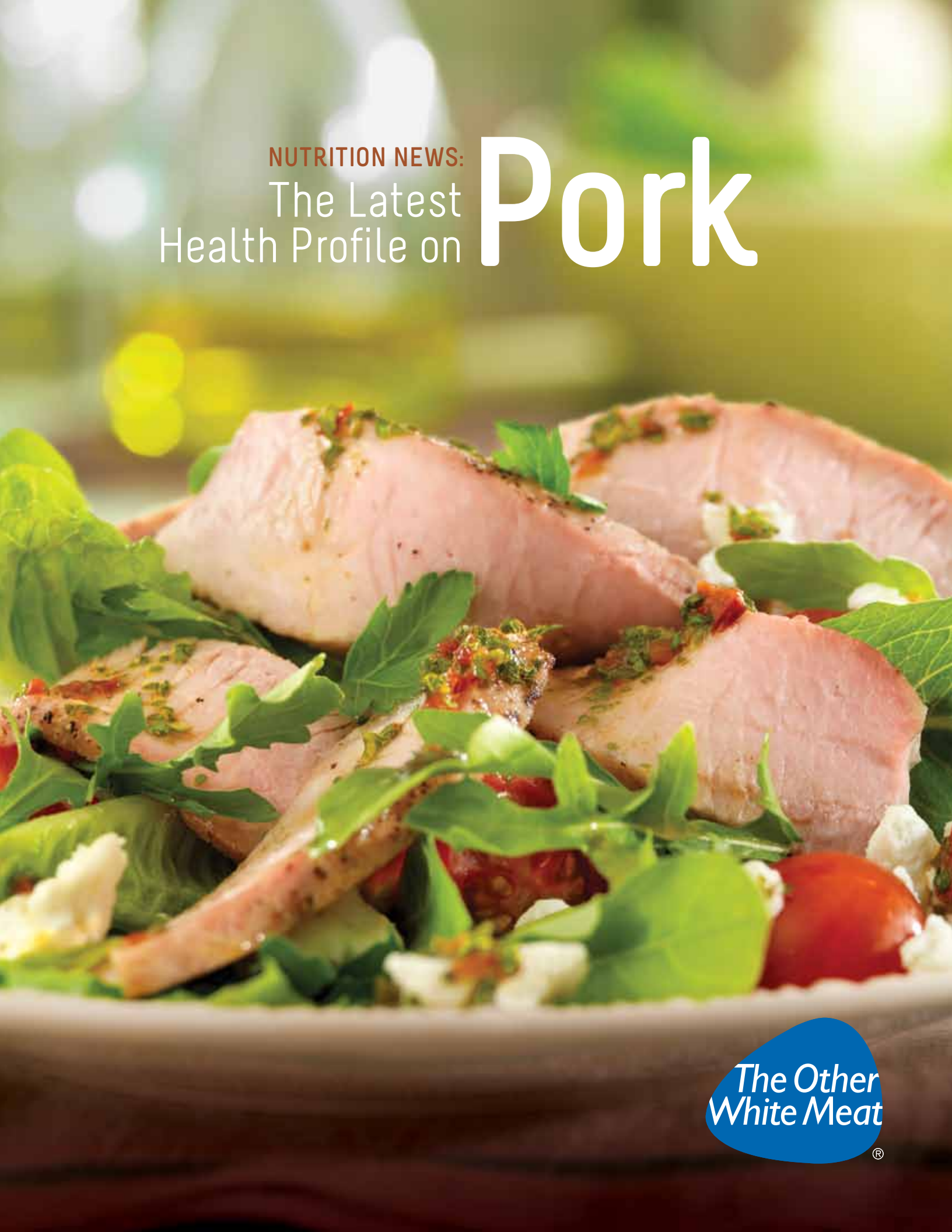
NUTRITION NEWS:

The Latest Health Profile on Pork



The Other White Meat®

I. Introduction

Pork was once considered to be high in fat and, as such, a less healthful choice in the "meat group." However, over the last two decades, pork producers have made changes in animal feeding and breeding which have resulted in the increased availability of lean cuts of pork (Williams et al 2006). U.S. Department of Agriculture (USDA) research shows that seven of the most common cuts of pork are, on average, 16% leaner and 27% lower in saturated fat today than two decades ago (USDA National Nutrient Database 2010). The differences are even greater for some specific cuts of pork (Fig. 1: Pork Nutrient Data: 1991 vs. 2010). The latest research confirms that pork tenderloin is just as lean as the leanest type of chicken, a skinless chicken breast, and many cuts of pork from the loin (e.g., pork chops, pork roast) are leaner than a skinless chicken thigh (Fig. 2: Today's Lean Pork compared to Lean Chicken). Additionally, pork's high-quality protein, vitamins and minerals support its choice as a nutritious, lean meat. In fact, lean cuts of pork can play an important role in helping achieve the recommendations of the 2010 Dietary Guidelines for Americans to promote health and reduce the risk of chronic diseases. The improvement in both the macronutrient and micronutrient content of pork also supports its inclusion in weight management and heart-healthy diets.

This review provides up-to-date information regarding pork's nutrient profile, its nutrient contribution to Americans' diets, the role of pork in weight management and its inclusion in heart-healthy diets, as well as how to keep pork safe and recommended ways to cook pork based on new USDA recommendations.

II. Pork's Nutrient Package

Lean pork is a nutrient-dense food, supplying a high concentration of many nutrients in relation to its energy (calorie) value. In fact, the "meat" group, which includes pork, has the greatest percentage (92%) of foods with high "nutrient quality index" scores compared to all other protein sources (Drewnowski 2005). A 3-ounce (85 g) serving of roasted, trimmed pork tenderloin contributes only 6% of calories to a 2,000-calorie diet, yet it is an "excellent" (i.e., ≥20% of the Daily Value [DV] on food labels) source of thiamin, selenium, protein, niacin, vitamin B6 and phosphorus, and a "good" (i.e., 10% to 19% of the DV) source of riboflavin, zinc and potassium (USDA National Nutrient Database 2010, U.S. Food and Drug Administration 21 CFR § 101.9). Compared to a skinless chicken breast, pork tenderloin contains twice as much zinc and ten times the amount of thiamin in a serving (Fig. 3: Pork Tenderloin and Chicken Breast Nutrient Comparison).

A variety of lean pork cuts are from the loin. These

Figure 1: Pork Nutrient Data: 1991 vs. 2010 (per 3-ounce cooked serving)

Pork Cut	1991 Calories	**2010 Calories**	1991 Fat (g)	**2010 Fat (g)**	1991 Saturated Fat (g)	**2010 Saturated Fat (g)**	1991 Cholesterol (mg)	**2010 Cholesterol (mg)**
Pork tenderloin	139	**120**	4.09	**2.98**	1.41	**1.02**	67	**62**
Pork boneless top loin chop	173	**147**	6.60	**5.17**	2.72	**1.77**	68	**61**
Ground pork, 96% lean	N/A	**157**	N/A	**5.27**	N/A	**1.77**	N/A	**72**
Pork top loin roast (boneless)	165	**147**	6.13	**5.34**	3.08	**1.64**	66	**68**
Pork center loin chop	172	**153**	6.86	**6.20**	2.51	**1.83**	70	**72**
Pork center rib chop	186	**158**	8.28	**7.10**	2.94	**2.17**	69	**56**
Pork sirloin roast (bone-in)	184	**173**	8.75	**8.02**	3.08	**2.44**	73	**76**

Source: 2010 National Nutrient Database for Standard Reference, Release 23.

