	300
2400	80	27	300
2800	93	31	300

*Recommendations endorsed by American Heart Assn., American Dietetic Assn., American Medical Assn., American Cancer Society, National Cholesterol Education Program, U.S. Department of Agriculture, and U.S. Department of Health and Human Services.

The National Cholesterol Education Program (NCEP) recommends that 30% or less of the calories in a daily diet come from total fat, 10% or less come from saturated fat, and daily cholesterol consumption be limited to less than 300 milligrams. Since the advice on total fat and saturated fat is expressed as a percentage of the calories consumed, the recommended limits for grams of fat per day will vary with the number of calories consumed. However, the cholesterol recommendation remains the same, regardless of level of calories consumed. Table 6 gives the relationship between calories consumed, and recommended dietary fat and cholesterol limits, as advised by the NCEP.

How do pork and other meat and poultry products fit into these daily recommendations? Figure 4 provides a perspective on this question. The open, horizontal bars depict the maximum total fat, saturated fat, and cholesterol advised for a person consuming 2,000 calories per day. Solid lines within each open bar show the amounts of fat or cholesterol provided by three-ounce cooked, trimmed servings of selected pork, beef, and chicken products. One to three servings of any of the products listed fit easily into the daily recommendations, with room to spare for contributions from other foods in the diet. One serving of pork center loin chop provides about 10% of the total fat, 14% of the saturated fat, and 23% of the cholesterol

