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Are there Effective Ways of Managing Arteriosclerosis?

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The story of the unfolding knowledge of the genesis of arteriosclerosis, and of the resistance of physicians to accept either experimental evidence, or the lessons of geographical pathology, when these point to the bizarre diet of prosperous people as the cause of this disease, reminds one that the facts about this problem are much like "Joy" in Schiller's ode: – "Aus der Wahrheit Feuerspiegel lächelt sie den Forscher an." We shall see, during this conference, how differently the truths of arteriosclerosis present their blinding light to each investigator.

From the patients' point of view, effective therapy means either an operation which eradicates the cause of disease, or a safe drug, with no unpleasant effects, which cures or suppresses the disorder. No such therapy is on hand or in prospect for arteriosclerosis.

The surgeons have evolved effective prostheses for replacing arteriosclerotic parts of the aorta (1), and of the renal and iliac arteries. They have many technics for abolishing the pain of angina pectoris, but no operation which prevents arteriosclerosis. It may be pointed out to them that sprue, and the sprue-like disorder which occurs when the upper half of the jejunum is resected or by-passed in operations for gastric or jejunal tumors, do effectively prevent arteriosclerosis. The only patients we see with normal function of the liver and blood cholesterol levels under 120 mg% are patients with sprue, jejunal lymphosarcoma, Whipple's disease, or operative revision of the gastrojejunal region. For severe familial hypercholesterolemia and precocious coronary disease, radical surgical attack on the jejunum might be justified. We are familiar with the complications of sprue, but we have no knowledge of the damage which may result from years of use of the various drugs now being given to people to prevent coronary disease.

Arteriosclerosis, and more especially coronary atherosclerosis begins in infancy and progresses steadily throughout life. To control such a process drug therapy must be as simple, inexpensive, effective, and free of danger as thyroid extract in hypothyroidism. Because coronary disease is far more frequent in white men than in white women, up to the age of 60, it was natural to see whether sex hormones could control this process. In chicks there is a striking effect on coronary atherosclerosis when estrogens are given to cockerels fed high cholesterol diets, and in men the lipoprotein pattern is favorably altered by estrogen administration.

On the other hand, in negro women coronary atherosclerosis develops earlier in life than in colored men (2), and in *Lober's* classical study (3) of coronary disease he concluded that "coronary sclerosis was found to be significantly more severe in males than in females even in the first decade of life". He also confirmed the fact that the intimal pads of areolar tissue, which are typical of the epicardial part of the coronary system, are thicker in new born male infants than in females. Since these pads are not seen in other arteries of the same size elsewhere in the body, it seems probable that they explain the occurrence of coronary atherosclerosis in young people who have no lesions of this sort in other arteries. Perhaps the sex difference in coronary disease is more anatomical than endocrine in origin, since there is no difference in aortic sclerosis even in white people. Yet, it is noteworthy that *Bauld* (4) observed that when estradiol 17 β was given intramuscularly, men with coronary disease excreted 5.5 times as much estriol as estrone, while controls excreted only 50% more estriol than estrone. A study of coronary intima and of estrogen metabolism in negro men and women might cast more light on the effect of sex on coronary disease.

From a practical point of view it must be noted that men with prostatic cancer, receiving massive doses of estrogen, have not been immune to coronary disease, and that effective doses cause loss of libido and potentia, as well as gynecomastia and some risk of breast cancer, if used over decades. We have only used this form of therapy for women past the menopause and for men who, for social or family reasons, were willing to be freed of sexual urge. In discussing with wives of patients whether they would prefer to have estrogen therapy given their husbands, rather than to prepare special diets, we have discovered that frigidity is rare in wives of coronary victims.

Heparin in modest and safe doses does change the pattern of plasma lipid and diminishes post-prandial lipemia. In larger doses at more frequent intervals it will greatly reduce the hazard of thrombotic accidents.