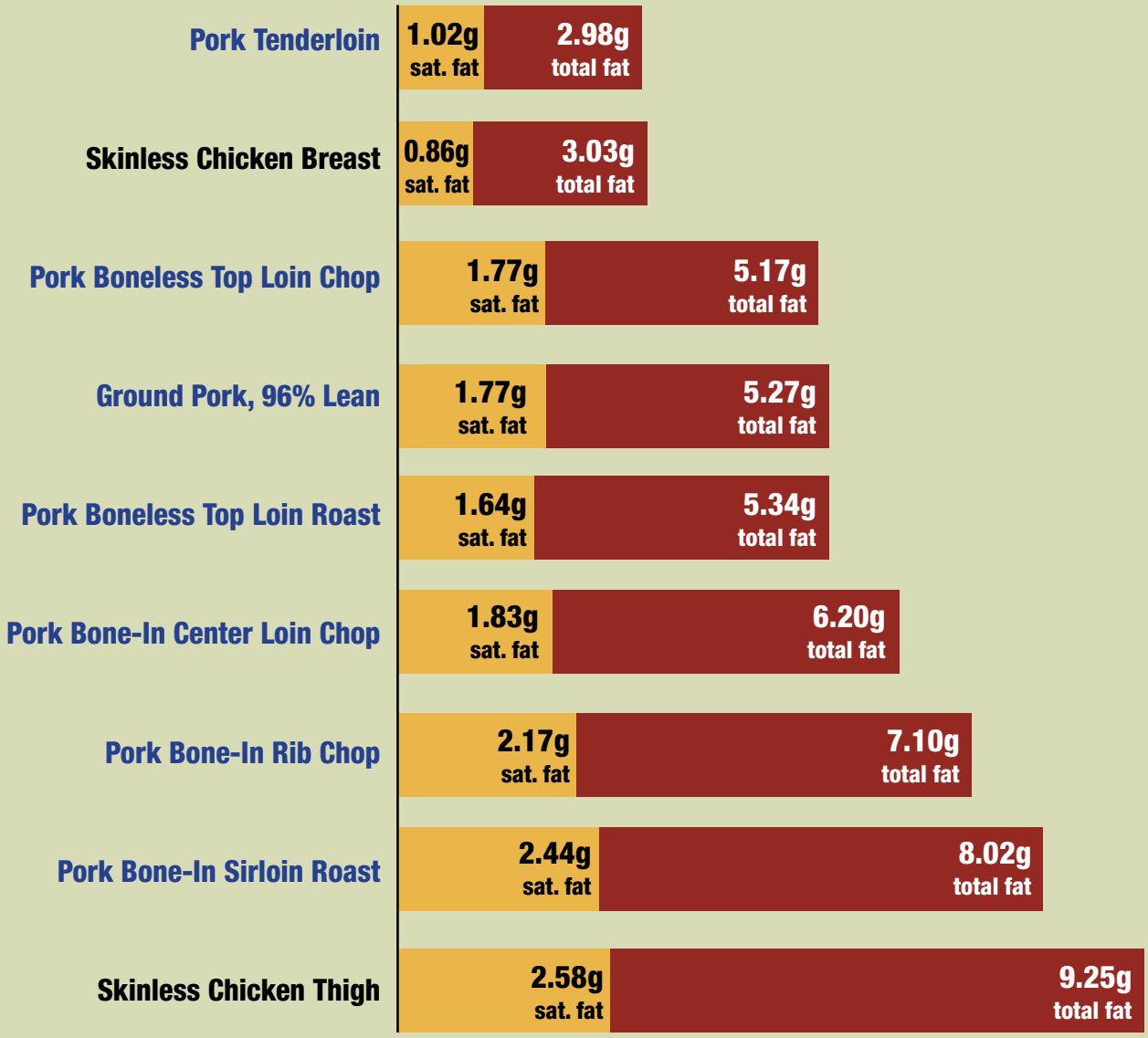
Figure 2: Today's Lean Pork Compared to Lean Chicken

An updated analysis from the U.S. Department of Agriculture reveals many of today's favorite pork options are among the leanest meats in the USDA database.

New research reveals pork tenderloin is just as lean as the leanest type of chicken, a skinless chicken breast. In fact, many cuts of pork from the loin (like pork chops and pork roast) are leaner than a skinless chicken thigh.

In 2010, seven common cuts of pork have, on average, 16% less fat and 27% less saturated fat as compared to 1991.

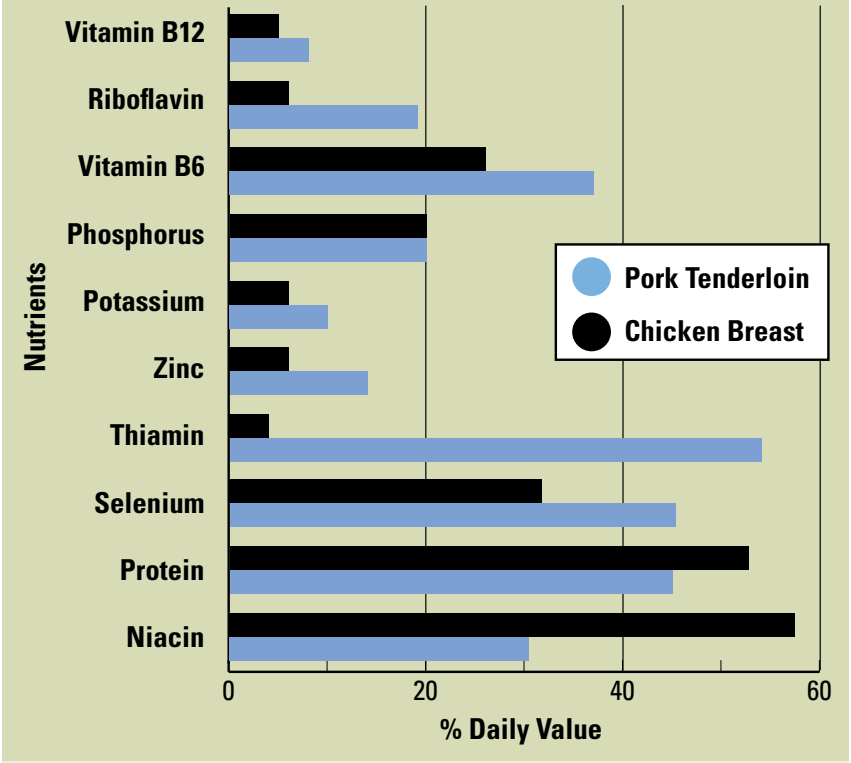
Here are six cuts of lean pork with a total fat content that falls between a skinless chicken breast and a skinless chicken thigh.



Based on 3-ounce cooked servings (roasted or broiled), visible fat trimmed after cooking.
Source: 2010 National Nutrient Database for Standard Reference, Release 23.

Lean: Less than 10 grams total fat, 4.5 grams saturated fat and 95 milligrams cholesterol per serving.
Extra Lean: Less than 5 grams total fat, 2 grams saturated fat and 95 milligrams cholesterol per serving.

Figure 3: Pork Tenderloin and Chicken Breast Nutrient Comparison



Source: 2010 National Nutrient Database for Standard Reference, Release 23. Based on 3-ounce cooked serving (roasted or broiled), trimmed or skinless.

Figure 4: Pork's Nutrient Package

Compared to Daily Values (DV) for nutrients, a 3-ounce serving of lean, roasted pork tenderloin contributes:

Nutrient	% Daily Value*
Thiamin	54% DV
Selenium	46% DV
Protein	44% DV
Niacin	37% DV
Vitamin B6	37% DV
Phosphorus	23% DV
Riboflavin	19% DV
Zinc	14% DV
Potassium	10% DV

Source: 2010 National Nutrient Database for Standard Reference, Release 23.

*Daily Values based on a caloric intake of 2,000 kcal per day for adults and children four or more years of age.

cuts meet the U.S. government guidelines for "lean" (less than 10 g fat, 4.5 g saturated fat and 95 mg cholesterol in 100 g of meat) (U.S. Food and Drug Administration 9 CFR § 317.362) with seven cuts each providing less than 10 grams of fat, 3 grams of saturated fat and 90 milligrams of cholesterol in a 3-ounce cooked serving (USDA National Nutrient Database 2010). Additionally, pork tenderloin is "extra lean," which means it contains less than 5 grams of fat, 2 grams of saturated fat and 95 milligrams of cholesterol per serving. When consumed as part of a 2,000-calorie diet, a serving of pork tenderloin contributes 5% of the DV for saturated fat, 4.5% of the DV for total fat and 21% of the DV for cholesterol, and is nutrient-dense (Fig. 4: Pork's Nutrient Package). Also, pork tenderloin is naturally low in sodium — only 42 milligrams of sodium per serving or 2% of the DV.

