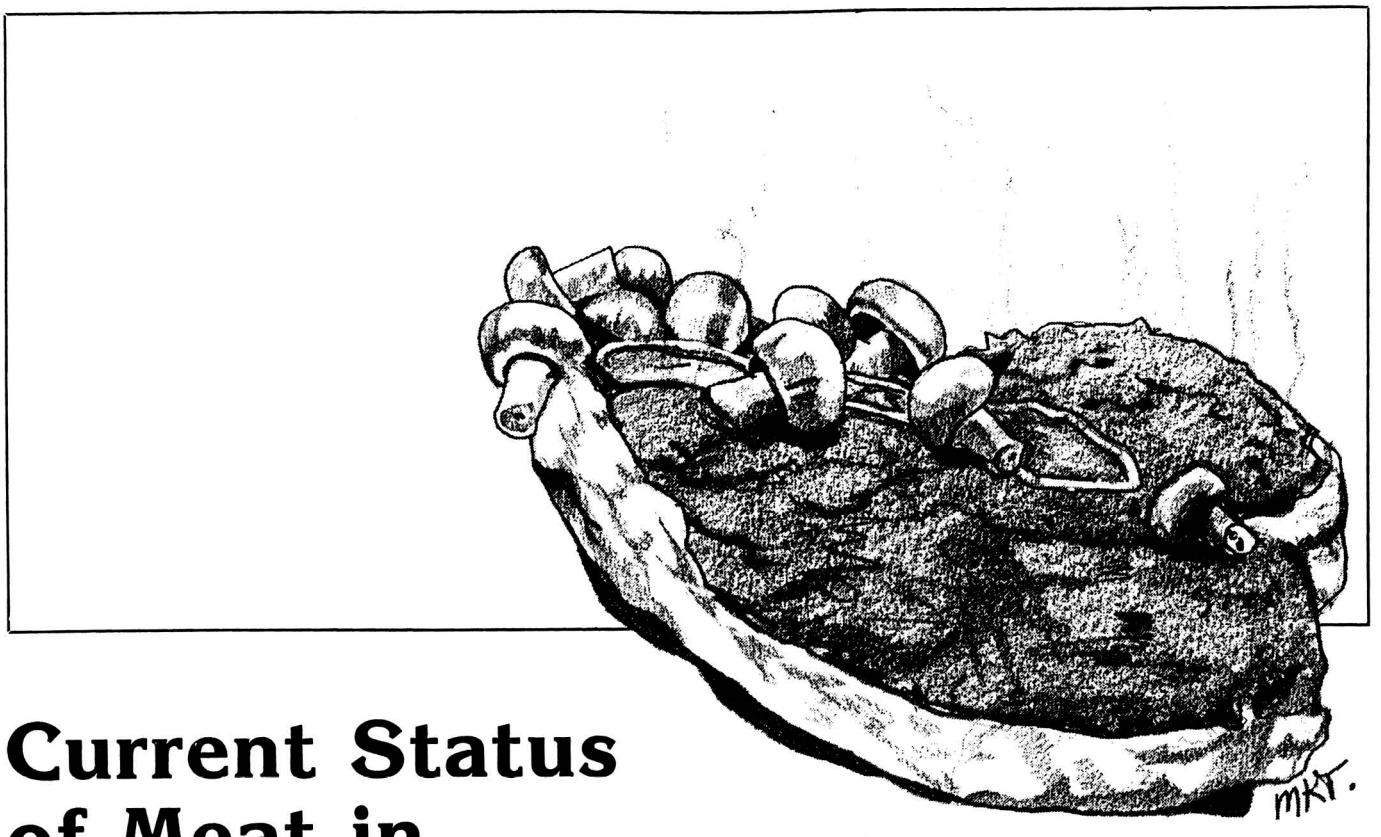

Current Status of Meat in the Diet and its Relationship to Human Health

by B.C. Breidenstein
Director of Research and Nutrition Information, National Livestock and Meat Board

The popularity of meat in the American diet is reflected in the fact that per capita consumption of red meat has increased by about 25 percent during the past three decades. The challenge to the propriety of meat in the diet is not a new one. The National Live Stock and Meat Board some 60 years ago stemmed from out of the rumblings and prevalence of the popular press. As director of research and nutrition information with the Meat Board, Dr. Burdette Breidenstein stresses the need for solid, factual information backed by scientific research before applying various interpretations to the general population.