Its use is justified whenever symptoms indicate acute increase in coronary insufficiency or actual myocardial infarction, and as maintenance therapy for those with coronary disease who will accept this and reject any other management. Dicoumarol, or its analogues, can be used to take over the anti-coagulant action after the first few days, but it lacks heparin's power to modify the plasma lipids. This is perhaps compensated for, in part, by greater ease in administration. But because laboratory control is essential, and hemorrhagic complications annoying or alarming, control of arteriosclerosis by anticoagulant can only be described as an unphysiologic substitute for proper management.

The use of lipotropic agents, and of substances like sitosterol, which to varying degrees interfere with absorption of cholesterol esters from the jejunum, can only be described as disappointing. In many patients there is no demonstrable effect even when agents of either type are given in maximal daily doses. In some patients the blocking agents, which are so effective in the rabbit or the chicken, do demonstrably lower plasma cholesterol, but the cost and inconvenience, together with the low order of effectiveness, eliminate these agents as dependable therapy for arteriosclerosis.

Drug-induced hyperthyroidism always lowers plasma cholesterol, and may be justified if the patient feels well and experiences no cardiac or other embarrassment from the induced disorder. We feel that the use of thyroid or tri-iodothyronine is justified only when the patient requires it because of other evidence of thyroid insufficiency. Tri-iodothyroacetate is especially effective in lowering cholesterol in relation to its other metabolic effects. But the combination of coronary disease and hyperthyroidism is so frequent that we cannot depend on thyroid therapy to control arteriosclerosis.

The administration of certain metals, such as vanadium, or of certain chelating agents, such as versene (ethylene diamine tetra-acetic acid), regularly lowers blood cholesterol levels and prevents or retards experimental atherosclerosis, but the risks of decades of such therapy appear to be considerable. Versene lowers the ionized calcium level, thus acting also as anticoagulant, and has produced renal tubular changes in man similar to those caused by potassium depletion.

There is only one physiologic and effective management for arteriosclerosis, but this requires the enlightened cooperation of the patient. The first step in effective control is to secure the cooperation of the patient and the family by providing such enlightenment. As a rule, this can only be done when there is no doubt about the seriousness of arteriosclerosis for the patient. Even among those who have the highest hazard,

such as American military, business and professional men, only one out of three will be seriously disabled or killed by arteriosclerosis. Prophylactic management usually is mischievous except when the patient is aware of symptoms due to vascular disease, or when the family history and the thorough study of a patient show that the risk of such symptoms is great. Blood cholesterol levels over 300 mg%, or lower levels plus hypertension, or electrocardiographic or ballistocardiographic evidence of cardiac injury by asymptomatic coronary disease, or the absence of pulsations in the arteries of the feet, may be accepted as reasons for discussion of management of arteriosclerosis with a patient who has been alarmed by vascular disease in close relatives.

Certain points need to be stressed in explaining the rationale of therapy to the patient. There is no agreement among experts that abnormal blood clotting precedes and produces arteriosclerosis, but it is agreed that clot formation often precipitates clinical episodes of great severity. There is abundant evidence that meals rich in animal fat cause hypercoagulability of the blood and retard fibrinolysis (5), and that coronary disease and tendency to post-operative accidents due to clot formation show parallel rates of incidence in various parts of the world, and in various economic groups. The incidence of these two types of disorder falls and rises when war suddenly reduces and peace restores the high fat diet (6). The patient can be assured that the diet which controls arteriosclerosis will greatly reduce the chance of serious vascular accidents due to clot formation from varicose veins or after operation, and will delay or prevent formation of gallstones.

The patient can be informed about the high incidence of coronary disease in American soldiers 18 to 35 years old, with the world's highest daily intake of cream, butter, eggs, milk and the fat of stall-fattened cattle, and the absence of coronary disease in armies where the ration is free of eggs and milk products, and relatively low in meat. He may be told how the severity of arteriosclerosis in pastoral people, living largely on milk products, and its rarity in those living mainly on bread, potatoes and beets, led Russian scientists to try the effect of animal fats on rabbits, and thus began the experimental production of arteriosclerosis.