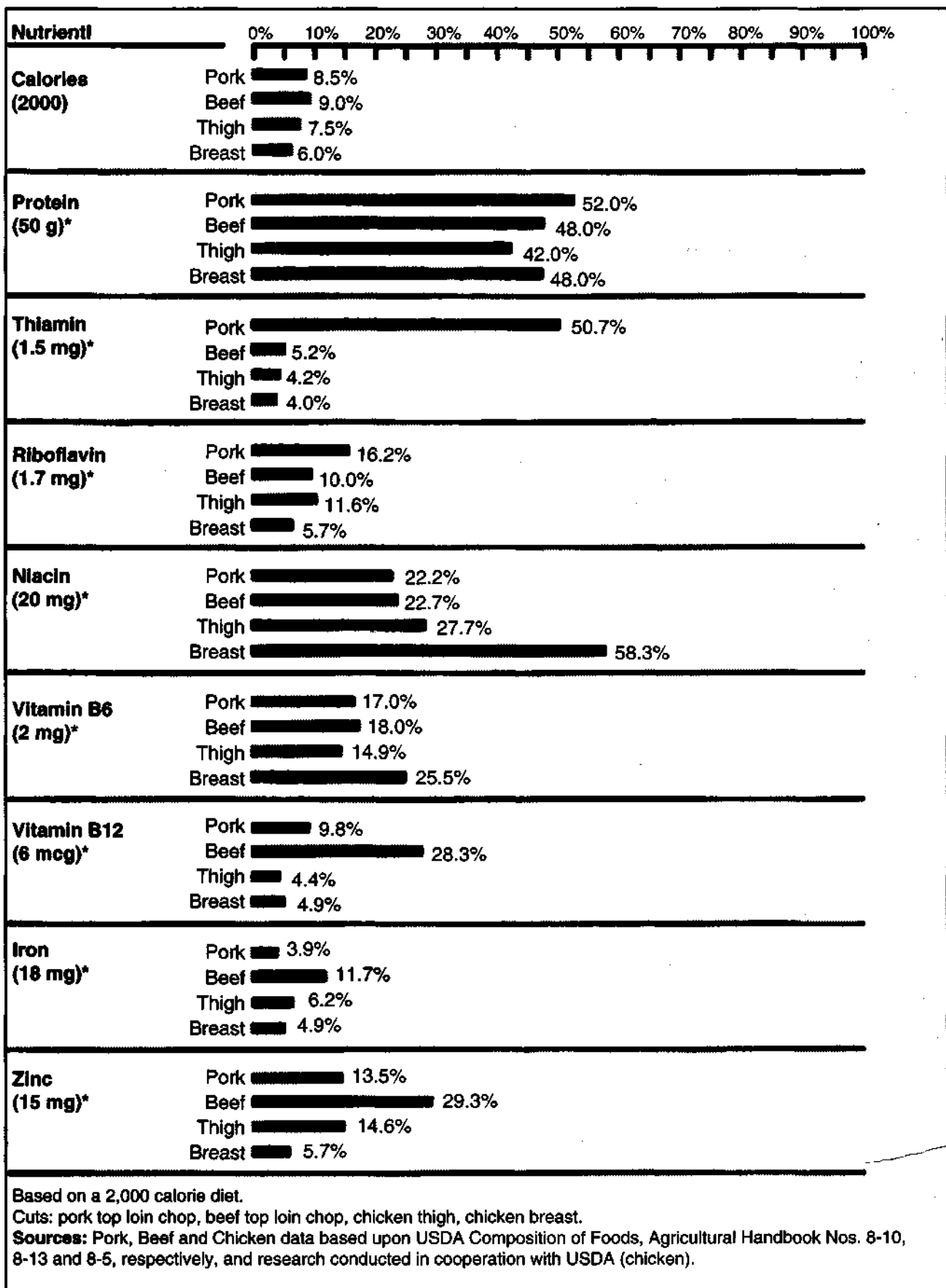


Figure 3. Contribution of Pork, Beef, and Chicken to the Reference Daily Intakes (RDI'S)* of Important Nutrients. Per three ounces cooked, lean meat and skinless poultry.

limits recommended by the government and health organizations. Figure 4 also points out that fat and cholesterol differences between different meat and poultry products are not very large, when excess fat is trimmed off and skin is removed before consumption. It also demonstrates that cholesterol content is not only associated with fat content, because lean veal has slightly more cholesterol than any of the other products.

Nutritional Labeling of Pork Products

The Nutritional Labeling and Education Act (NLEA) which went into effect in 1994 requires a nutritional label for all multi-ingredient food products. The nutritional labeling of generic fresh meat cuts such as pork chops and roasts remains voluntary, but is strongly encouraged. The U.S. Department of Agriculture worked with the meat and poultry industry to develop standardized information and formats for presenting nutritional information for such

fresh cuts. This "Nutri-Facts" information can be made available to consumers in brochures, posted as large wall charts at the retail meat case, or put on individual packages. Information from different species has been combined into three fact sheets: (1) Pork and Lamb; (2) Beef and Veal; (3) Chicken and Turkey. Table 7 presents the Pork Nutri-Facts taken from its fact sheet. All values are based upon three-ounce cooked servings, with or without trimmable fat (diagonal bar in each box separates trimmed and untrimmed information).

Virtually every processed pork product will carry a nutritional label (there are exceptions for very small packages and low-volume products). Serving size will vary with the nature of the product. Table 8 presents nutritional information taken from the labels of a variety of value-added pork products. Many traditional products are now offered in "Light" forms, which contribute less fat and calories to the diet.