Throughout the recorded history of man, and in all likelihood prior to that time, the primary diet/health concerns revolved around the need to obtain sufficient nutrients to maintain life. The priority status associated with consumption of meat and other animal products is well documented in the Old Testament of the Bible. Whether this status can be attributed to the perceived nutrient contribution to the diet or to taste appeal is not clear, but one could well speculate that it might have been a combination of those two reasons.

Nutrient Deficiencies Observed

Nutrient deficiencies have been observed and recognized as such for several hundred years. The use of certain foods in the prevention or correction of these deficiencies has been commonly practiced. For example, scurvy, a symptom of vitamin C deficiency, was a common problem during long ocean voyages of European explorers and was found to be prevented by the consumption of citrus fruits such as limes, which are now known to be an excellent source of vitamin C. Nevertheless, the scientific study of man's

nutrient needs and the food sources for satisfying those needs is relatively recent. Those "needs" of the human body are, however, not definable as a single quantifiable entity. Rather, age, sex, level of physical activity, ambient conditions, genetics and general health factors are among the factors known to influence nutrient requirements. Further complicating the issue is the fact that certain nutrients exert a sparing effect on the need for other nutrients. The bioavailability of nutrients from different sources also varies. For example, the heme iron contained in meat is known to be one of the most bioavailable forms of the mineral. In addition, its presence in the diet makes the less available plant sources of iron more available to humans. On the other hand, consumption of an excess of some nutrients may result in metabolic waste of others.

The human not only has a threshold of minimum requirements, but in many cases, is also very tolerant of an excess beyond those requirements. It is generally recognized, for example, that approximately 200 mg. of sodium are required daily for humans. Yet about 70 percent to 80 percent of the U.S. population is believed able to tolerate daily intakes of sodium of 10 to 20 times that amount without adverse effects. The magnitude of the range between the minimum requirement for any person and the intake level resulting in adverse effects is undoubtedly different for different nutrients—and is probably influenced by the same factors that affect the minimum requirement levels.

Red Meat Consumption* Pounds Per Capita/Year

Decade	Beef	Veal	Lamb & Mutton	Pork Exc. Lard	Total Red Meat
Last half 1940s	63.5	10.2	5.7	69.5	148.9
Last half 1950s	75.3	8.1	4.3	66.0	153.7
Last half 1960s	98.7	4.8	4.3	63.3	171.1
Last half 1970s	117.2	2.9	2.5	64.1	186.7
1980s	105.6	1.8	1.6	75.1	184.1

*Carcass weight disappearance.

Per Capita Consumption Increased

In spite of the continuous challenges to the desirability of its inclusion in the diet, per capita meat consumption in the United States has increased steadily during the current century. It is probably that, during at least the early part of that time period, its popularity in the diet was due largely to its taste appeal and secondarily to a perceived preferential source of nutrients. During the past several decades, however, meat has become increasingly recognized as a premier dietary source of high-quality protein, B vitamins and minerals. The reputation of meat as a source of these essential nutrients is rarely, if ever, seriously challenged.

Probably because the basal statistics are readily available, meat consumption figures are frequently expressed as total carcass weight of livestock slaughtered, divided by that year's total population. It is true that meat consumption per capita expressed on that basis increased during the current century, but obscured by such a figure is the change in carcass composition that has occurred in response to consumer demand. For example, prior to the wide availability of plant source oils swine were viewed as somewhat dual purpose animals. They were prized not only for their ability to produce appetite-satisfying meat in a wide variety of products, but also for their ability to convert plant materials to fat, thereby representing a primary source of edible fats in the United States. The rapid increase in the supply of relatively low-cost vegetable oils since World War II resulted in a depressed price for lard and the diminished status of swine as a source of edible fats. In recognition of this economic reality, the swine industry has, since the early 1950s, been very actively engaged in highly successful genetic, nutritional and management programs designed to maximize muscle and minimize fat production per animal marketed. As a result of these efforts, lard production per head slaughtered in 1977 has been reduced to about half the level produced in 1950. This has been accomplished simultaneously with ever-closer trimming of fat from the cuts offered to the consumer.