The patient should know that cholesterol is a normal component of all his tissues and blood, and that none is needed in his food. Cows yield milk with cholesterol in it, chickens lay eggs with cholesterol in the yolk, and all the herbivorous animals and birds are on cholesterol-free diets, but have 2.5% cholesterol in their brains, 0.1% to 1.0% in other tissues. Since no wild animals or primitive men show any atherosclerosis, the cholesterol formed in tissue or blood is harmless. On the other hand,

suckling rabbits (8) and human sucklings all show cholesterosis of the aorta, and have much higher blood cholesterol levels than when they are weaned.

Carnivorous animals can eat large quantities of fat and cholesterol without having any arterial disease, but if they are put on low protein diets, or have their thyroid glands destroyed, cholesterol added to their diets causes the same rise in plasma cholesterol content, the same arteriosclerosis, as is shown by healthy young rabbits or chickens when cholesterol is added to diets adequate in protein and containing only vegetable oils. In men, as in normal dogs, adding cholesterol to normal diets or to diets containing only vegetable oils, has very little effect on blood cholesterol levels, while changing from 100 g a day of corn oil or fish oil to 100 g of beef fat, butter fat, egg yolk fat, or coconut oil causes a striking rise in blood cholesterol (9, 10). The patient must know that the character of the fat, and the quantity of fat, in the diet are of great importance in determining the fate of the cholesterol he absorbs from his alimentary canal. He must be taught that saturated fatty acids, fatty acids with low iodine numbers, are harmful, while unsaturated fatty acids, those with high iodine numbers, are needed by the body, are relatively harmless in atherogenesis, and have minimal effect in accelerating coagulation or delaying fibrinolysis.

As an aside to the physician, it should be noted that we do not know why the saturated fatty acids act as they do. One can suggest that the esters they form with cholesterol are relatively inert and not easily used by the body. Most of the cholesterol in the plasma is esterified with unsaturated fatty acid, but, as *Schoenheimer* and later *MacArthur* noted, the cholesterol in atheromas is largely esterified with palmitic acid (11), which is the most common of the saturated fatty acids in animal or vegetable fats. The iodine number of palmitic acid is 0; of oleic acid, 90, of linoleic acid, 181; of linolenic acid, 274; and of arachidonic acid, 340. The iodine number of coconut oil is 7; of butter, beef fat, and cocoa butter, 40; of pork, egg yolk, chicken and rabbit fat, 60–80; of olive and peanut oils, 100; of corn, sesame and cotton seed oils, 110–120; of soybean oil, 130; of sunflower and poppy seed oils, 140; of cod liver, sardine, seal and tuna oils, 170 to 190; and of linseed oil, 200.

In feeding experiments, oils with iodine numbers 120 or higher do not raise and may lower the blood cholesterol of men on fat-free diets, adequate in protein and calories. Fats with iodine numbers less than 90 do raise the blood cholesterol, while oils in the 100 to 120 range reduce the levels only if the diet contains considerable fat with iodine numbers under 50. Those oils with iodine numbers over 140, added to diets with

3 g of cholesterol and 100 g of saturated fat, cause a significant fall in plasma cholesterol (10). The iodine numbers of fats are reduced by cooking, and especially by frying.