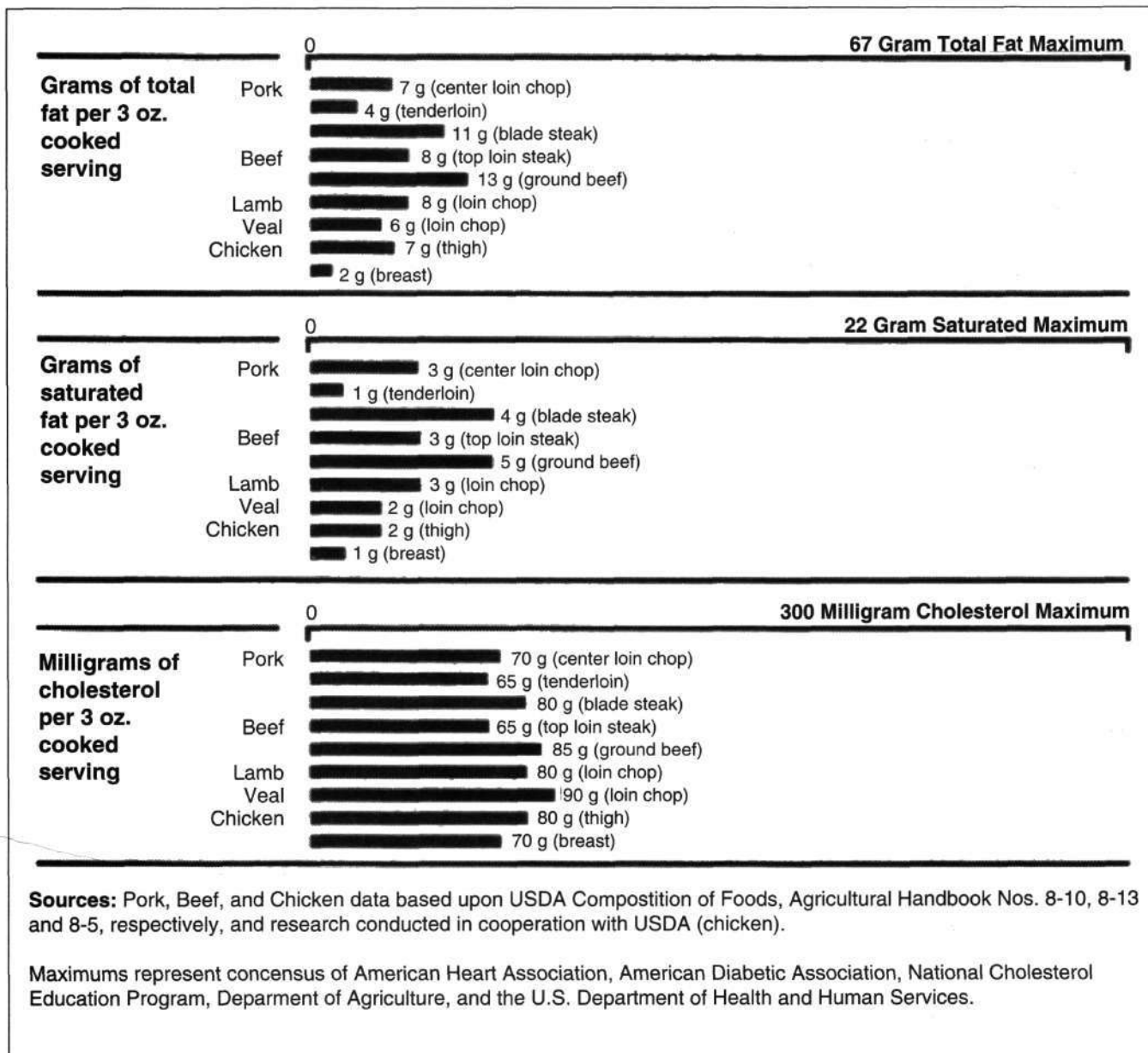


Figure 4. Contribution of Pork, Beef, and Chicken to Daily Dietary Recommendations for Total Fat, Saturated Fat, and Cholesterol.
Per three ounces cooked, trimmed lean meat or skinless poultry. For a 2,000 calorie diet.

TABLE 7.