The following is a brief snapshot of key nutrients provided by pork and their respective biological roles (Fig. 5: Pork Provides Protein, Vitamins and Minerals).

- **Protein** is the most important macronutrient in the diet because it provides both essential amino acids and is a source of energy. Protein is the major structural and functional component of all cells. Proteins function as enzymes, membrane carriers, blood transport molecules and hormones and play a key role in the immune system. The constituent amino acids act as precursors for nucleic acids, hormones, vitamins and other important molecules. Pork is a source of high-quality protein, providing all of the essential amino acids needed by humans. When protein needs are high, as during growth and development, consumption of animal products such as pork will provide both greater quantity and quality of protein than plant products. New research indicates protein may have health benefits, including weight management, beyond its originally understood functional roles.
- **B-vitamins** such as thiamin, riboflavin and niacin function as coenzymes essential in the metabolism of carbohydrate, protein and fat to yield energy in all cells. Both thiamin and niacin help to maintain a healthy cardiovascular system, and riboflavin is important in maintaining normal vision and preventing cataracts.
- **Vitamin B6** (pyridoxine) functions as a coenzyme in the metabolism of protein and carbohydrate, helps convert tryptophan into niacin and serotonin

(a messenger in the brain), helps produce insulin, hemoglobin and antibodies that fight infection, and is a key player in the metabolism of homocysteine, an amino acid. Intakes of vitamins B6 and B12 have been shown to reduce blood levels of homocysteine, a risk factor for cardiovascular disease and stroke. Additionally, researchers have been investigating a potential relationship between vitamin B6 status and a wide variety of neurological conditions such as seizures, chronic pain, depression, headache and Parkinson's disease, as well as its effect on premenstrual syndrome.

- **Vitamin B12** is essential for the production of healthy red blood cells, neurological function and synthesis of DNA. As mentioned above, vitamins B6 and B12 reduce homocysteine levels. Studies show that vitamins B6 and B12 help to keep homocysteine levels within a normal range. Many Americans, especially older adults, are at risk for vitamin B12 deficiency (Allen 2009). A 3-ounce serving of lean, roasted pork tenderloin provides 8% of the DV of vitamin B12, a micronutrient not found in plant-based foods.
- **Phosphorus**, a mineral, is a major component of bones and teeth and helps to maintain a normal pH in the body. Phosphorus is involved in many metabolic processes, including activating and deactivating enzymes, and is an essential component of ATP, the energy source of cells.
- **Potassium**, a mineral, assists in muscle contraction and in maintaining fluid and electrolyte balance in cells. Potassium is also important in sending nerve impulses, as well as releasing energy from protein, fat and carbohydrates during metabolism. Additionally, dietary potassium lowers blood pressure by blunting sodium's adverse effects on blood pressure and helps to reduce the risk of developing kidney stones and bone loss. Recognizing potassium's health benefits and the general population's low potassium intake, the 2010 Dietary Guidelines for Americans identifies potassium as a "nutrient of concern" (Dietary Guidelines for Americans 2010).
- **Selenium**, a trace element, is a component of enzymes involved in the body's defense against oxidative stress, and selenoproteins regulate thyroid hormone metabolism.
- **Zinc**, a trace element, functions as a component of numerous enzymes involved in the body's use of carbohydrate, protein and fat, and in the regulation of gene expression. Growth and reproduction, appetite, taste and the activity of some hormones are other physiological functions dependent on adequate zinc intake.
- **Iron** functions as a component of a number of proteins, including enzymes and hemoglobin, the latter being responsible for transporting oxygen from the lungs to all cells in the body. Iron plays a role in brain development and cognitive function and supports a healthy immune system. A lack of iron can result in anemia. The 2010 Dietary Guidelines

Figure 5: Pork Provides Protein, Vitamins and Minerals

Source: 2010 National Nutrient Database for Standard Reference, Release 23.
Based on 3-ounce cooked pork tenderloin.
"Excellent" Source = 20% or more of Daily Value; "Good" Source = 10%-19% of Daily Value.

identifies iron as a "nutrient of concern" for women of reproductive capacity, including adolescent girls. A 3-ounce serving of lean, roasted pork tenderloin provides 5% of the iron in heme form, which is more readily absorbed than iron from plant sources.

III. Pork's Nutrient Contribution to Americans' Diets

Pork is a well-liked meat evidenced by the fact that pork ranks third as a source of total meat consumption in the U.S. and accounts for about 42% of red meat (i.e., beef, pork, lamb and veal) consumed (Barraj et al 2010). Further, pork makes an important nutrient contribution to the U.S. diet (Barraj et al 2010, Murphy et al 2011). Researchers recently examined 2-day average nutrient intake data from nearly 10,000 pork consumers aged 2 years and older who participated in the 2003-2006 National Health and Nutrition Examination Survey (NHANES) (Barraj et al 2010). Pork was classified as fresh products (e.g., pork chops, steaks, ribs, fresh ham, other fresh pork), processed pork products (e.g., lunch meats, hot dogs, bacon, sausage, smoked ham) and lean pork products (i.e., meeting USDA criteria for lean meat).

The findings show that total pork is an important contributor to protein and intakes of micronutrients. Lean pork consumers tended to have, on average, higher intakes of protein, magnesium, phosphorus, potassium and selenium, and lower intakes of cholesterol, fat, saturated fat and sodium than consumers of processed pork (Barraj et al 2010).

When researchers compared total nutrient intakes of adult consumers of lean pork with nonconsumers of lean pork, based on a single 24-hour dietary recall, they found that consumers of lean pork had higher intakes of protein and select nutrients (e.g., phosphorus, potassium, selenium, thiamin, riboflavin, niacin and vitamin B6) than nonconsumers of pork (Murphy et al 2011), No differences were found in energy-adjusted intakes of total fat, saturated fat, iron, magnesium, zinc and vitamin B12 between consumers and nonconsumers of lean pork (Murphy et al 2011).

IV. Pork and Evidence-Based Dietary Guidance

Overweight and obesity have reached epidemic proportions in the United States (Ogden et al 2010, Flegal et al 2010). Nearly one-third of U.S. children and adolescents and 68% of adults are overweight or obese (Ogden et al 2010, Flegal et al 2010). In addition, many Americans fail to consume recommended in-

takes of essential nutrients such as vitamins A, C, D, E and K, and choline, calcium, phosphorus, magnesium potassium and dietary fiber (Dietary Guidelines Advisory Committee 2010). Four underconsumed nutrients are of public health concern for the general population — vitamin D, calcium, potassium and dietary fiber (Dietary Guidelines for Americans 2010, Dietary Guidelines Advisory Committee 2010). Three nutrients — iron, folate and vitamin B12 —are of concern for specific population groups (e.g., iron and folate for women capable of becoming pregnant and vitamin B12 for older adults). Poor food choices — specifically overconsumption of high-calorie, nutrient-poor foods and low intake or omission of specific food groups or specific foods within food groups — are largely to blame.

A. The 2010 Dietary Guidelines for Americans

In January 2011, the USDA and U.S. Department of Health and Human Services jointly released the 2010 Dietary Guidelines for Americans (www.dietaryguidelines.gov), the seventh edition since first introduced in 1980. The new Dietary Guidelines were developed using a scientific evidence-based, systematic review methodology to address research questions posed by an advisory committee of 13 scientists (Dietary Guidelines Advisory Committee 2010). The 2010 Dietary Guidelines provides nutritional guidance to all healthy Americans over the age of 2 to help choose a diet that promotes health and reduces the risk of major chronic diseases. The two overarching themes of the 2010 Dietary Guidelines are to balance calorie intake with calorie expenditure (i.e., physical activity) to manage body weight throughout life, and choose nutrient-dense foods and beverages from the basic food groups — vegetables, fruits, grains, milk and milk products and protein foods (formerly the "meat and bean" group). Foods in the protein group include seafood, lean meat and poultry, eggs, beans and peas, soy products and unsalted nuts and seeds. Consumption of a variety of protein foods as part of a healthful diet is recommended to improve nutrient adequacy and overall good health.