Returning to our patient, we must explain to him that his alimentary tract receives cholesterol not only from food, but from bile and from the lining of the intestine. Studies on cholesterol secretion by *Cheng* and *Stanley* (12) have shown that normal young people secrete 1.5 g of cholesterol into the intestine daily when on diets low in fat, and about 2 g each day when the diet contains 100 g of olive oil. On the same diet a patient with familial xanthomatosis and a blood cholesterol of 425 mg%, secreted 3 g of cholesterol. Absorption of cholesterol, by young normals, is nearly 1.3 g on the low fat diet, over 1.5 g on a diet with 100 g fat, and was 2.7 g in the man with xanthomatosis. Adding 2 g of cholesterol to the 100 g of olive oil caused the absorption to rise to more than 3 g in a normal man and secretion also rose to about 3 g. The work of *Groen*, of *Kinsell* (13), of *Ahrens*, and of *Bronte-Stewart*, on feeding animal or vegetable, saturated or unsaturated, fats has shown that, in man, blood cholesterol levels and presumably rates of arteriosclerosis are more influenced by the quantity of saturated fat than by the cholesterol content of the diet, which rarely does more than double the amount available from bile.

From the patient's point of view the important fact is that milk products, eggs, and the fat of stall-fed cattle are rich both in cholesterol and saturated fats, and that all these are items which are absent in the diets of wild animals, primitive men, and the vast majority of people living in China, Japan, and Indonesia, as well as among the lower classes of western Europe and America until the last half century. In all these poorly fed peoples, coronary disease and postoperative thromboses are very rare.

The diet of the patient who wishes to control arteriosclerosis by physiologic and rational means — in other words, by the Hippocratic method — will be based on grain, vegetables, fruit, sea-food and lean meat. Products made from skimmed milk may be most useful in such a diet. The fat content will not be high, since this increases cholesterol secretion and absorption, but it will provide enough seed fat and marine fat to be appetizing and supply the unsaturated fatty acids necessary to good nutrition. The diet will be low enough in starch and calories so that obesity will be curbed. When fats are synthesized from sugar they are highly saturated and form the inert and harmful type of cholesterol esters. The unsaturated fats do not accelerate clotting or retard fibrinolysis to the same degree as saturated fatty acids (5c).

In addition to instruction, and supervision of his diet, the patient needs to be told that smoking tobacco, or use of snuff, apparently hasten the rate of arteriosclerosis. In America, men who are dying of coronary disease average 10 years younger, women 15 years younger, if they use more than 20 cigarettes a day than if they use no tobacco. Men who require leg amputations show an even more striking age difference between smokers and non-smokers. But in countries where the diet prevents atherogenesis, as in Japan, heavy smoking seems to be harmless to the circulation. If one is either to give up smoking or the rich egg and cream diet, it is safer to go on smoking than to go on eating in luxury. On a really Spartan diet, smoking may be quite harmless to the vascular bed. However, we advise our patients to give up tobacco even when they follow a proper diet, for the studies of *Davis* (14) and his colleagues at Johns Hopkins have shown conclusively that cardiac function is impaired by smoking a single cigarette in over 60% of patients who have angina or healed myocardial infarction. In those who have hypertension, or any evidence of myocardial failure, we also urge that the diet should be very low in sodium.

It is particularly essential for patients to understand that cholesterol levels rise and atherogenesis is favored by a sedentary life (15), and that the hazards of atherogenic diets are greatest when patients are confined to bed by operations or by heart attacks. The object of management therefore is to maintain physical fitness, minimize strict bed rest, and encourage physical activity as long as there is no undue acceleration of pulse or respiration and up to the limit of tolerance in those who have angina pectoris. Cardiac and voluntary muscles burn fat as their main fuel (16), and lipemia as well as blood cholesterol levels fall with vigorous exercise.

Our experience with angina pectoris and myocardial infarction, treated according to the Hippocratic plan of a normal way of life, and a normal human diet, has been entirely satisfactory. In the group of physicians, whom we can follow most closely and who most closely follow this regime, all who have survived the first three days have returned to full activity, two requiring rigid salt restriction and digitalis to control heart failure. None have shown deterioration in their ballistocardiograms and electrocardiograms, none have had second episodes of myocardial infarction. This group of 18 physicians now has had a total of 60 years in practice on the regime described. In the larger groups of patients, less rigorously controlled, followed by us and by *Scarborough* at Johns Hopkins, the incidence of deterioration in ballistocardiograms, or of clinical evidence of progressive disease, appears to average less than 5% per year. In other

words, individuals, like whole populations, appear to be free from coronary disease on such regimes.