PORK NUTRITION FACTS								
PORK, 3 oz cooked serving	Calories	Calories From Fat	Total Fat	Saturated Fat	Cholesterol	Sodium	Protein	Iron
	g	g	g	mg	mg	g	%DV	
Ground Pork, broiled	250	160	18	7	80	60	22	6
Shoulder, Blade Steak, broiled	220	130	14	5	80	60	22	6
Loin, Country Style Ribs, roasted	280	190	22	8	80	45	20	6
Loin, Rib Chop, broiled	220	120	13	5	70	55	24	4
Center Chop, Loin, broiled	200	100	11	4	70	50	24	4
Top Loin, Chop, boneless, broiled	200	90	10	3	70	55	25	4
Top Loin, Roast, boneless, roasted	190	90	10	4	65	40	24	4
Loin, Tenderloin Roast, roasted	150	45	5	2	65	45	24	6
Loin, Sirloin Roast, roasted	220	120	14	5	75	50	23	4
Spareribs, braised	340	230	26	9	105	80	25	8

Table 8. Nutrient Composition of Processed Pork Products.

	Portion Size	Calories	Protein	Total Fat	Cholesterol
Pork Sausage (Fried)	2 oz	230	9	21	50
Light Pork Sausage (pre-cooked)	2 links (1.5 oz)	110	7	9	30
Fresh Bratwurst (cooked)	1 link (3 oz)	300	14	27	70
Fresh Lite Bratwurst (cooked)	1 link (3.2 oz)	230	15	18	80
Liverwurst	2 oz	150	9	12	120
Bone-in Ham	3 oz	130	16	6	45
Boneless Ham	3 oz	10	17	4	50
Sliced Bacon (Fried)	2 slices (.6 oz)	90	4	8	15
Canadian Bacon (1.8 oz)	3 slices	70	11	3	30

Source: Nutritional labels of products at retail.

Summary

The composition and nutritive value of pork products affects consumer demand. Pork products change in composition due to changes in practices at the producer, processor, and retail level. Today's pork cuts are more closely trimmed of waste fat, and contain more lean per unit-weight. Pork is an excellent source of high-quality protein, B-vitamins (especially thiamin), and important minerals. One three-ounce cooked, trimmed serving of pork loin chop provides only 10% of the total fat, 13% of the saturated fat, and 23% of the cholesterol maximums recommended by health organizations for people on a 2,000 calorie diet. Fresh and value-added pork products contribute a variety of appealing tastes, convenience, and important nutrients to people around the world.

References

Anderson, B.A. (1992). *Composition of Foods, Pork Products: Raw, Processed, Prepared*. United States Department of Agriculture, Human Nutritional Information Service, Agriculture Handbook No. 8-10.

Anderson, B.A. and Hoke, I.M. (1990). *Composition of Food Products, Beef Products: Raw Processed, Prepared*. United States Department of Agriculture, Human Nutritional Information Service, Agriculture Handbook No. 8-13.

Bockus, S. and Knutson, J. (1997). *Meat and Poultry Facts*. American Meat Institute, Washington, D.C.

Buege, D.R., Held, J.E., Smith, C.A., Sather, L.K., and Klatt, L.V. (1990). *A Nationwide Survey of the Composition and Marketing of Pork Products at Retail*. College of Agricultural and Life Sciences, University of Wisconsin-Madison, Research Bulletin 3509.

Buege, D.R., Ingham, B.H., Henderson, D.W., Watters, S.H., Borchert, L.L., Crump, P.M., and Hentges, E.J. (1997). *A Nationwide Audit of the Composition of Pork and Chicken Cuts at Retail*. J. of Food Comp. and Anal. (Submitted).

Grundy, S.M. (1994). *Influence of Stearic Acid on Cholesterol Metabolism Relative to Other Long Chain Fatty Acids*. Am. J. Clin. Nutri. 60 (suppl.), 986S-990S.

National Pork Producers Council. (1991). *Procedures to Evaluate Market Hogs* (3rd Edition). Des Moines.

Posati, L.P. (1979). *Composition of Foods, Poultry Products: Raw, Processed, Prepared*. Science and Education Administration, United States Department of Agriculture, Agriculture Handbook No. 8-5.

USDA/USDHHS. (1995). *Dietary Guidelines For Americans* (Fourth Edition). United States Department of Agriculture and United States Department of Health and Human Services. Home and Garden Bulletin, No. 232.



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