While cattle and lamb fats have been, and remain, an important by-product of their slaughter, the reliance on them as converters of plants to fat has never been viewed as an economic asset as was the case historically for swine. However, consumers undoubtedly purchase all red meats primarily for their

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Differences of opinion among scientists is to be expected. One of the valuable attributes of a scientist is the ability to think in independent and original terms. Such traits lead to the expansion of the frontiers of the scientific community and indeed to the community at large. It should not be surprising that such characteristics make it more difficult to reach even a consensus opinion, let alone a unanimous one, regarding such a complex issue as diet/health.

There are those in the scientific community who seem willing to make sweeping dietary recommendations on the premise that such changes involve an acceptable risk level for adverse effects and may possibly result in benefits.

muscle content and consider the fat contained as an economic loss. Thus, the consumer pressure for increased leanness of meat products, which expressed itself forcefully in pork consumption in the early 1950s, became fully recognized in the beef and lamb consumption perhaps a decade later. As a result of this awareness on the part of the cattle and sheep industry, their response was similar to that of the swine industry. Even a casual observer of carcass composition must recognize the dramatic changes toward less fat and more lean that have taken place in the meat supply during the past three decades. As a result, if one assumes that little of the fat attached to retail cuts is actually consumed, then the true consumption of meat has increased to a greater extent than indicated by carcass weight disappearance data.

It is obvious from observing the per capita consumption, which has increased by more than 25 percent over the past three and one-half decades, that red meat is viewed by consumers as a desirable dietary component. Pork consumption has remained relatively constant over that time period while lamb and mutton and veal consumption has declined. Those declines, however, have been more than compensated for by increases of more than 80 percent of beef consumption.

Diet/Health Controversy Not New

The diet/health controversy, insofar as red meat is concerned, is not a new issue. During the first two decades of this century, the annual per capita consumption of red meat and lard declined by more than 27 lb., with beef consumption accounting for nearly 23 lb. of that total. Thomas E. Wilson, president of the Institute of American Meat Packers speaking before the American National Livestock Assn. on Jan. 12, 1922, said: "One of the outstanding factors operative for the last two decades has been the fostering and development by propaganda of an impression that meat is harmful to the health. In this connection, meat has been misrepresented in a damaging fashion and in a widespread way. The food value of meat has been mis-stated, its place in the diet minimized, and its healthfulness challenged. People are naturally sensitive to any propaganda relating to their health. They are quick to avoid foods said to be harmful. In this way the public, no doubt, has been materially influenced. Almost every other food interest has made invidious comparisons of its products with ours to the disparagement of meat. Many of these comparisons have not reflected the truth from a scientific standpoint." Characteristic of such information is an article from the April 1905 issue of The Ladies Home Journal entitled "Why I Do Not Believe in Much Meat," an excerpt from which is: "Nourishing diet, in the minds of most people, is a meat diet, which soon upsets the digestive organs and makes the person a martyr to rheumatism and gout. Women grow constipated and have cloudy complexions; men red-faced, or very thin, according to their various resisting powers."

Mr. Wilson suggested: "Scientific data wherewith to correct adverse propaganda should be collected, compiled and disseminated showing the high value of meat in the diet. Such information should be circulated among dietitians, physicians, hospitals, teachers, home demonstrators, household editors, agricultural colleges and others."

In its Jan. 21, 1922, issue, the National Provisioner reported on the creation of the National Live Stock and Meat Board stating that it "shall be created to conduct and direct an adequate educational campaign counteracting the widespread and insidious propaganda against the food value of meat and disseminating through all possible avenues correct information about meat in the diet."

Opinions Differ

Differences of opinion among scientists is to be expected. One of the valuable attributes of a scientist is the ability to think in independent and original terms. Such traits lead to the expansion of the frontiers of scientific knowledge and, as such, are a valuable asset of the scientific community and indeed to the community at large. It should not be surprising that such characteristics make it more difficult to reach even a consensus opinion, let alone a unanimous one, regarding such a complex issue as diet/health. Some recent examples of truly dedicated, knowledgeable and well-meaning scientists reaching differing conclusions from observing a common body of knowledge reflect that difficulty. Dr. D.M. Hegsted of the Harvard School of Public Health in a press release on Feb. 14, 1977 regarding the second edition of dietary goals said: "The diet of the American people has become increasingly rich—rich in meat, other sources of saturated fat and cholesterol, and in sugar. It should be emphasized that this diet which affluent people generally consume is everywhere associated with a similar disease pattern—high rates of ischemic heart disease, certain forms of cancer, diabetes and obesity. These are the major causes of death and disability in the United States."