The advocate of a diet low in eggs and in the fat and milk of mammals, need not concern himself particularly with the effects of his teaching on the eating habits or on the economy of his country, because he knows that no significant part of the population will need or accept the diet. People continue to buy more wine and spirits even when the cause of cirrhosis of the liver is well known, and even in countries where deaths from alcoholism outnumber those from tuberculosis. Americans continue to smoke more cigarettes every year, although the newspapers constantly report that smoking causes lung cancer and that heavy smokers dying of coronary disease average 10 years younger than non-smokers. The acceptance by doctors and laymen of the evidence that a diet low in animal fat and cholesterol provides great protection from arteriosclerosis will not seriously reduce the demand for these delicious foods, and the constant rise in population and buying power will increase that demand. Those who manufacture milk chocolate, those who produce milk and cheese, paté de foi, omelettes and fondues need have little fear of a declining market due to the spread of knowledge about the causes of arteriosclerosis.

On the other hand, there probably will be openings for those who can put on the market substitute foods, rich in milk protein, poor in butter fat but containing corn, soybean or cotton seed oil. Skimmed milk, concentrated to half or one third its original water content, makes a very acceptable substitute for cream and with some soybean or cotton seed oil, as *Malmros* has shown, it may furnish the base for new varieties of ice cream, cheese and milk chocolate. One can foresee new industries providing protective foods for those who wish to have their vascular disease controlled by diet. Already, the British fishing trade has begun advertising the virtues of their product as a protection against heart disease, and iodine numbers are likely to become well known to the lay public. However, it is certain that there will be wide-spread use of drugs (17) which lower blood cholesterol and that there will be no decline in world demand for rich foods and especially for those tasty processed items which are derived from milk.

The interest of Swiss physicians in milk and dairy products has been manifest for four centuries. *Conrad Gesner's* treatise of 1543 cites ancient texts going back to *Pliny* and *Galen* and quotes both favorable and unfavorable opinion as to the value of dairy products in human nutrition (18). In America, the dietetic experts regard a high milk and cream intake as necessary to good health, and our per capita intake is far higher

than that of most pastoral people, far above that of the Swiss. Because of their quality, Swiss dairy products command high prices in America, but some samples were sacrificed in order to determine whether bacterial action had favorably altered the saturation of the fat. Unfortunately, this proved not to be the case; the iodine numbers, varied from 19 to 33 for cheese from cow's milk, and reached 38 only in the case of cheeses made from goat or sheep milk. These are lower than in fresh butter fat.

A cheese from Glarus, made from skimmed milk, had the unusually low iodine number of 19, and this brought to mind an old Swiss joke, with which *Gesner* concluded his little book on milk and milk products.

"Some jestingly say", wrote *Gesner* "that in Switzerland the four humors are represented by the cheese of Glarus for earth, the wine of Zurich for water, the speech of Rhaetia for air, and the brass coins of Fribourg for fire". *Gesner* had to concede that the skimmed milk cheese of Glarus was quite earthy "especially in the old days when it was chopped up with knives, or little hatchets made for that purpose". But he went on to point out: "Yet the Swiss would be hard put to it to stay alive without dairy products ... It seems to me to be all wrong to compare the cheese of Glarus to the most vile of all elements, forgetting how valuable, how delightful and how wholesome it is, and finally how agreeable as food and drink; it restores lost appetite, is pleasing and useful to the stomach, and raises up the weary!"

