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K. J. Drewry

M. D. Judge

H. H. Mayo

L. L. Wilson

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Meat for the Table

K. J. Drewry, M. D. Judge, H. H. Mayo and L. L. Wilson
Animal Sciences Department

Introduction

In America no food is more popular than meat (beef, veal, pork, lamb, and mutton), and this well-liked food ranks as high nutritionally as it does in popularity. Meat is the basic dish for the homemaker in planning and preparing nutritious family meals.

This publication points out the changes in meat consumption over recent years and some of the nutritional and physical characteristics of meats. This is general information for the breeder, feeder, processor, retailer and consumer.

Consumption

People are eating more red meat. The average per capita consumption of meat has increased at the rate of approximately 1 pound per year for the past 35 years. In 1964 the average consumption of these meats per person was 171.5 pounds. This represents an annual consumption of approximately 31 billion pounds.

Average per capita consumption of the individual meats during 1964 was: 99.0 pounds beef, 4.9 pounds veal, 4.6 pounds lamb and mutton, and 63.0 pounds pork. The consumption of beef and pork accounted for about 94 percent of the total meat consumed (beef 57.7 and pork 36.7), and veal, lamb and mutton accounted for 6 percent.

Consumption of the different meats has changed over the years. Table one shows

the consumption pattern for beef, lamb and mutton, pork and veal from 1950 to 1964.

Table 1. Changes in consumption per capita since 1950

Species	Unit	Year			
		1950	1955	1960	1964
Beef	lb.	63.4	82.0	85.2	99.0
Lamb and mutton	lb.	4.0	4.6	4.8	4.6
Pork	lb.	69.2	66.8	65.2	63.0
Veal	lb.	8.0	9.4	6.2	4.9

The United States ranks 5th in meat consumption. The top four meat-consuming countries are New Zealand, Uruguay, Australia and Argentina.

The average per capita meat consumption by species for the top 14 countries is given in Table two.

The United States, has approximately six percent of the world's land area and population and produces and consumes over 30 percent of the world's meat supply.

The increase in per capita consumption of meat is a result of personal preference and enjoyment, the nutritive bonus from meat, increased purchasing power, increased

Table 2. Meat consumption in the top 14 countries ^{a/}

	Beef and Veal	Pork	Lamb and Mutton	Total
New Zealand	95	36	95	226
Uruguay	167	19	35	221
Australia	108	23	88	219
Argentina	149	17	11	177
United States	106	65	4	175
Canada	89	55	3	147
United Kingdom	57	60	25	142
France	70	61	6	142
Switzerland	55	66	2	125
W. Germany	45	74	1	121
Denmark	38	79	1	119
Austria	43	68	-	113
Belgium	59	42	1	110
Paraguay	105	--	--	105

^{a/} Livestock and Meat Situation. March 1966. Table 9.

scientific know-how, and modern agricultural efficiency. This increased scientific know-how and modern agricultural efficiency has been brought about by selective breeding and improved methods of feeding, management, herd health, slaughtering, processing, refrigeration and transportation.

Meat Composition - Physical

Meat cuts contain muscle tissue, connective tissue, fat and usually bone. The recommended cooking method for the various cuts is determined by the composition. The composition of the cut (relative percent of muscle and connective tissue, fat and bone) is determined by the location of the cut in the carcass. The meat's color, tenderness, juiciness and flavor is determined by such items as inheritance, cooking method, age of animal and the particular muscles involved.

Muscle Tissue - Muscles vary in length, depth and thickness. All muscles contain some fat and connective tissue and are sur-

rounded by a connective tissue sheath which varies in thickness.

Muscles may be classified into two types - the striated or voluntary (skeletal) muscles and the smooth or involuntary (visceral) muscles. Striated muscles are in the edible meat cuts.

A single muscle contains many "bundles" of muscle fibers which are held together by connective tissue. The size of the fiber bundle partially determines the texture of meat. Different sized bundles may be found in different muscles of the same carcass. The individual muscle fibers are long, multi-nucleated cells with an average cross section of about 0.002 inches.

Connective Tissue - The two major constituents of connective tissue are elastin and collagen. Collagen is made tender by cooking but elastin is not.

Fat - Fat is contained in all meats. It may be found between muscles, between bundles of muscle fibers, between and even within the long, multi-nucleated muscle cells. The amount of fat which the carcass contains is influenced by such items as inheritance, age of animal, management, and ration.

Some carcasses have large quantities of fat as an external covering and as internal deposits around the heart and kidney. Research indicates that the amount of internal and external fat is one of the best indicators to use in predicting pounds of lean meat. The more pounds of fat trimmed from carcasses of the same weight, the lower the pounds of retailable meat. Most of today's meat cuts have a closer fat trim than 20 years ago.

Fat is distributed in very small particles throughout the muscles or lean. This fat may or may not be visible. The intermingling of visible fat in lean is called marbling. Meat research indicates that the visual estimate of the amount of marbling and its relationship to measurements of tenderness, juiciness and flavor of meat may not be as high as previously believed. These studies have shown that a moderate amount of marbling usually results in maximum palatability.