Only some two years later in a 1979 report from the Surgeon General appears the statement that "the population of the United States has never been healthier" and "mortality rate for coronary heart disease has declined 20 percent during the last 20 years and is currently falling at 2 percent per year." The following year, 1980, the Food and Nutrition Board of the National Academy of Science said, "The American food supply on the whole is nutritious and provides adequate nutrients to protect essentially all healthy Americans from deficiency diseases" and "the excellent state of health of the American people could not have been achieved unless most people made wise food choices."

It should be recognized that a diet is a massively complex and variable combination of a multitude of nutrients and other components. Ingested by the human, which is an organism of an extremely complex and nonuniform nature, those dietary ingredients are broken down into simpler forms by various biochemical and physical means to exert

their ultimate effect on the human organism. The oversimplification of the role of diet or even a single food entity on the health and well-being of the human leads to potentially dangerous conclusions. It is somewhat analogous to characterizing a single tree while not recognizing the existence of the forest of which the single tree is only a small part.

There are those in the scientific community who seem willing to make sweeping dietary recommendations on the premise that such changes involve an acceptable risk level for adverse effects and may possibly result in benefits.

It is disturbing that such a segment of the scientific community seems to be gaining in influence, especially in the popular press. It would seem that challenges to the safety of our environment or our food supply whether or not properly founded in fact, are deemed newsworthy and hence receive widespread media distribution. On the other hand, a statement such as made by the Food and Nutrition Board in 1980 that "the excellent state of health of the American people could not have been achieved unless most people made wise food choices," is viewed as not very dramatic and hence receives little attention by the news media.

Meat Contributes Positively to Diet

Although the diet/health controversy regarding meat has not subsided over the eight decades of this century, there has been, and continues to be, an increasing body of scientific knowledge reflecting the positive contributions of meat to the diet of man. Meat has long been recognized as an excellent source of high quality protein. A 3-oz. serving of meat supplies more than half the daily human requirement for protein. The fact that it is a high quality protein simply means that it contains all of the essential amino acids in amounts appropriate for best use by the human. It therefore needs no supplementation from other proteins to be effectively utilized.

Meat is an excellent source of the B vitamins and ranks as the principal dietary source of most of them. Pork is an exemplary source of thiamin with a 3-oz. serving supplying well over 50 percent of the U.S. RDA. A 3-oz. serving of meat supplies about 15 percent of the U.S. RDA for riboflavin and more than 15 percent for niacin. Meat is also recognized as a good source of pyridoxine (B_6) and vitamin B_{12}.

Meat is a good dietary source of minerals, especially of iron. The heme iron in meat is highly available to the human and its presence also aids in the assimilation of the nonheme iron present in the diet from plant sources. Meat also supplies about 15 percent of the U.S. RDA for the trace mineral zinc.

Because meat contains such significant quantities of these important nutrients in relation to its caloric contribution of about 200 calories, it is described as a food of high nutrient density.

Dietary Implications on Human Health

There are many human conditions that the scientific community and the popular press have purported to be related to the diet. It is the intent of this discussion to limit such considerations to those having implications for the livestock and meat industry and likewise perceived to be important by the public-at-large. Dietary implications regarding obesity, cardiovascular diseases, hypertension and cancer are discussed.

Probably obesity is a condition that excites the least controversy. The Food and Nutrition Board contends that obesity, or excess fatness, is the most common form of malnutrition in the Western nations of the world. It has a multiple etiology and is influenced by neurohumoral, endocrine, metabolic and social factors. It is generally recognized that, in many persons, obesity is associated with significant increases in morbidity and mortality from such diseases as hypertension, diabetes, coronary heart disease and gall bladder disease, and that mortality from these diseases is reduced with weight reduction. Obesity results from the failure, for whatever reason, to balance energy intake with energy expenditure. Such a balance is difficult to achieve when energy expenditure is low, as is generally true for the adult population of the United States.

