Nutritional manipulation has been suggested as a mode of decreasing atherosclerosis. Atherosclerosis is a disease process that begins with fatty streaks during infancy and childhood and progresses at a variable rate to the formation of atheromatous plaques and subsequent obstruction of arteries, which may result in coronary and cerebral thrombosis.

Hypercholesterolemia, hypertension, smoking, obesity, abnormal glucose tolerance, lack of physical activity, and psychosocial tension have been identified as risk factors of arteriosclerosis in adults. Attention has been directed to advisable diets of infants and children, although arteriosclerosis and coronary artery disease are rare in these age groups. Dietary recommendations for adults, including low-fat and low-cholesterol diets, have been made to limit some of the risk factors and thus help prevent arteriosclerosis. Evidence supporting and denying the importance of each of the risk factors has been reported extensively and is not reviewed here. The application of some of these dietary recommendations to children has been questioned.

Dietary factors in children must be considered simultaneously with physical activity, life-style, and genetic influences. Limiting fat and cholesterol intake has been questioned because, during the first years of life, breast milk (a cholesterol-containing food) is considered the ideal food for infants. In teenagers, serum cholesterol consistently decreases from preteen levels. In addition, formation of bile acids, hormones, and special tissues may indicate a continuing need for cholesterol during the entire growth period. Furthermore, limitation of total caloric intake to maintain ideal weight and dietary variability, including vegetables, will result in a lowering of fat intake.

There is controversial evidence concerning the relationship between dietary and serum lipids in infants. This relationship either is not found in children aged 6 to 16 years old or is not striking. Children with elevated serum cholesterol levels show a greater response to diets low in cholesterol and saturated fat than children with levels in the normal range. In schoolchildren, the variations in cholesterol concentration correlate better with familial patterns than with dietary factors.

Dietary constituents other than cholesterol and fat have received less attention. Fiber, especially pectin, is known to be hypocholesterolemic through the promotion of bile acid excretion. Despite extensive work in animals, the source of dietary protein has been shown only recently to be a factor in man. High intakes of cholesterol in the neonatal period have been shown to be associated with an increased ability to handle a dietary cholesterol challenge in rats, but not in guinea pigs.

Human milk contains more cholesterol than cow's milk or formulas derived from it. The role of breast-feeding in preventing atherosclerosis is not clear. One relatively long-term study showed lower serum cholesterol concentrations in children aged 7 to 12 years old who were fed prepared formula (3 mg/dL of cholesterol) rather than human milk or cow's milk (more than 10 mg/dL of cholesterol) during the first 3 months of life. Another report suggests that the duration of early feeding practices does not seem to influence subsequent cholesterol levels.

As in adults, obesity in children is associated with elevation of serum cholesterol values. A significant percentage of 5- to 14-year-old children in the Bogalusa study whose serum cholesterol levels were at the 95th percentile were also at or above the 90th percentile for weight. (Exercise rather than diet probably accounts for the differences in lipid profiles between marathon runners, joggers, and sedentary men.) Although an increased sodium intake is associated with the development of hypertension in the experimental animal and may play a role in genetically susceptible adults, data on both sodium intake and hypertension in children are not adequate for conclusions concerning the role of these factors in the development of clinical manifestations of atherosclerosis in later life.

Identification of the child at risk for the development of early atherosclerotic disease is possible...
and is thought to be more practical than screening the entire child population. After the first 2 years of life, during which time the serum lipid pattern reflects the dietary intake, correlation with the serum lipid pattern of the child's parents has been found. Children of parents with high-cholesterol levels are 2.7 times more likely to have serum cholesterol values greater than the 95th percentile than children in the general population. Myocardial infarcts or strokes in primary relatives (including grandparents) occurring at ages less than 60 years are associated with a high prevalence of genetically determined disorders of lipoprotein metabolism. Familial obesity and hypertension are also warning signals.

How should pediatricians react to this information? The Committee on Nutrition recommends that human milk or prepared formula supplemented with infant foods after 4 to 6 months of age be used during the first year of life. These feeding regimens are ample in unsaturated fat. They appear to be appropriate for infants at risk of developing atherosclerosis, as well as for those not at risk.