Bones - The bones in cuts of meat are of special interest for two reasons. Their main purpose is for easy identification of the cut. Secondly, bones are a clue to the age of the animal from which the cut originated. The bones in meat from young beef, pork and lamb carcasses are porous and red; whereas, the bones in meat from older animals are white and flinty. However, this relationship between the bone-determined (physiological) age and the actual (chronological) age may be low due to either genetic or environmental factors.

Color - The pink or red color of meat is due to the pigment myoglobin present in

the muscle tissues. The amount of myoglobin in muscle tissues varies between and within species. In general pork muscle contains less myoglobin than beef, and older animals have more myoglobin than younger animals. However, there are frequent cases of "dark cutting" beef carcasses among young animals which are unrelated to myoglobin level. These carcasses produce meat cuts that are equal in palatability to other beef.

The color changes observed in meat after exposure to air are due to oxygenation of myoglobin to oxyglobin. Color changes observed when meat is cooked are due to the combined action of heat, various enzymes, acids and alkalines.

Meat Composition - Chemical

The chemical components of meat are proteins, fats, carbohydrates, minerals, vitamins, nitrogenous and non-nitrogenous compounds, pigments, enzymes and water.

Proteins - Proteins are found in every living cell. Some of the uses of protein in the body are: building and maintaining body tissues, helping regulate the acid-base balance, helping form hormones and enzymes and furnishing energy. It has been suggested that proteins help build resistance to disease.

Chemical research has shown that there are hundreds of different proteins. Carbon, hydrogen, oxygen, nitrogen and sulphur are the chemical elements found in the proteins. The differences between the various proteins are determined by the kind and sequence of amino acids they contain. Amino acids are known as the "building blocks" of protein. Some 20 amino acids have been isolated and 10 of these are known as essential amino acids for man because the body cannot always synthesize sufficient amounts of them. The other amino acids can be produced by the body if not provided in the food.

Proteins found in animal products (meat, poultry, fish, eggs, milk and cheese) have a high "biological value." This means that there are relatively high amounts of the essential amino acids in meat protein. Grain foods and many fruits and vegetables also contain some of the essential amino acids. However, for the most efficient utilization of plant protein the meal should also contain animal protein.

The protein content of meat is usually about 22 percent, and fish and most cheeses contain about 20 to 30 percent. The protein content for most raw fruits and vegetables ranges from 0.5 to 8 percent and varies from 10 to 45 percent for most legume plants and their products depending on percent moisture and type of processing. Thus, with the plentiful American meat supply and the application of nutritional knowledge, protein deficiency disease is rare in the United States.

Fats - Fats are also an essential part of a balanced diet. Fats are important as a concentrated source of energy, supplier of necessary fatty acids and carrier of Vitamin A, D, E and K. Fat deposits throughout the body serve as protectors for vital organs and body tissues, and fat beneath the skin helps to protect the body from excess heat losses. This layer of fat also assists in protecting beef, lamb, veal and swine carcasses from excessive moisture and bacterial action during refrigeration or storage.

Today, many consumers remove the separable fat from the meat. However, the small amounts of fat within and on the meat adds flavor, appetite appeal, and satiety. Thus, some fat is required in all meats for good eating.

Carbohydrates - These are very important in the diet. The level of carbohydrates (primarily sugars and starches) found in the animal body is quite low. The liver is the carbohydrate reservoir of the animal body and contains about 50 percent of the carbohydrates

found in the body. The remaining half is distributed throughout the muscles and blood.

Carbohydrates are found most abundantly in sugars, corn syrup and other concentrated sweets. Cereal foods, legumes, potatoes, certain vegetables and fruits are also good sources.

Enzymes - Enzymes are found in the various cuts of meats. The most important enzymes are those which act on the proteins (proteolytic), the carbohydrates (amylolytic) and the fats (lipolytic). The action of these enzymes continue during storage.

Energy - This is measured by the calorie which is defined as the amount of heat required to raise the temperature of 1 gram of water 1 degree Centigrade. Thus, the calorie is the unit used in expressing the heat- or energy-producing value of a food. The statement that a tablespoonful of honey contains about 100 calories means that when utilized in body tissues, it will release that amount of energy to the body for various needs.

Carbohydrates, fats and proteins are three sources of calories in foods. The percentage of these components vary with the different foods. Generally, plant foods are high in carbohydrates and to some extent in fats; whereas, meat is considered high in protein and may or may not be high in fats. Surveys show that carbohydrates furnish about 50 percent, proteins about 15 percent, and fats about 35 percent of the calories in the average American diet.

In 100 grams (approximately 3.5 ounces) of cooked lean meat with separable fat removed, the number of calories from protein and from fat varies with the species and with the cut of meat.

The percent of total calories furnished by protein is usually higher in less tender beef, lamb, and pork ham and loin cuts. In the more tender beef, lamb, and pork shoulder cuts, the higher percent of total calories is

from fat. The source of calories is higher from protein than from fat in all veal cuts.

Future of Meat

Meat is a wholesome and essential part of the modern American's diet. In the future, per capita consumption of meat will increase as it has in the past. A combination of a 10 to 15 percent increase in per capita consump-

tion of meat and a 25 percent or more increase in population within the next 20 years, emphasizes the increased efficiency that the meat industry must experience. This efficiency must start with the livestock breeder and involve the feeder, packer and retailer. Even with the increased demand for meat, the competition between people involved in each segment will remain highly competitive, as it has in the past.

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