Additional Dietary Guidelines' recommendations include choosing smaller portions of foods and beverages and reducing intake of foods that are substantial sources of sodium, solid fats, cholesterol, added sugars and refined grains. Some specific recommendations are to keep total and saturated fat at recommended levels (20%-35% of calories as fat, <10% of calories as saturated fat), and reduce sodium intake to less than 2,300 mg/day, or 1,500 mg/day for adults 51 years and older and those of any age who are African American or have hypertension, diabetes or chronic kidney diseases. Also, keeping foods safe by cooking foods to appropriate internal temperatures and avoiding cross-contamination are recommended.

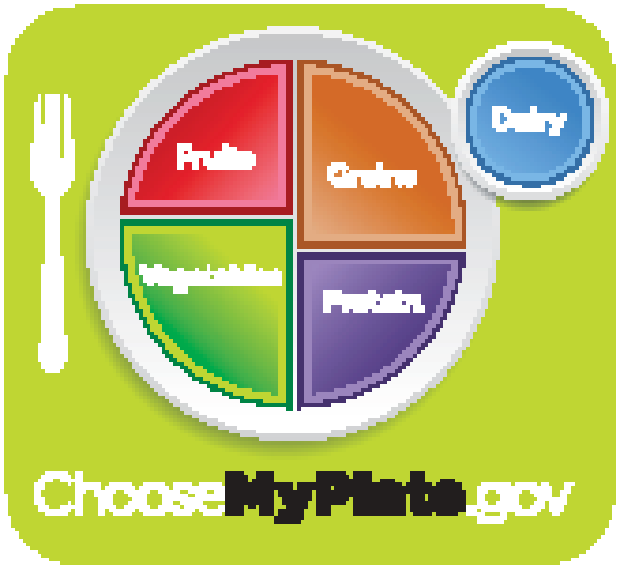
B. MyPlate

To help consumers make healthy food choices consistent with the 2010 Dietary Guidelines, USDA has introduced a new, simplified graphic symbol and education tool called MyPlate (www.choosemyplate.gov), an update of USDA's more complex MyPyramid (www.mypyramid.gov) (Fig. 6: MyPlate). The new food icon is part of a comprehensive nutrition communications initiative that provides consumers with easy-to-understand recommendations, a website (www.choosemyplate.gov) with expanded information, and other tools and resources. MyPlate's six key how-to messages to guide healthy eating are to:

- Enjoy your food, but eat less.
- Avoid oversized portions.
- Make half your plate fruits and vegetables.
- Switch to fat-free or low-fat (1%) milk.
- Compare sodium in foods like soup, bread and frozen meals, and choose the foods with lower numbers.
- Drink water instead of sugary drinks.

The new MyPlate icon is a plate half filled with fruits and vegetables, the other half with grains and protein, and a circle to the side representing low-fat

Figure 6: MyPlate



and fat-free dairy foods. The sections vary in size depending on the recommended portion of each food a person should eat. Viewing the MyPlate icon online allows consumers to click on each section of the plate for more information about specific food groups. For example, by clicking on the Protein Foods section, consumers can learn:

- What foods are in the Protein Foods Group (e.g., meats including lean cuts of ham, pork and lean ground pork).
- How much is needed each day (i.e., 2-ounce equivalents to 6½ ounce equivalents, the specific amount depending on age, sex and level of physical activity).
- What counts as an ounce equivalent (i.e., in general, 1 ounce of meat [including cooked lean pork or ham], poultry or fish is equivalent to ¼ cup cooked beans, or 1 egg, or 1 tablespoon of peanut butter or ¼ ounce of nuts or seeds).
- Nutrients and health implications.
- Tips for making wise choices (e.g., choose lean pork including pork loin, tenderloin, center loin and ham).

V. Pork in Healthy Diets

The 2010 Dietary Guidelines acknowledges that a healthy eating pattern is not a rigid prescription. Rather, healthy eating patterns can be flexible to accommodate cultural, ethnic, traditional and personal preferences, as well as food costs and availability. The USDA Food Patterns and the Dietary Approaches to Stop Hypertension (DASH) Eating Plan are provided as examples of healthy eating patterns that integrate the Dietary Guidelines' recommendations and can be adapted to suit personal and cultural preferences. Lean pork easily fits into these balanced eating plans suggested by the Dietary Guidelines. Lean pork is not only nutrient dense, providing protein and a host of vitamins and minerals, but also has fat and saturated fat levels equivalent to skinless chicken.

A. USDA Food Patterns

USDA Food Patterns, developed to meet nutrient needs, identify daily amounts of foods, in nutrient-dense forms, to eat from the five major food groups and their subgroups (Dietary Guidelines for Americans 2010). The patterns include an allowance for oils and limits on the maximum number of calories that should be consumed from solid fats, added sugars and alcohol. For individuals consuming a diet containing 2,000 calories per day, the following servings are recommended from each of the food groups: 5.5 ounces/day from Protein Foods; 3 cups/day from the Milk and Milk Products (Dairy Products) Group; 2.5 cups/day from the Vegetable Group; 2 cups/day from the Fruit and Juices Group; 6 ounces/day from the Grains Group; and 6 teaspoons/day from oils. Each food group provides part, but not all, of daily nutrient needs. It is therefore important to choose a variety of foods from all of the food groups, keeping in mind moderation. This includes choosing at least half of grains as whole grains and selecting a variety of colorful fruits, vegetables and protein foods.

In recent years, lean pork has gained recognition as a nutrient-dense food choice in the Protein Foods Group. While usual intake of Protein Foods meets or exceeds USDA Food Patterns, most adolescent girls and many adult women consume levels below recommended amounts (Dietary Guidelines for Americans 2010). About 75% of girls aged 9 to 18 years and about 50% of adult women fail to consume recommended amounts of Protein Foods (Dietary Guidelines Advisory Committee 2010).

B. DASH Eating Plan

As discussed below, lean pork can be included in the DASH eating plan — a low-fat diet rich in fruits, vegetables and low-fat dairy products — designed to lower blood pressure (Dietary Guidelines for Americans 2010, U.S. Department of Health and Human Services 2006).

VI. Pork and Health

A. Scientific Research

Scientists are constantly investigating relationships between food intake and our health — from obesity and heart disease, to cancer and diabetes. The weight of evidence regarding such relationships is based on consideration of many different types of research — beyond one single research study. Each type of study provides a different type of conclusion. Below is an overview of different types of scientific research about food and health.

Types of Research

- **Clinical trials** – Experimental research conducted on human subjects, often to confirm epidemiological research or to determine if the results of basic research are applicable to humans. The gold-standard of scientific research is a clinical trial that is randomized, double-blind (neither the researcher nor the subject knows if the subject is receiving the test substance) and placebo-controlled (the test substance and a false placebo must be virtually identical).
- **In-vitro or animal research** – Basic experimental research often conducted in test tubes (in vitro) or on animals to determine biochemical processes. These studies are often done to further explain observations from epidemiological research.
- **Epidemiological** – Observational studies that look at associations between health outcomes and other variables. They can be useful for suggesting relationships, but do not necessarily indicate cause and effect. These studies report absolute risk (the risk of developing a disease over a time period due to change) and relative risk (the comparative risk between two different situations or treatments in groups of people). When interpreting epidemiological studies, it's important to remember that even when relative risk is high, absolute risk can be low. For example, buying two lottery tickets instead of one produces a relative risk of 2.0 (or a 100% increase) to win, but your actual chances to win are still extremely low.
- **Meta-analysis** – A systematic methodological approach combining data from individual studies to produce an overall summary association (i.e., an average relative risk estimate of all studies). Results from a meta-analysis are only as good as the data from the original studies included in the analysis.

B. Weight Management

As overweight and obesity have escalated in recent decades (Ogden et al 2010, Flegal et al 2010), meat, including pork, has become leaner and the fat available in the U.S. food supply contributed by meat has declined (e.g., from 23.8% in 1975-1984 to 16.5% in 2005) (Hiza et al 2008). Recent findings indicate that total pork contributes only 4% of total calories in the U.S. diet (per capita mean estimate) (Barraj et al 2010). Evidence that the calories from lean pork compare favorably to skinless chicken (e.g., 143 kcal/100 g for pork tenderloin, 165 kcal/100 g for skinless chicken breast) supports the inclusion of lean pork in weight loss and weight maintenance diets (USDA National Nutrient Database for Standard Reference 2010).