The diet-heart hypothesis is only one aspect of the multifactorial etiology of atherosclerosis. Although many physicians advocate the "prudent" diet as a wise recommendation for the entire population, others have reservations. The advocates believe that diets high in saturated fat, cholesterol, sodium, and calories are the "primary, essential cause" of the current epidemic of premature atherosclerosis, and the evidence is overwhelming that a change in dietary habits of the entire population will be beneficial. Furthermore, because the disease process starts early in life, the dietary recommendations should be instituted when eating habits are being established. Reservations concerning this approach can be summarized as:

1. Epidemiologic studies are not of themselves sufficient to establish cause-and-effect relationships.
2. In diseases of multiple etiology involving genetic factors, it is necessary to understand the extent to which dietary intervention and individual responses are related.
3. Clinical trials in the population at risk should be positive before widespread application.
4. The institution of a public health nutrition program requires the active support of the health-related professions.
5. The safety of diets designed to decrease caloric intake, increase consumption of complex carbohydrates, decrease intake of refined sugars, decrease consumption of fat and cholesterol, and limit sodium intake has not been established in growing children and pregnant women. An increase in cereal grains at the expense of animal protein with a decrease in the density of essential nutrients without further dietary advice might result in a decrease of some protective micronutrients such as vitamins and minerals; this might pose health risks to children. Dietary guidelines, which meet these objectives of adequate nutrient intake and the Recommended Dietary Allowances for children more than 5 years old, have been published by Dwyer.

Recommendations for changes in infant's and children's diets should contain the following elements:

1. When breast-feeding is unsuccessful, inappropriate, or stopped early, infant formulas provide the best alternative for meeting nutritional needs during the first year of life. Supplementary foods are recommended beginning at 4 to 6 months of age. Dietary fat should not be restricted in this age group.
2. After 1 year of age, a varied diet from each of the major food groups is the best assurance of nutritional adequacy.
3. Detection of obesity by measuring height and weight and detection of hypertension by measuring blood pressure according to the schedules published by the Academy will permit the early recognition and treatment of obesity and hypertension.
4. Maintenance of ideal body weight, a regular exercise program, and, in teenagers, counseling concerning the dangers of smoking should be a routine part of all health supervision visits.
5. The family history for every patient should include information about family members who have had premature heart attacks or strokes (when the patient is 60 years old or less), hypertension, obesity, and hyperlipidemia.
6. Screening of children more than 2 years old who are at risk because of family history should consist of at least two serum cholesterol measurements. The high-density lipoprotein cholesterol should be measured in those who consistently have levels above the 95th percentile for age and sex. If high-density lipoprotein cholesterol is not the cause of the hypercholesterolemia, the patient should be treated with an appropriate diet and/or medication.
7. Current dietary trends in the United States toward a decreased consumption of saturated fats, cholesterol, and salt and an increased intake of polyunsaturated fats should be followed with moderation. Diets that avoid extremes are safe for children.

Committee on Nutrition, 1982–1983
Alvin M. Mauer, MD, Chairman
Harry S. Dweck, MD

AMERICAN ACADEMY OF PEDIATRICS
SELECTED READING

Council on Scientific Affairs: American Medical Association concepts of nutrition and health. JAMA 1979;242:2335

ANNOUNCEMENT OF 1983 NEONATAL-PERINATAL MEDICINE EXAMINATION

The Sub-Board of Neonatal-Perinatal Medicine of the American Board of Pediatrics will administer its next certifying examination on Monday, November 28, 1983.

The following criteria must be met to be eligible to sit for the examination:
1. Certification by the American Board of Pediatrics;
2. Two years of full-time graduate training in neonatal-perinatal medicine completed by September 1, 1983;
3. Verification of training.

Each application will be considered individually and must be acceptable to the Sub-Board of Neonatal-Perinatal Medicine.

Registration for this examination will extend from DECEMBER 1, 1982 until MARCH 31, 1983. Requests for applications received prior to the opening of registration will be held on file until that date, at which time application materials will be sent to those who have requested them.

The application fee for the written examination is $550 ($150 processing + $50 registration + $350 examination). Candidates who are not approved to take the examination will be refunded the $400 examination and registration fees. The processing fee will be retained.

Please direct inquiries to: American Board of Pediatrics, Inc
111 Silver Cedar Court
Chapel Hill, NC 27514
Phone: (919) 929-0461
Toward a Prudent Diet for Children

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