Because meat is of high nutrient density, it fits very well into either a weight-reduction diet or a diet low in energy and designed to maintain body weight at the desired level. Dr. Maria Simonson of John Hopkins has compared response to vegetarian vs. meat diets in weight-reduction programs. She reports that those on a meat diet 1) lost weight somewhat more slowly, though not significantly so, 2) were more consistent in weight loss, 3) had fewer drop-outs and less cheating, 4) had no feelings of hunger, 5) had far fewer physical and psychological problems, 6) had no anemias, 7) improved their work productivity and work efficiency (by 13 percent) and 8) showed excellent weight maintenance for up to one year for those who achieved goal weight. To obtain the necessary nutrient intake in diets of reduced energy level, it is obvious that nutrient-dense foods, such as meat, must play a prominent role.

Arteriosclerosis and its complications, i.e., coronary artery disease, stroke and peripheral vascular disease are the leading causes of death in the United States. Cardiovascular disease is the leading health problem accounting for about 50 percent of the deaths in this country. Mortality rates from cardiovascular disease, as is true for other degenerative diseases, increase sharply with increasing age. Several risk factors for cardiovascular disease have been identified through epidemiological studies. Among these is hypercholesterolemia or high levels of cholesterol in the blood serum. Risk factors are those factors found to be statistically associated with an increased incidence of the disease and cannot, without independent evidence, be considered causative agents of the disease. In any event, the identification of high serum cholesterol levels as a risk factor has led to concern about cholesterol and

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fat, especially saturated fat, in the diet. Cholesterol is found primarily in foods of animal origin with a 3-oz. serving of lean meat containing about 75 mg. The human synthesizes between 800 mg. and 1,500 mg. of this essential metabolite per day. Dietary cholesterol is poorly absorbed by man, with only 10 percent to 50 percent of dietary intake actually absorbed.

Diet modification with respect to level and kind of fat and the amount of cholesterol has been shown to alter serum lipid and lipoprotein concentrations of subjects in metabolic wards under rigid dietary control. A high intake of saturated fat as a percentage of calories is a major factor in elevating serum cholesterol and LDL (low density lipoproteins) levels and the reverse is true for a high intake of polyunsaturated fat. Studies among free-living subjects, however, indicate that such dietary modification is only about 60 percent as effective in altering serum cholesterol and lipoprotein levels as was the case for the controlled-metabolic-ward studies. Obviously, other factors still to be identified, in addition to diet, influence serum lipid values of free-living persons in an as yet unpredictable manner.

Intervention trials utilizing diet modification to alter the incidence of coronary artery disease and mortality in middle-aged men have generally been negative. It has not been proven that lowering serum cholesterol and LDL levels by dietary intervention will consistently affect the rate of new coronary events. The Food and Nutrition Board "recommends the dietary fat content be adjusted to a level appropriate for the caloric requirements of the individual" and "that sedentary persons attempting to achieve weight control may be well-advised to reduce the caloric density of their diets by reduction of dietary fat." Regarding dietary cholesterol, the Food and Nutrition Board says, "no significant correlation between cholesterol intake and serum cholesterol concentration has been shown in free-living persons in this country" and "the board makes no specific recommendations about dietary cholesterol for the healthy person."

A genetic predisposition for hypertension is believed to exist in the United States for about 15 percent to 20 percent of the population. While sodium has been implicated in this condition, an association between blood pressure and salt intake has not been demonstrated within selected U.S. populations. Nevertheless, dietary sodium reduction is a frequently made recommendation for those persons with elevated blood pressure.

Sodium appears to exist in red meats in a reasonably constant relationship to protein. Red meat contains about 3.5 mg. of sodium per gram of protein. Thus a 3-oz. serving of fresh meat having 16 percent protein would contain about 48 mg. of sodium. It can, therefore, be used very effectively in diets restricted in sodium.

Salt (NaCl) has been widely used for centuries as a preservative for meats in addition to its flavor-enhancement properties. Salt is the primary contributor to the sodium content of processed meats. At this time, the meat industry has no economically viable preservative alternative to the use of sodium chloride. Research is currently in progress to develop alternative compounds, combinations, etc., to permit reduction in the amount of sodium used. It is probable that some reduction in amount will be possible as a result of such research, with potential reductions estimated at about 25 percent.