Protein

Pork is an excellent source of high quality protein. Accumulating research indicates that protein has a beneficial effect in weight management. The Recommended Dietary Allowance (RDA) for protein — the amount to prevent a deficiency for 98% of the population — is 0.80 grams per kilogram (g/kg) of body weight per day for all healthy adults aged 19 years and older, or 56 g/day for men and 46 g/day for women (Institute of Medicine 2002). The National Academy of Sciences, Institute of Medicine's Acceptable Macronutrient Distribution Range (AMDR) for protein — the range of intake associated with reduced risk of chronic disease while providing adequate intake — is between 10% and 35% of daily calories for adults (Institute of Medicine 2002). This range allows flexibility to meet individualized protein needs. According to research presented at a recent Protein Summit — which brought together leading protein researchers to examine the state of science related to high-quality protein and various health outcomes - many adults may achieve health benefits, including reduced risk of obesity, by consuming protein intakes in excess of the RDA (Rodriquez and Garlick 2008). The potential health benefits of high protein diets, coupled with inadequate protein intakes in some population groups, call for greater efforts to encourage Americans to meet protein recommendations by following USDA food patterns (Fulgoni 2008).

The beneficial effect of high-protein diets in weight management may be explained by protein's impact on satiety and thermogenesis, leading to overall reduced energy intake and increased energy expenditure, which may improve metabolism and promote weight loss (Paddon-Jones et al 2008). Also, high-protein, weight-

loss diets are associated with improved body composition (i.e., increased fat loss and preservation of lean body mass) (Leidy et al 2007, Paddon-Jones et al 2008). Furthermore, high-protein intakes may help limit weight regain after weight loss (Lejeune et al 2005, Larsen et al 2010, Layman et al 2009). It is important to note that, although the amount of protein in diets varies by study protocol, a majority of the studies used protein levels within the recommended AMDR of 10%-35% of calories (Institute of Medicine 2002). The high-protein diets were at the upper end of the range (35%), and the control diets were at the lower end of the range (10%). Many of the studies achieved higher protein levels by including an additional serving or two of high-protein foods such as lean meat (e.g., pork), fish or eggs in place of a serving or two from a different food group to effectively maintain calorie balance.

Protein and Satiety

A number of studies have investigated the role of protein in satiety (Weigle et al 2005; Leidy et al 2007, 2009, 2010, 2011; Leidy and Racki 2010). In general, protein can be more satiating than either carbohydrate or fat (Paddon-Jones et al 2008, Halton and Hu 2004, Astrup 2005, Institute of Medicine 2002). Short-term studies that examined protein's impact on subjective satiety measures have shown decreased hunger ratings after subjects were fed a meal high in protein as compared to a meal high in fat or carbohydrate (Halton and Hu 2004, Astrup 2005).

Researchers from Purdue University found that overweight and obese women following a weight-loss diet who increased their dietary protein (30% of total calories), with pork as the only source of meat, for 12 weeks reported feeling fuller after a meal than those consuming a weight-loss diet with a normal protein level (18% of total calories). The women also rated themselves more positively in terms of overall mood and feelings of pleasure during dieting (Leidy et al 2007). By decreasing feelings of hunger and reducing calorie intake in a subsequent meal, protein may ultimately help decrease overall food consumption and play a role in weight loss.

Subsequent studies in overweight and obese men following weight-loss diets have found that a high protein intake reduces hunger sensations and increases satiety (Leidy et al 2010, 2011). In a 12-week study of 27 overweight and obese men who consumed either a normal protein (i.e., 14% of calories or ~ 0.8 g protein/kg/day) weight-loss diet or a high-protein (i.e., 25% of calories or ~1.4 g protein/kg/day) weight-loss diet — the additional protein provided by pork and eggs — the high protein intake during weight loss improved daily satiety and appetite control in the evening (Leidy et al 2011). These findings suggest that high-protein intake might reduce thoughts of food as well as late-night snacking and overeating in the evening, which are leading contributors to poor compliance when following a weight-loss diet (Leidy et al 2011).

Studies have shown that the timing of protein intake, specifically increasing protein intake at breakfast, has a beneficial effect on satiety and appetite control (Leidy et al 2009; Leidy and Racki 2010). When nine men on a weight-loss diet increased their intake of high-quality protein foods, including lean pork (Canadian bacon), at breakfast, they experienced greater initial and sustained feelings of fullness throughout the day compared to increasing protein intake at lunch and/or dinner (Leidy et al 2009). And in "breakfast-skipping" teens, consuming a protein-rich breakfast increased fullness and reduced appetite and daily energy intake (Leidy and Racki 2010). These studies suggest that consuming more protein at breakfast provides more appetite control for the rest of the day.

Protein and Thermogenesis

Another potential reason why high-protein intake may facilitate weight loss is due to a greater thermic effect, or a higher proportion of energy expended to metabolize the food consumed. Protein uses approximately 20%-30% of energy consumed in metabolism, whereas carbohydrate and fat are significantly lower at about 5-10% of calories and 0% to 3% of calories, respectively (Westerterp-Plantegna et al 2009). As reviewed by several researchers, studies examining the thermic effect of various diets have found that as the percentage of calories from protein increases, the amount of energy expended on thermogenesis increases (Halton and Hu 2004, Westerterp-Plantegna 2009, Paddon-Jones et al 2008). Regarding the source of protein, one study reported that ingestion of animal (pork) protein resulted in a 2% higher energy expenditure than plant-based protein (soy) (Mikkelsen et al 2000). The increased thermic effect from protein may be due to the fact that metabolically it is more difficult for the body to store or break down protein.

Protein and Body Mass Index

With the evidence to suggest that high-protein diets can increase satiety and thermogenesis, it is important to ex-

amine whether following this type of diet can influence weight loss and body composition. Maintaining muscle mass during energy restriction is essential to maximize fat loss and ultimately long-term energy expenditure. In a study of high-protein diets and body weight, researchers found that overweight and obese women who followed a reduced-calorie diet with higher amounts of protein (30% of calories), including approximately 6 ounces of lean pork per day, retained more lean body mass while losing weight compared to women who consumed the same amount of calories but less protein (18%) (Leidy et al 2007). The preservation of lean body mass was more pronounced in the overweight women compared with the obese women (Leidy et al 2007).

In a study of overweight women following a 1,700-calorie diet with an intake of either 30% of calories from protein or 16% of calories from protein (fat intake less than 30% of calories for both groups), researchers found similar amounts of weight loss in both groups; however, the higher protein diet group had a greater loss of fat to lean tissue compared to the lower protein group (Layman et al 2003). This change in body composition suggests that a higher proportion of calories from protein in a weight-loss diet may help spare muscle. Additionally, these researchers showed that a higher protein diet coupled with exercise has additive beneficial effects on body composition during weight loss in women (Layman et al 2005). Also, when obese adults consumed a high-protein diet (i.e., 30% of total calories), body composition, blood lipids and long-term compliance improved compared to those who consumed a conventional high-carbohydrate diet containing 15% of calories as protein (Layman et al 2009). The subjects consumed a weight-loss diet for four months followed by 8 months of weight maintenance. Although weight loss did not differ between the groups at either 4 months or 12 months, the group consuming the higher protein diet experienced greater losses of fat and improvements in body composition (Layman et al 2009).

A meta-analysis of 87 studies looked at the effects of variations in protein and carbohydrate intake on body mass and composition during energy restriction. Overall, the low-carbohydrate, high-protein diets favorably affected body mass and composition by sparing more lean muscle tissue (Krieger et al 2006). Another review including 15 randomized trials lasting between 7 days and 1 year reported that about half of the studies resulted in a statistically significant decrease in total body weight with the higher protein

diet (Halton and Hu 2004). Several other studies, of at least 1 year in duration, observed that at 6 months participants following a high-protein diet lost more weight; however, by 1 year, weight loss in all groups was similar (Hu 2005). This finding suggests that high-protein diets may be effective for weight loss in the short term; however, beyond 6 months they are similar in effectiveness to higher carbohydrate, low-fat diets. Long-term research studies are needed to understand whether the benefits of higher protein diets extend beyond short-term weight loss to provide a permanent healthy-eating solution (Hill 2005).

