baked goods and therefore with sugar has constituted but a small proportion of its total intake, most fat being eaten independently of any sweetening. In contrast, the association of sugar with cream on fruit desserts and with fat in cakes, pies and similar foods results in an overwhelming proportion of the sugar that is consumed being eaten together with fat. Even when sugar is used to sweeten tea or coffee, the addition of milk or cream results in some association. It is consequently possible to dissociate the effects of fat consumption from those of sugar, but virtually impossible to dissociate the effects of sugar consumption from those of fat. This would readily help to explain the negative findings of the Keys multivariate analysis. Keys drew attention to the rising incidence of coronary heart disease in both the United Kingdom and the United States during the first half of the twentieth century when fat consumption in both countries rose considerably but sugar consumption changed very little. This does not exonerate sugar as a risk factor. Theoretically, if both sugar and animal fats were risk factors and sugar consumption held constant while fat consumption increased, the incidence of CHD would rise. Longitudinal studies of food consumption would only exonerate sugar if a society could be found in which fat intake was constant, sugar consumption rose but coronary heart disease incidence did not change. Such a society is unlikely ever to exist. The observations of Keys therefore, while not implicating sugar as a risk factor, certainly do not exclude it.[107]

In conclusion, excessive sugar intake is conducive to obesity and results in surges in serum insulin levels with an eventual increase in insulin resistance. The results of experimental dietary studies suggest that, particularly in the context of a coincidental liberal saturated fat intake, high sugar consumption is followed by elevation of serum cholesterol as well as triglyceride levels. The relation of high cholesterol levels to increasing incidence of coronary heart disease is well established and recent studies have implicated liberal sugar consumption with serum triglyceride elevation, insulin resistance and rising glycosylated levels as well. All of these are established risk factors for CHD. The great increase in English sugar consumption during the Georgian era has been shown to coincide with a sharp increase in consumption of animal fats and reasons for a direct linkage between the effects of these two dietary changes have been demonstrated. The evidence therefore suggests that the dramatic rise in sugar usage in eighteenth-century England could be implicated as an ancillary factor contributing to the initial emergence of angina pectoris and its increasing prevalence thereafter.

Coffee

The original home of coffee bushes growing in the wild was probably Ethiopia and it was there that they were first cultivated. The necessary knowledge spread initially through Persia and the medieval Arab world. The stimulating properties of the bean were recognized in antiquity and were the subject of many legends. One that originated in Arabia concerned herdsmen who observed that goats grazing on the berries of certain bushes became exceedingly frisky and gambolled the night

[107] Keys, op. cit., note 88 above, pp. 194–5.

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through. This unusual behaviour was reported to the local clerics who had an infusion prepared from the berries, the drinking of which enabled them to forego sleep totally and to extend their religious devotions throughout the nights as well as the days.[108] Coffee eventually reached Europe by land routes, largely in association with Turkish conquests in the Balkans during the late Middle Ages. In 1683, after the siege of Vienna was raised, the liberated Austrian garrison found and took possession of supplies of coffee in the abandoned baggage trains of the formerly encircling Turkish armies. The subsequent re-occupation of once held Turkish conquests hastened its widespread dissemination throughout Christian Europe.[109] The process had already begun earlier in the seventeenth century, the first coffee house in England having been opened in 1652.[110] Production for the European markets surged with the development of colonial Spanish and Portuguese plantations in Central and South America that utilized slave labour.

The use of coffee was frowned upon by the Cromwellian government as part of the Puritans' opposition to anything undertaken for pleasure alone. There was a surge in its popularity with the 1660 restoration of the monarchy, but the government of Charles II viewed the newly opening coffee houses with some disapproval, suspecting, not without justification, that many were centres of subversion. An attempt was made to close them in 1675 but enforcement proved impracticable and did little to slow their growing popularity.[111] By the beginning of the eighteenth century there were over 2,000 coffee houses in London alone and their number continued to grow thereafter. Some moral disapproval continued notwithstanding the eclipse of Puritan influences in England, but this disapprobation was blunted by the growing recognition that coffee provided a popular non-intoxicating alternative to alcoholic drinks.