Conrad Gesner, the first man to describe his joy in Alpine travel, and to voice his contempt for those who did not share that joy, knew what it was to be weary, and to be refreshed by the herdsman's humble fare. His life was too vigorous and brief for him to worry about the effects of food on his arteries. When such a man, an intense lover of life, learns that it might lengthen his days if he gave up the joys of the table and solace of nicotine, that sovereign restorative of contemplative calm, he is likely to conclude with Shakespeare's soldier: "We owe death but one debt; who pays this year is quit for the next". *Gesner*, who spent many hours seeking Alpine flowers, after hearing us debate diet and death, perhaps would also agree with *Theodore de Banville*,

«Cherchez les effets et les causes,
Nous disent les rêveurs moroses,
Des mots! des mots! cueillons les roses.»

Summary

Operative repair of aortic lesions and surgical control of angina pectoris, but not of arteriosclerosis, are now available. Drug therapy offers

some promise, but the cost and discomfort, the hazards and uncertain effectiveness of drugs make the physiologic management – return to a diet normal for man – the method of choice of the Hippocratic physician.

The patient must realize that coronary disease and postoperative thromboembolism are extremely rare among the millions who live on grain, vegetables, fruit, lean meat and sea-food; common where diets are rich in dairy products and eggs. He must learn that bile provides 1.5 mg. of cholesterol daily for alimentary absorption, and this is raised by diet rich in fat, and can be doubled or tripled by diet rich in eggs or butter fat containing more cholesterol. Blood levels of cholesterol rise when diets are rich in saturated fatty acids, but not when similar amounts of unsaturated fats, from seeds or sea-food, are eaten. Both atherogenesis and clotting tendency are increased by meals rich in saturated fats.

Tobacco accelerates atherogenesis of those on rich diets, but apparently does not damage the vessels of those on normal diets. Since smoking causes immediate evidence of impaired cardiac function in 60% of those with angina or healed myocardial infarcts, even those on normal diets are wise if they stop smoking.

Sedentary living raises and physical activity lowers blood cholesterol; patients are urged to continue work and play, and to keep a high level of physical fitness by activity up to their limit of comfortable tolerance.

Knowledge of the relation of diet to arteriosclerosis will have no significant effect on the rising demand for eggs, fattened cattle, and dairy products; may create a market for special foods with fats of high iodine number and low cholesterol content.

A foot-note on Conrad Gessner's *Libellus de Lacte*, 1543, and the value of dairy products in the diet.

Zusammenfassung

Aortenläsionen und Angina pectoris sind heute der chirurgischen Behandlung zugänglich, nicht aber die Arteriosklerose. Die Arzneimitteltherapie bietet einige Aussichten, aber die Kosten, das Unbehagen, die Risiken und die unsichere Wirksamkeit der Arzneien machen aus physiologischen Maßnahmen – Rückkehr zu einer normalen Diät – die Methode der Wahl für den hippokratischen Arzt.

Der Patient muß sich klar werden, daß Coronarerkrankungen und postoperative Thromboembolie unter jenen Millionen von Menschen, die von Getreide, Gemüse, Früchten, magerem Fleisch und von Nahrung aus dem Meere leben, außerordentlich selten sind, bei Leuten jedoch, die sich von Milchprodukten und Eiern ernähren, häufig vorkommen.

Er muß wissen, daß die Galle täglich zur alimentären Absorption 1,5

mg Cholesterin bereithält; bei einer fettreichen Nahrung steigt die Produktion und kann sich bei einer an Eiern oder Butterfett reichen Diät, die mehr Cholesterin enthält, verdoppeln und verdreifachen. Der Blutspiegel des Cholesterins steigt mit dem Gehalt der Nahrung an gesättigten Fettsäuren, wenn aber ein gleich großer Gehalt an ungesättigten Fettsäuren aus Samen und Nahrung aus dem Meere aufgenommen wird, bleibt er unverändert. Sowohl Atherogenese als Gerinnungstendenz nehmen bei Genuß von Mahlzeiten, die an gesättigten Fettsäuren reich sind, zu. Der Tabak beschleunigt die Atherogenese bei jenen Menschen, die sich an eine fettreiche Diät halten, schädigt aber die Blutgefäße jener, die eine normale Diät einhalten, offensichtlich nicht. Da aber das Rauchen bei Leuten mit Angina pectoris oder geheiltem Myokardinfarkt in 60 % der Fälle unmittelbar eine Herzinsuffizienz erzeugt, ist es klüger, wenn sie das Rauchen aufgeben.