The beneficial effect of high-protein diets on body composition during weight loss is not surprising considering evidence showing that increased protein intake helps to preserve muscle mass in older adults, thereby reducing the risk of sarcopenia (age-related loss of muscle) (Houston et al 2008, Lord et al 2007). With respect to the source of protein, some studies have demonstrated that animal protein is more effective than plant protein in maintaining muscle mass (Houston et al 2008, Lord et al 2007, Aubertin-Leheudre and Adlercreutz 2009). An observational study of middle-aged women found that diets including meat (i.e., animal protein) were more effective at preserving lean muscle mass than vegetarian diets (i.e., plant proteins) with the same amount of protein (Aubertin-Leheudre and Adlercreutz 2009).

Potential Issues with High-Protein Diets

Despite some early suggestions that a high-protein diet may be a causal factor in the age-related decline

in renal function, bone calcium loss, kidney stones, cardiovascular disease and other diseases, today the weight of evidence indicates that these concerns are unfounded (Rodriquez and Garlick 2008, Wolfe 2008, Dietary Guidelines Advisory Committee 2010, Institute of Medicine 2002). Recent scientific findings indicate either a health benefit or no harm of high-protein intakes at levels in excess of the RDA, but still within the AMDR (Rodriguez and Garlick 2008). Based on the Protein Summit's comprehensive review of the science related to the effect of high-protein diets on health outcomes, it was concluded that "protein intake can be increased to at least double the RDA, and perhaps higher, without risk of adverse responses in healthy individuals with normal renal function" (Wolfe 2008). In fact, research continues to reinforce the importance of high-protein intakes on health outcomes such as weight management, diabetes and cardiovascular disease (Rodriguez and Garlick 2008). The Institute of Medicine concluded that there is no conclusive evidence that high-protein diets increase the risk of kidney stones, osteoporosis, cancer, cardiovascular disease and obesity (Institute of Medicine 2002).

The 2010 report of the Dietary Guidelines Advisory Committee concluded that, based on epidemiological studies, the relationship between animal protein products and health outcomes such as cardiovascular disease, type 2 diabetes and some cancers is generally inconsistent or non-existent. Nevertheless, the report suggests that consumers pay attention to the quantity and preparation of animal protein foods such as meats and that serving sizes of animal protein products be appropriate as some animal protein products contain saturated fat and are high in calories (Dietary Guidelines Advisory Committee 2010).

C. Heart-Healthy Diets

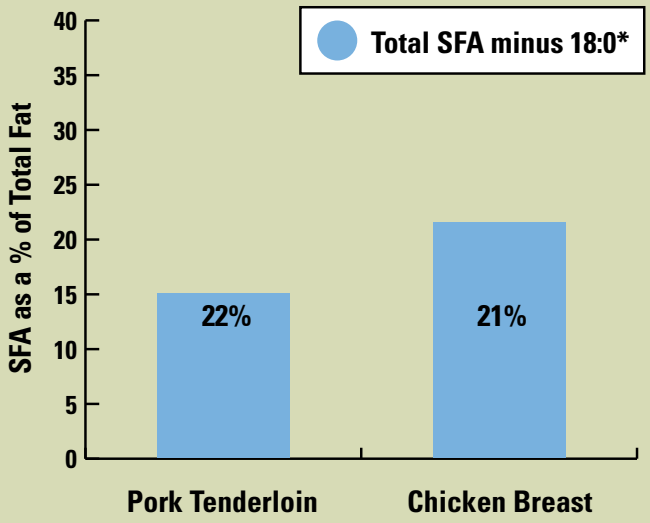
The American Heart Association's lifestyle prescription to promote cardiovascular health includes recommendations to consume an overall healthful diet, balance calorie intake with physical activity to achieve and maintain a healthy body weight, limit intake of saturated fat to <7% of calories, *trans* fat to <1% of calories and cholesterol to <300 mg/day (e.g., by choosing lean meats) to achieve a desirable blood lipid profile, and aim for normal blood pressure by consuming the DASH diet (Lichtenstein et al 2006).

Evidence shows that lean meat, including pork, can be part of a nutritionally balanced diet that does not increase the risk of heart disease. When overweight and obese women consumed a calorie-reduced diet containing either 18% or 30% of calories from protein, with pork as the only source of meat, there was no difference in cardiovascular health between the groups (Leidy et al 2007). Blood pressure and the lipid-lipoprotein profile (cholesterol and triglyceride) improved with weight loss (Leidy et al 2007).

Recommendations to reduce total and saturated fat and cholesterol are often misinterpreted to mean to cut back or eliminate meat such as pork and substitute fish or skinless chicken. As mentioned above, today's most popular cuts of pork have 16% less total fat and 27% less saturated fat than 20 years ago. Seven pork cuts meet USDA's guidelines for "lean" (i.e., less than 10 g fat, 4.5 g saturated fat and 95 mg cholesterol per serving).

Pork tenderloin, which meets USDA guidelines for "extra lean," is as lean as a skinless chicken breast. This pork cut contains only 1.02 grams saturated fat per serving and about one-third of that comes from stearic acid (USDA National Nutrient Database for

Figure 7: Percent of Saturated Fatty Acids (SFA) in Pork and Chicken that Raise Low-Density Lipoprotein (LDL) Cholesterol



***18:0 (Stearic Acid) does not elevate blood cholesterol levels**

Not all saturated fatty acids have the same effect on LDL cholesterol. Stearic acid (C18) appears to have a neutral effect on blood LDL cholesterol levels. In contrast, other long-chain saturated fatty acids such as lauric (C12), myristic (C14) and palmitic (C16) acids raise total and LDL-cholesterol levels (Mensink et al 2003). Thus, the amount of LDL-cholesterol-raising potential of saturated fatty acids found in lean pork is similar to that in a skinless chicken breast.

Source for pork and chicken data: 2010 National Nutrient Database for Standard Reference, Release 23.

Standard Reference 2010), which appears to have a neutral effect on blood total and low-density lipoprotein (LDL) cholesterol levels (Mensink et al 2003) (Fig. 7: Percent of Saturated Fatty Acids [SFA] in Pork and Chicken that Raise Low-Density Lipoprotein [LDL] Cholesterol). Although saturated fat makes up about one-third (i.e., 34%) of pork tenderloin's total fat per serving, more than half (i.e., 52%) of pork tenderloin's fat content is monounsaturated and polyunsaturated fat, which is associated with improved blood lipids (National Nutrient Database for Standard Reference 2010, Dietary Guidelines Advisory Committee 2010). A serving of pork tenderloin contains 0.028 grams *trans* fat — low enough to be labeled as "*trans* fat free" (i.e., less than 0.5 g per serving) (USDA National Nutrient Database for Standard Reference 2010, U.S. Food and Drug Administration 2003).

According to 2003-2006 NHANES data from 377 adult pork consumers who completed a 24-hour dietary recall, lean pork (e.g., pork tenderloin, loin chops, loin roast) contributed 7% of calorie intake, 9% of total fat and 11% of saturated fat (Murphy et al 2011). When compared to the more than 9,000 nonconsumers of pork, no significant differences were found in energy-adjusted intakes of total fat and saturated fat between the groups (Murphy et al 2011). Although lean pork consumers were found to have a slightly higher, although non-significant, intake of cholesterol than nonconsumers of pork, the potential negative effects of dietary cholesterol on blood lipids are relatively small compared to those of saturated fat and *trans* fatty acids (Howell et al 1997, Dietary Guidelines Advisory Committee 2010).