The coffee houses were almost exclusively a male preserve. They were frequented extensively not only by the nobility and the gentry but also by businessmen and professionals, writers and to some extent by working men. Some coffee houses were patronized predominantly by members of a single profession, such as physicians, clergymen or lawyers. Others were the meeting places of men engaged in a particular line of business, insurance brokers for example. They were post office collection and delivery centres, locations for dissemination of news and commercial information as well as for major business transactions.[112] Insurance schemes were operating out of coffee houses by the mid-seventeenth century. The best known subsequently was the one devoted to the arranging of shipping insurance and associated with Edward Lloyd, whose surname has remained synonymous with marine coverage to this day.[113] For aspiring but poverty stricken newcomers to London they provided a presentable address and contacts that could lead to gainful employment. The coffee houses often served as departure points for travel both by land and sea and as sources of

[108] E Robinson, *The early English coffee house*, 2nd ed., Christchurch, Dolphin Press, 1972, pp. 6, 7.
[109] Ibid., p. 5.
[110] Bryant Lillywhite, *London coffee houses*, London, George Allen and Unwin, 1963, p. 17.
[111] Robinson, op. cit., note 108 above, pp. 150, 166.
[112] Lillywhite, op. cit., note 110 above, p. 19.
[113] Ibid., p. 24.

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information about the arrivals and departures of stage-coaches and ships. They were centres of literary activity, including readings of newly written plays, prose and poetry. Joseph Addison's contributions to the *Spectator* were penned for the most part in coffee houses. Some of their functions however were less salutary. There were ones which were centres for disposal of stolen goods, and outbreaks of violence within coffee house walls were not unknown.[114]

The multitude of activities associated with the coffee houses resulted in their being patronized, especially in London, by large numbers of men whose visits were frequent and often extended for a great part of the day. The coffee was continuously on the boil in eight to ten gallon pots and the cups or mugs of the patrons were constantly replenished. As a result, consumption was very much higher than is customary nowadays, ten or even more cups a day being not infrequent. Dr Johnson would drink a dozen cups of coffee at a time, and in this respect he was by no means exceptional. The coffee that was drunk was almost invariably black, very strong and taken with large amounts of sugar cut from a loaf. Coffee houses were associated with the smoking of pipes and the atmosphere was usually laden with tobacco smoke. Early in the nineteenth century, Lord Macaulay commented unfavourably on this. When its use spread to private houses, coffee was taken by ladies as well as gentlemen. Invitations to light refreshment, either in late morning or mid-afternoon, became popular. The addition of cream became usual and the jugs used for this purpose became known as creamers.

From 1697 to 1780 data concerning the coffee trade were compiled in the office of the government Inspector General of Imports and Exports. The Inspector obtained returns of both the quantities and the values of all merchandise brought into or sent out from each port and these were combined into annual totals for England and Wales. The data were assembled and tabulated by Elizabeth Schumpeter in a monumental work that embraced trade figures for almost all commodities used in the eighteenth century. The tables that she compiled give both the values and the amounts of coffee imported and re-exported during the eighteenth century, the difference between these two being a presumed measure of domestic consumption. Schumpeter's figures show a more than doubling of domestic coffee consumption between the first and fourth decades of the eighteenth century, net imports (imports minus re-exports) rising from 2,335 to 5,688 cwt, but with a subsequent decline, with retained imports fluctuating between 2,721 and 1,458 cwt during the following four decades. There are, however, cogent reasons for questioning these figures. Her tabulations showed considerable fluctuations from year to year, an extreme example being an excess of imports over re-exports of 11,402 cwt recorded for 1757 and an almost identical figure, 11,173 cwt, for excess of exports over imports for the following year. During the period 1774 to 1780 the numbers show an excess of re-exports over imports of some 12,300 cwt. This would imply that stocks of at least this magnitude were available in 1773 in order to meet these subsequent re-export requirements, a most unlikely possibility. In addition, there was a very dramatic rise in both imports and re-exports during this century. Any errors in these figures, even if minor, would

[114] Robinson, op. cit., note 108 above, p. 190.

