Meetings

Atherosclerosis

Recent advances in research on atherosclerosis were the subject of an international symposium, held in Athens, Greece, 30 May–2 June 1966. About 150 participants from 23 countries attended.

During the opening session, on epidemiology of atherosclerosis, J. J. Groen (Israel) identified some possible risk factors—age and sex; ethnic background; diet (saturated and unsaturated fat, cholesterol, carbohydrates); lack of physical activity; hypercholesteremia; hyperbetalipoproteinemia; obesity; cigarette smoking; predisposing diseases, such as diabetes; psychosocial factors; and genetic factors. Depending upon the population being studied various factors assume importance, but he deemed diet, physical activity, and hypercholesteremia among the most important in all studies. D. Brunner (Israel) reported on a 15-year study among workers in communal settlements in Israel. The group under study lived in a uniform environment. There was no difference in body weight or serum lipids between sedentary and nonsedentary workers, but in the former group he observed between 2.5 and 4 times greater incidence of angina and myocardial infarction. J. Stamler (Chicago) evaluated high risk factors in a large group of men and found that these factors (hypercholesteremia, obesity, hypertension, cigarette smoking) could be influenced by education and changes in dietary habits. H. C. McGill, Jr. (New Orleans) reported on a cooperative study carried out by 19 pathologists in 17 countries. The pathologists collected 23,000 coronary arteries and aortas from autopsied patients whose age range was 10 to 69 years. Aortic fatty streaks in young individuals did not correlate well with aortic-raised lesions at older ages. However, coronary artery fatty streaks correlated well with coronary artery lesions. Coronary artery fatty streaks are more likely to be converted to advanced lesions than are aortic fatty streaks. The two groups exhibiting the greatest extent of raised aortic lesions were New Orleans whites and Oslo natives. The third and fifth groups were Durban Indians and Filipinos. New Orleans Negroes were third in prevalence of lesions, but Brazilian Negroes were 16th. It will be of interest to ascertain what factors cause the fatty streaks which occur in certain populations to progress to raised lesions. In a session devoted to whole body metabolism of cholesterol, E. H. Ahrens, Jr. (New York) discussed analytical methodology used in quantitation of steroid excretion. He has found that unsaturated fat, while lowering serum cholesterol levels, does not increase the fecal output of neutral sterols or bile acids. He is investigating other metabolic pathways which may account for the loss of sterol from the serum. On the other hand, L. Kinsell (Oakland) reported that unsaturated fat does indeed increase the fecal output of cholesterol and its metabolic products. This dichotomy was not resolved.

The metabolism of whole arteries and of tissue cultures was another area of discussion. H. B. Lofland, Jr. (Winston-Salem) presented data obtained from perfusion of aortas of White Carneau pigeons, a breed that is susceptible to spontaneous atherosclerosis. The aorta of the pigeon synthesizes significant quantities of fatty acids; the rate of synthesis is enhanced as atherosclerosis becomes more severe and synthesis is most active in the atherosclerotic plaque. In normal aortas most of the newly synthesized fatty acids are in the triglycerides and phospholipids, but in atherosclerotic aortas the most significant increase in newly synthesized fatty acid is in the sterol ester. In some cases a significant synthesis of cholesterol has been observed.

D. E. Bowyer (Cambridge, England) reported on the perfusion of rabbit aortas with various fatty acids. He found that palmitate was more readily incorporated into tissue lipids than were oleate, linoleate, or stearate. Perfusions with cholesteryl esters indicated that cholesteryl stearate was more readily taken up by aortic tissue than were cholesteryl oleate or linoleate. Cholesteryl palmitate was the least readily incorporated. In other experiments, hydrolysis of cholesteryl esters was studied. The order of experimentation was: linoleate, palmitate, oleate, and stearate. These data are significant in view of the general observations that appreciable amounts of cholesteryl esters appear only in atherosclerotic aortas, and the principal ester found is cholesteryl oleate. The findings are also related to reports by J. Patelski (Poznan, Poland) and T. Zemplenyi (Prague, Czechoslovakia) that aortas of species resistant to atherosclerosis (dog, rat) have a higher lipolytic activity than do those of susceptible species (rabbit, chicken). In discussions of metabolism of cells or cellular fractions, J. Mead (Los Angeles) reported that growth of HeLa or heart cells ceased in the absence of linoleic or arachidonic acids. A. L. Robertson, Jr. (Cleveland) noted that hypoxia led to increased incorporation of cholesterol by human aortic cells.

P. Alaupovic (Oklahoma City) reviewed methods for separation of lipoproteins and discussed their chemical composition. An explanation of the secondary structure of lipoproteins of human serum by optical rotatory dispersion was reported by Dr. A. Scanu (Chicago). His data indicate that lipids do not play a significant role in the maintenance of the secondary structure of the apoproteins of the low and high density lipoproteins. H. Peeters (Bruges, Belgium) has achieved separation of serum α_1, α_2, and β lipoproteins and chylomicrons by a process which he calls electrochromatography, a combination of chromatography and electrophoresis. This separation method readily yields the various fractions in a form suitable for further chemical analysis. D. S. Fredrickson (Bethesda) discussed the combined use of paper electrophoresis with a buffer containing albumin for separation of the serum lipoproteins. This method has permitted Fredrickson to classify patients into five different categories based upon their lipoprotein patterns, and thus to recognize easily defects in fat metabolism

which may be of genetic origin. Much discussion was devoted to atherosclerosis (natural and experimental) in primates as well as other animals.