Figure 8: Today's Pork: Cooking Times and Temperatures

Method	Cut	Thickness/Weight	Final Internal Temp. (Fahrenheit) followed by 3-minute rest	Average Recommended Cooking Time (in minutes, unless otherwise specified)
Roasting Roast in an uncovered, shallow pan at 350° F	Loin Roast, Bone-in or Boneless*	2 - 5 lbs.	145°	20 per pound
	Crown Roast*	10 lbs.	145°	12 per pound
	Leg*	3½ lbs.	145°	40 per pound
	Shoulder Roast (Butt)*	3 - 6 lbs.	145°	45 per pound
	Tenderloin (roast at 425°F)	½ - 1½ lbs.	145°	20 - 27
Broiling Broil 4 inches from heat, or **Grilling** Grill over direct heat **Grilling** Grill over indirect heat	Chops, Bone-in or Boneless	¾ inch	145°	8 - 9
	Thick Chop	1½ inches	145°	12 - 16
	Kabobs	1-inch cubes	Tender	10 - 15
	Tenderloin	½ - 1½ lbs.	145°	20
	Ground Pork Patties	½ inch	160°	8 - 10
	Loin Roast, Bone-in or Boneless*	2 - 5 lbs.	145°	2 lbs. roast = 20 per pound 3 ½-5 lbs. roast = 15 per pound
	Shoulder Roast (Butt)*	3 - 6 lbs.	Tender	45 per pound
Sautéing Sauté with a small amount of oil over medium-high heat in an uncovered pan	Cutlets, Bone-in or Boneless	¼ inch	Tender	3 - 4
	Chops, Bone-in or Boneless	¾ inch	145°	8
	Tenderloin Medallions	¼ - ½ inch	Tender	4 - 8
	Ground Pork Patties	½ inch	160°	8 - 10
Braising Braise with a small amount of liquid over low heat in a tightly covered pan	Chops or Cutlets	½ inch - ¾ inch	145°	6 - 8
	Cubes	1 inch	Tender	8 - 10
	Tenderloin Medallions	½ inch - ¾ inch	145°	8 - 10
	Shoulder Roast (Butt)	3 - 6 lbs.	Tender	2 - 2½ hours
Stewing Stew in liquid at a slow simmer in a covered pot	Cubes	1 inch	Tender	45 - 1 hour

Pork today is very lean and shouldn't be overcooked. To check doneness, use a digital cooking thermometer. The National Pork Board follows the guidance of the U.S. Department of Agriculture, which recommends cooking roasts, tenderloins and chops to an internal temperature of 145 degrees F, followed by a 3-minute rest time, resulting in a flavorful, tender and juicy eating experience. Ground pork, like all ground meat, should be cooked to 160 degrees F.

D. The DASH Diet

Recommendations to reduce the risk of or treat high blood pressure, a risk factor for cardiovascular disease, include attaining and maintaining a healthy body weight, reducing sodium intake (i.e., to 2,300 mg/day or 1,500 mg/day for at-risk individuals), consuming a DASH-type dietary pattern and increasing potassium intake to 4.7 g/day (Appel et al 2006, Chobanian et al 2003).

The DASH dietary pattern is rich in fruits, vegetables and low-fat dairy products; includes whole grains, lean meats, poultry and fish and nuts; and is reduced in fats, sweets and sugar-containing beverages (i.e., "combination diet") (Karanja et al 1999, Dietary Guidelines for Americans 2010, U.S. Department of Health and Human Services 2006) Meats, poultry and fish range from 3 to 6-9 servings/day, the number depending on calorie levels. At a 1,800- to 2,600-calorie intake, 6 servings or less of meat, poultry and fish are recommended (Dietary Guidelines for Americans 2010). The landmark DASH trial included three diets: a control diet consistent with typical American eating patterns; a diet similar to what Americans eat but higher in fruits and vegetables; and the DASH "combination" diet which included low-fat dairy foods (Appel et al 1997). Both the fruit and vegetable diet and the "combination" DASH diet decreased blood pressure in hypertensive and nonhypertensive individuals, with the "combination" diet resulting in a greater drop in blood pressure (Appel et al 1997).

A follow-up DASH-Sodium trial of hypertensives and prehypertensives tested the effect of three levels of sodium (1.5 g, 2.5 g and 3.4 g) on blood pressure (Sacks et al 2001). The DASH diet lowered blood pressure at all sodium levels, but the greatest reduction occurred when subjects consumed the DASH diet at the lowest sodium level. Research examining various DASH-style eating patterns has shown that these diets lower blood pressure, improve blood lipids and reduce risk of cardiovascular disease compared to typical American diets (Dietary Guidelines for Americans 2010). A recent analysis estimated that following the DASH eating plan would reduce the 10-year risk of developing coronary heart disease (Chen et al 2010).

Lowering sodium intake in the diet in combination with increasing potassium intake is key to healthy blood pressure regulation (Dietary Guidelines for Americans 2010). Fresh foods are typically low in sodium and higher in potassium. In fact, over 75% of consumed salt comes from processed foods (Mattes and Donnelly 1991). The DASH dietary pattern can include fresh, lean pork since a 3-ounce serving contains on average 345 milligrams of potassium (i.e., is a "good" source of potassium) and less than 60 milligrams of sodium.

Using NHANES 2003-2006 data, researchers recently found that potassium intake was slightly greater (i.e., 2,858 mg/day) for consumers of fresh lean pork than for nonconsumers (i.e., 2,723 mg/day), based on a 24-hour dietary recall (Murphy et al 2011). However, consumers of fresh lean pork had slightly higher energy-adjusted intakes of sodium (i.e., 3,775 mg/day) than nonconsumers (i.e., 3,669 mg/day) (Murphy et al 2011). Fresh cuts such as pork tenderloin contain approximately 16 milligrams of sodium per ounce and processed or cured products such as extra lean ham which contain ~ 301 milligrams sodium per ounce (USDA National Nutrient Database for Standard Reference 2010). Selecting fresh lean pork (e.g., pork tenderloin) and lower sodium options of processed pork products can help lower sodium intake. Not only is fresh lean pork naturally low in sodium and pork a good source of potassium, but lean pork can also be included in weight-loss diets (Leidy et al 2007), which help to reduce obesity, a contributor to high blood pressure.

VII. Food Safety

Keeping meat and other foods safe reduces the risk of foodborne illness and is vital for healthful eating (Dietary Guidelines for Americans 2010). Due to modern farming and processing practices, it is unlikely that fresh pork contains bacteria that could cause illness (Burgess et al 2005). However, if consumers mishandle raw meats, including pork, the chance of illness increases. Recently, USDA revised its recommended cooking temperatures for all whole cuts of meat, including pork (USDA Food Safety and Inspection Service 2011) The following steps can help you keep pork safe (US Department of Agriculture, Food Safety and Inspection Service 2011; Dietary Guidelines for Americans 2010):

At the Store

- Buy pork before the "use by" or "sell by" date on the package, if available. Use or freeze pork by the "use by" date; for pork with a "sell by" date, use or freeze within 3 to 5 days after purchasing. If properly frozen, pork can be used after the expiration date.

- Make sure pork is cold and that frozen pork is solid when purchasing.
- Don't buy packages that are torn, cracked, dented or bulging.
- Buy perishable foods such as pork last, take home immediately and refrigerate or freeze promptly. Refrigerate meat such as pork within 2 hours of purchasing or preparation or within 1 hour if the air temperature is over 90° F.

Storing at Home
- Keep your refrigerator at or below 40° F and your freezer at or below 0° F.
- Store cold meat such as fresh pork tightly wrapped in butcher paper versus the plastic or Styrofoam that it comes in from the store. Butcher paper will help lock in flavor and prevent freezer burn.

Getting Ready
- Wash hands with warm soapy water for 20 seconds (count to 30) before and after handling pork.
- Wash thoroughly all utensils, containers, cutting boards and work surfaces with hot soapy water.
- Thaw pork in the refrigerator or cold water (in an air-tight or leak-proof bag) or microwave. Never thaw pork on the counter or elsewhere at room temperature.
- It is unnecessary to wash raw pork before cooking, as any bacteria on the surface would be destroyed by cooking.
- Cook pork immediately if thawed by microwaving. After thawing pork slowly in the refrigerator, it can be kept in the refrigerator for 3 to 5 days before cooking. Frozen pork can be safely cooked in the oven, on the stove or grill without defrosting, although cooking times may be about 50% longer.
- Cut meat, poultry and fish on a different cutting board than other fresh foods like vegetables, or thoroughly clean the cutting board between uses.
- Discard uncooked leftover marinades – do not reuse.