Processed meats, such as ham, bacon and a myriad of different sausages, have provided a multitude of dietary variations and have added greatly to our food enjoyment. They have greatly enhanced the overall palatability of the American diet. It seems that the first requirement of a suitable diet is frequently overlooked; namely that it be palatable and otherwise appealing to the consumer. Processed meats have much to contribute in that regard as well as making a substantial contribution to nutrient requirements.

NRC Committee Report

The issue of diet/cancer was recently addressed by a special committee of the National Research Council reported on June 16, 1982, in a document entitled Diet, Nutrition and Cancer. As acknowledged by that committee, the extent of the relationship between diet and cancer is not precisely understood at this time. That committee further stated: "It is not now possible, and may never be possible, to specify a diet that would protect everyone against all forms of cancer. Nevertheless, the committee believes that it is possible, on the basis of current evidence, to formulate interim guidelines that are both consistent with good nutritional practices and likely to reduce the risk of cancer."

Two of those interim guidelines have potential for direct impact on the red meat industry: 1) the consumption of both saturated and unsaturated fats be reduced in the average U.S. diet from the current level of about 40 percent of calories to about 30 percent and 2) the consumption of food preserved by salt curing (including salt pickling) or smoking be minimized.

Regarding dietary fat, it is of interest to note that the per capita consumption of animal fats has declined over the past 70 years by about 7 percent, but the per capita consumption of vegetable fats has increased by 180 percent.

As consumers consider reduction in caloric intake, they should be fully aware of the nutrient contributions made by the fat-containing foods they consume. Animal-source foods are often nutrient-dense, providing significant quantities of nutrients in relation to calories contributed. Eliminating or reducing such foods because they contain fat may result in a deficiency of other essential nutrients provided by those foods.

To further illustrate this point, the U.S. Department of Agriculture's Nationwide Food Consumption Survey 1977-78 has shown that women from 20 to 50 years of age did not receive the Recommended Dietary Allowances for the following nutrients: vitamin B_6 (78 percent of RDA), folacin (71 percent),

iron (77 percent) and zinc (69 percent). This short-fall occurred with a dietary pattern in which 42 percent of the calories originated from fat. It seems prudent to suggest that any change in food consumption aimed at reducing dietary fat should be made only after consideration of its effect on other essential nutrients, especially those already perilously low.

The committee's recommendation that the consumption of salt cured or smoked food be minimized appears to be based primarily on epidemiological data. It is presumed by the committee that such foods contribute to the incidence of esophageal and gastric cancer, especially gastric cancer. This recommendation is made despite the acknowledgement by the committee that gastric cancer in the United States is low and is decreasing. It has been described by others as "almost a vanishing disease." That declining incidence has occurred during a time period in which per capita processed-meat consumption has increased by about 50 percent.

The transfer of associations revealed by epidemiological studies from extremely diverse life styles would seem to be tenuous at best. In this case, populations in China, Japan and Iceland that consumed diets containing salt-cured or smoked foods were referenced as having high incidences of esophageal and stomach cancer. The body of the committee's report identifies salt-pickled vegetables as being widely consumed in China and states that they are frequently contaminated by fungi. The committee acknowledges that the N-Nitroso compounds (carcinogens) contained in such foods were believed to originate with the fungus contaminants. To suggest that this food consumption pattern and its association with a high incidence of stomach cancer is useful in establishing recommendations for the U.S. population regarding processed-meat consumption would seem, at best, questionable.

Balanced Diet Best Approach

Red meat continues to be a vital contributor to the satisfaction of the human nutrient requirements in the United States. The recommendation to consume a balanced and varied diet, including foods from all food groups, remains the most effective approach to good nutrition. The red meat industry takes justifiable pride in its contribution to the current health condition described by the Surgeon General of the United States, "The population of the United States has never been healthier."

Finally, the Food and Nutrition Board of the National Academy of Sciences, since 1941 the nation's recognized authoritative voice regarding nutrition/health, expressed its concern in 1980 over excessive hope and fears in many current attitudes toward food and nutrition. The Board said, "Sound nutrition is not a panacea . . . Good food that provides appropriate proportions of nutrients should not be regarded as a poison, a medicine, or a talisman, IT SHOULD BE EATEN AND ENJOYED." AJ