R. W. Wissler (Chicago) discussed experiments in which Rhesus monkeys on an average American diet exhibited higher levels of cholesterol and more atherosclerosis than monkeys on a "prudent" diet with decreased quantities of fat, carbohydrate and cholesterol and less saturated fat. Wissler has also been able to accelerate development of atherosclerosis in Rhesus monkeys by feeding them a commercial monkey ration supplemented with 25 percent fat consisting of a ratio of one to one mixture of coconut oil and butter oil and containing 2 percent cholesterol. S. B. Andrus (Boston) reported that spontaneous atherosclerosis is prevalent in the chimpanzee. T. B. Clarkson (Winston-Salem) reviewed the pathologic characteristics of atherosclerosis in New World monkeys and stated that squirrel (*Saimiri sciureus*) and spider (*Ateles sps*) monkeys exhibit spontaneous atherosclerosis. The latter breed of monkey seems especially well suited for experimental work because of size (8 kilograms at maturity) and a willingness to eat experimental diets.

The most striking report in the area of experimental atherosclerosis in nonprimates was that of H. Malmros (Lund, Sweden) who showed that it is possible to induce atherosclerosis in dogs by feeding them a semisynthetic diet free of thiouracil and containing cholesterol and hydrogenated coconut oil. Dogs had hitherto been considered resistant to atherosclerosis induced by cholesterol. Another major topic of discussion was the use of pharmaceutical agents for lowering levels of lipids and thus possibly reducing mortality from cardiovascular disease. G. Schettler (Heidelberg, Germany) and C. J. Miras (Athens, Greece) noted the pharmaceutical armamentarium available to the clinician. Drugs currently in use are nicotinic acid, β-pyridine carbinol, D-thyroxine, and p-chlorophenoxy isobutyric acid (CPIB). The two last named compounds may be used together since the former has a greater effect on serum levels of cholesterol and the latter on levels of triglyceride. It was stressed that all currently available drugs must be administered under strict medical supervision. Miras also suggested that diet may still be the best hypolipemic therapy. G. Schlierf (Heidelberg, Germany) advocated vigorous exercise as a means to lower levels of lipids, to improve cardiac performance, and to increase formation of collateral circulation.

T. Shimamoto (Tokyo, Japan) reported on the dramatic improvement observed in patients with Buerger's disease who were treated with pyridinol carbamate (1 gram daily). There was an increase in arterial pulsation and prolongation of claudication time within 2 weeks. In patients who were being treated for longer periods (1 to 10 months), there was evidence of the opening (partial or complete) of occluded arteries. This drug has also caused regression of preestablished atheromata in rabbits.

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Earthquake Prediction

An increasing interest in the subjects of earthquake mechanism and earthquake prediction was demonstrated by Japanese and U.S. geophysicists at the second Conference on Research Related to Earthquake Prediction held under the auspices of the U.S.–Japan Cooperative Science Program at the Lamont Geological Observatory of Columbia University in Palisades, New York, 6–10 June 1966. Although precise prediction of size, time of occurrence, and spatial location of earthquakes is not yet possible, the conference demonstrated that there are many topics for research which offer the hope of providing information of value for prediction.

At the opening session, T. Hagiwara (University of Tokyo) described the 5-year Japanese research program on earthquake prediction. This program is already under way and includes measurement of crustal strain through the use of tide gauges, geodetic surveying techniques, strain meters, and tiltmeters. Seismic activity is determined for shocks of all sizes including the ultramicroearthquake range, and observations are made of changes in seismic velocity, of heat flow, and of the geomagnetic field. Also included in the program are studies of relevant rock properties under laboratory conditions.

F. Press (MIT) described the proposed 10-year U.S. program which differs from the Japanese program more in emphasis than in content. The U.S. program focuses a massive instrumental and systems effort on an area of the country likely to experience a major destructive earthquake and one which is reasonable logistically, the San Andreas Fault zone of California. Some emphasis would also be placed upon the Alaskan and Nevadan seismic areas. The U.S. program had not been funded at the time of the meeting.

New seismograph systems described range in size from the 525-sensor, 125-mile diameter LASA installation in Montana (P. Green, MIT) to a high-frequency, high-gain, self-powered instrument (P. Pomeroy, Columbia University) suitable for backpacking into remote areas for study of microearthquakes. I. Iida (Nagoya University), T. Asada (Tokyo University), and D. Tocher (ESSA) described more elaborate multicomponent systems for precise location and for other types of investigations of microearthquakes. T. Rikitake (Tokyo University) and S. Breiner (Stanford University) reported on magnetometers for measuring differences in the geomagnetic field at two stations separated by a few kilometers. The purpose of such devices is to separate the locally induced portion of the geomagnetic field from the rapidly varying regional field. K. Kasahara (Tokyo University) and R. Hofmann (California Department of Water Resources) described electronic distance measuring devices and their application. In California such measurements indicate that fault creep of the order of several centimeters per year is occurring along the San Andreas fault system and agree with the geodetic results for that area reported by B. Meade (USC&GS) and with direct creep measurements described by D. Tocher (ESSA). Hofmann found some indication of a change in rate and sometimes sense of fault movement preceding California earthquakes.

Kasahara opened the discussion of the most unusual earthquake swarm at Matsushiro as he described measurements of earth strain which agree with the stress system deduced from seismic data. Strains as high as 20×10^{-6} per month were observed. Hagiwara presented information on the