Cooking
- Cook all raw pork steaks, chops and roasts to a minimum internal temperature of 145° F as measured with a digital cooking thermometer in the thickest part of the pork before removing pork from the heat source. The addition of a 3-minute resting time before carving or consuming will result in a high-quality product that is microbiologically safe. Ground pork should be cooked to an internal temperature of 160° F. Correctly cooked pork is juicy and tender, with a slight blush of pink in the center.
- Never brown or partially cook pork, then refrigerate, and complete the cooking later. However, it is safe to partially precook or microwave pork immediately before grilling to finish cooking.

Serving
- Eat cooked pork (e.g., fully cooked take-out pork dishes) within 3 to 4 days, either cold or reheated to 165° F (hot and steaming).
- Never leave cooked pork out at room temperature for more than 2 hours (1 hour in hot weather 90° F or above).
- Serve cooked food on a clean plate and use clean utensils. Use separate serving plates and utensils for raw and cooked meats such as pork.

Leftovers
- Chill cooked pork leftovers in the coldest part of the refrigerator within 1 to 2 hours after serving and use within 2 days. Well-wrapped leftover pork can be frozen for up to 3 months.
- Freeze leftover pork that cannot be used in a few days.
- Reheat leftovers until the middle is hot before serving.
- Discard leftover marinades — do not reuse.
- When in doubt, throw it out.

VIII. Possible Questions

What's enhanced pork?

Enhanced pork is the process for adding nonmeat ingredients to fresh pork to improve the eating quality of the final product. Eating quality is based on the juiciness, tenderness and flavor of pork. The enhanced pork process is regulated by USDA's Food Safety and Inspection Service. The major ingredients used in enhanced pork are water, sodium phosphate, salt, sodium lactate, potassium lactate, sodium diacetate and flavoring agents (Miller 1998).

What about nitrites?

Sodium nitrite, a USDA-approved food additive, is used in small amounts as a preservative in cured meats (e.g., ham, bacon, hot dogs) to inhibit the growth of harmful microorganisms, including *Clostridium botulinum* that can cause botulism, a deadly foodborne disease (Hwang 2008). Nitrites also enhance the taste, texture and appearance (pink color) of cured

meat (Taormina et al 2003). Not only is sodium nitrite a safe and regulated food additive, but industry efforts have also lowered residual nitrite levels in cured meat products in the United States by approximately 80% since the mid-1970s (Cassens 1997).Today, nitrite-cured meats contain relatively minor amounts of nitrite. Nitrite comes from a variety of sources (Hord et al 2009). About 80% of daily intake of nitrite comes from nitrate in green, leafy vegetables or root vegetables (e.g., lettuce, spinach, carrots) (Hord 2009, Hwang 2008). Other sources include baked goods, cereals and processed and cured meats.

Scientific evidence fails to support suggested detrimental effects of nitrite in humans (Archer 2002, Council for Agricultural Science and Technology 1997, Hwang 2008). In 2004, the American Medical Association concluded that "the risk of developing cancer as a result of consumption of nitrites-containing foods is negligible" (American Medical Association 2004).

In 2000, the U.S. Department of Health and Human Services' National Toxicology Program, the world's leading authority on the toxicological safety of chemicals, conducted a multi-year study to evaluate sodium nitrite's safety (National Toxicology Program 2000). The agency concluded that nitrite is safe at the levels used. Numerous scientific panels have evaluated sodium nitrite's safety and concluded that nitrite is not only safe, but because of its proven track record of preventing botulism, it is an essential public health tool.

What about carcinogens?

Overcooking any protein is not recommended. Pork is best cooked to medium doneness, or 145° F internal temperature (160° F for ground pork), at which point it will be slightly pink in the center. The exposure to carcinogens can be reduced by choosing leaner cuts of meat and by using a marinade. Trim fat from the meat, remove charred areas of cooked meat and use tongs rather than a fork. Piercing meat with a fork can cause juices and fat to drip onto the heat source, creating flames which can increase the risk of charring (Purdue University Animal Sciences 2008). Research has shown that marinating meat can cut down the possibility of producing any harmful chemicals that can develop during the grilling process. A study published in the *Journal of Food Science* suggests that readily available commercial marinades containing antioxidant-rich spices/herbs may reduce formation of cancer-compounds in grilled meat (Smith et al 2008).

What about processed meats and colorectal cancer?

The possible link between eating processed meat and developing colorectal cancer reported by the World Cancer Research Fund (WCRF) in November 2007 is based on conflicting studies and is not supported by the full body of scientific research. WCRF included only five cohort studies in its meta-analysis and only two of those six comparisons (one study was broken down between men and women) were statistically significant. The largest study included showed no relationship between eating processed meat and developing colorectal cancer. As the WCRF states, "There is no generally agreed definition of 'processed meat.' The term is used inconsistently in the epidemiological studies. Judgments and recommendations are therefore less clear than they could be" (World Cancer Research Fund/American Institute for Cancer Research 2007). A recent comprehensive review of epidemiologic evidence related to the consumption of red meat and processed meat and cancer concludes that "the currently available epidemiologic evidence is not sufficient to support an independent association between red meat consumption or processed meat consumption and colorectal cancer" (Alexander 2010). Associations between red/processed meat are generally weak, not statistically significant, inconsistent and confounded by other dietary and lifestyle characteristics. Further, evaluations of postulated mechanisms implicating red/processed meat as a risk factor for colorectal cancer among human populations have resulted in inconsistent findings (Alexander 2010).

IX. Cooking Today's Pork

Pork is best when cooked to an internal temperature of 145° F using a digital thermometer (160° F for ground pork). Correctly cooked pork is juicy and tender, with a slight blush of pink in the center. Because today's pork is so lean, it's important not to overcook it.

Dry or Wet?

There are two basic methods for cooking meats: dry heat and moist heat. Generally, dry heat methods are best applied to naturally tender cuts of meat. Moist heat methods tenderize less tender cuts.

Dry Heat Methods

- Grilling for both small pork cuts cooked over direct heat and large pork cuts cooked with indirect heat.

- Broiling for small cuts such as chops, tenderloin, kabobs and ground pork patties.
- Sautéing for small pork cuts such as medallions, ground patties, chops, cutlets and strips.
- Roasting for large pork cuts – loin roasts, tenderloin, shoulder roasts, ham and leg roasts.

Moist Heat Methods

- Stewing for smaller pieces of less tender cuts, such as ribs and pork cubes.
- Braising for large or small cuts, but traditionally less tender cuts.

Tips for Keeping Meals Lean

Preparing healthful meals that feature lean pork starts at the supermarket and ends at the table. Smart choices along the way will help ensure pork stays lean all the way to the table:

- *Get a lean start.* While all cuts of pork are leaner today, there are seven cuts of fresh pork that represent the leanest cuts of pork available in the meat case. These cuts of pork have on average 16% less fat and 27% less saturated fat than 20 years ago. Pork tenderloin is just as lean as a skinless chicken breast and six cuts of pork fall between a skinless chicken breast and thigh in terms of total fat and saturated fat content. Pork cuts with minimal visible fat and marbling (the white streaks within the meat) are the leanest. More importantly, remember this rule of thumb: The leanest cuts of pork have the word loin or leg in the name, such as pork tenderloin or loin chop. Pork leg (ham) may be sold fresh or cured, and as ham steaks or roasts.
- *Trim to slim.* Reduce calories and fat by trimming all visible fat from lean cuts before cooking. Removing visible fat prior to cooking reduces the total fat content by an average of 50%. Trimming prevents fat from being absorbed into the meat during cooking.
- *Cook it light.* Using low-fat cooking methods, like grilling, broiling, stir-frying and pan-broiling, maximizes flavor while keeping added fat to a minimum.
- *Spice for life.* Seasoning pork with nonfat, low-sodium herbs and spices is an easy way to boost flavor and cut back on fat and sodium at the same time. Rub herbs and spices onto pork before grilling, broiling or roasting. Experiment with different seasonings to discover exciting new ways to enjoy healthful eating.
- *Develop an eye for size.* Practicing portion control is just as important as buying and cooking lean. USDA's MyPlate (www.choosemyplate.gov) recommends 2 to 6 $^{1}/_{2}$ ounce equivalents from the Protein Group each day, the amount depending on age, sex and level of physical activity. Estimate about 4 ounces of boneless, trimmed raw pork to get 3 ounces of cooked pork. A 3-ounce serving of trimmed, cooked pork is about the size of a deck of cards.

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