Sitzende Lebensweise steigert, körperliche Tätigkeit senkt das Blutcholesterin. Die Patienten werden angespornt, Arbeit und Spiel fortzusetzen und die körperliche Tauglichkeit durch eine sich in den Grenzen der Verträglichkeit bewegende Tätigkeit auf hohem Niveau zu halten. Das Wissen um die Beziehung der Diät zur Arteriosklerose wird das Ansteigen der Nachfrage nach Eiern, fettem Fleisch und Milchprodukten nicht wesentlich beeinflussen, möglicherweise aber zur Schaffung eines Marktes für Lebensmittel mit Fetten hoher Jodzahl und niederen Cholesteringehaltes führen.

In einer Fußnote behandelt der Autor Conrad Gessners Libellus de Lacte 1543 und den Wert der Milchprodukte in der Diät.

Résumé

Les lésions aortiques peuvent de nos jours être opérées et les angines de poitrine traitées chirurgicalement. Ce n'est pas le cas pour l'artériosclérose. La thérapeutique médicamenteuse permet certains espoirs, toutefois, le coût, le désagrément, le risque et l'efficacité douteuse des médicaments font que le traitement physiologique, c'est-à-dire, le retour à un régime naturel reste la thérapeutique de choix du médecin hippocratien.

Il s'agit de faire comprendre au malade que la maladie coronarienne et les trombo-embolies post-opératoires sont extrêmement rares parmi les millions d'hommes, qui vivent de céréales, de légumes, de fruits de mer; en revanche, ces maladies sont fréquentes parmi les populations dont l'alimentation est riche en produits laitiers et en œufs. Il doit se rendre compte que la bile fournit 1,5 mg de cholestérol par jour pour l'absorption des aliments et que cette quantité augmente, lors d'une alimentation riche en graisses. Elle peut même doubler ou tripler lorsque le régime est riche

en œufs ou en beurre qui contiennent davantage de cholestérol. Le taux sanguin du cholestérol s'élève quand l'alimentation est riche en acides gras saturés, en revanche, il ne s'élève pas quand elle comporte des acides gras non saturés en quantités égales provenant de graines ou de fruits de mer. Les repas riches en graisses saturées accroissent l'athérogénèse et les tendances à la coagulation.

Chez les sujets dont l'alimentation est trop riche, le tabac accélère l'athérogénèse, alors que chez les sujets dont l'alimentation est normale, le tabac ne semble pas causer de lésions vasculaires. Puisque le tabac produit des manifestations cardiaques chez 60 % des sujets atteints d'angine de poitrine ou d'infarctus du myocarde guéris, ceux-là mêmes qui ont une alimentation normale seraient bien inspirés de cesser de fumer.

La vie sédentaire fait monter le taux du cholestérol sanguin alors que l'activité physique produit un effet opposé. Il faut donc insister auprès des malades pour qu'ils continuent à travailler et à prendre de l'exercice, selon une activité proportionnée à leur tolérance, de manière à se maintenir en bonne forme physique.

Le fait que la relation entre l'alimentation et l'artériosclérose soit connue du public n'aura pas d'influence sur la demande croissante d'œufs, de viandes grasses et de produits laitiers; il peut, en revanche, favoriser la création d'un marché spécialisé en graisses à indice d'iode élevé et contenant peu de cholestérol.

Dans une note, l'auteur renvoie au *Libellus de lacte* de 1543 de Conrad Gessner et donne des renseignements sur la composition des aliments journaliers dans un régime.

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