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affect the comparatively small differences between them in a highly significant way. It is hardly credible that the tenfold increase in the documented coffee imports would be unassociated with some corresponding rise in domestic consumption.[115] Smuggling was rampant at the time and the quantities of goods imported illegally very large. The highest in the land were not averse to purchasing the products of such landings.[116] It is therefore likely that the amount of coffee brought into England during the eighteenth century increased to a much greater extent than the Inspector General's figures suggest. Statistics for the whole country would also have failed to reflect changes in consumption by a part of the population such as the middle and upper classes. It was their members who provided most of the coffee house patronage. Their per capita coffee consumption probably exceeded the national average.

An assessment of the possible contribution of increased coffee consumption to the eighteenth-century emergence of symptomatic coronary heart disease requires, *inter alia*, consideration of the effects of caffeine and possibly of other constituents of coffee on cardiovascular haemodynamics and serum lipids. Caffeine increases blood pressure moderately, although with some attenuation of effect with continued use. It raises adrenalin and noradrenaline production, and activates the sympathetic nervous system.[117] In a review, Dag S Thelle and his colleagues noted that twenty-two investigator groups reported a significant positive association between coffee consumption and elevation of serum total cholesterol levels. In seven there was either no relationship or one that was demonstrated only in a subgroup.[118] The discrepancies reflect the difficulty in separating the effects of coffee from those of cream, sugar and tobacco, with all of which drinking coffee is closely associated.

Epidemiologic studies of the relationship between coffee consumption and incidence of CHD in its various clinical manifestations have been bedeviled by several additional difficulties. Estimates of coffee consumption depend on personal recollection of both the recent and the remote past and are therefore liable to be inaccurate. Retrospective investigations based on comparison of the coffee consumption of groups with and without known coronary heart disease are particularly liable to error. Apart from memory lapses, there may be a tendency for patients to understate coffee consumption because they think of it as a beverage of which the investigator disapproves. Individuals with a history of CHD may have reduced their intake of coffee when symptoms first became manifest. As discussed later, differing methods of preparation may have differing consequences. Cups of filtered or instant coffee contain less caffeine than cups made by adding boiling water to the ground beans, which was the eighteenth-century method of preparation. The relationship between the amount of coffee consumed and the caffeine intake can therefore be quite variable. An association between consumption of decaffeinated coffee with elevation of serum cholesterol suggests that one or more ingredients of coffee other than caffeine may

[115] Elizabeth Schumpeter, *English overseas trade statistics, 1697–1808*, Oxford, Clarendon Press, 1960, pp. 60–1.

[116] Ramsay, op. cit., note 82 above, p. 132.

[117] J L Izzo Jr *et al.*, 'Age and prior caffeine use alter the cardiovascular and adrenomedullary responses to oral caffeine', *Am J Cardiol*, 1983, **52**: 769–73, pp. 770–1.

[118] Dag S Thelle, S Heyden and J George Fodor, 'Coffee and cholesterol in epidemiological and experimental studies', *Atherosclerosis*, 1987, **67**: 97–103, p. 98.

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be culprits.[119] Attempts to establish any connection between coffee consumption and incidence of coronary heart disease have unsurprisingly been inconsistent, yielding variably positive or negative results. Further review of the literature suggests, however, that coffee can under certain circumstances be a risk factor in its own right and contribute to a rise in CHD incidence. In the following discussion some concluding emphasis is placed on the consequences of many years of drinking of large amounts of strong coffee prepared by boiling, this having been the customary eighteenth-century practice.

The Framingham investigators were unable to find any overall association between reported coffee consumption and incidence of angina pectoris during a twelve-year follow-up. However, the results were confounded by a direct relationship between the amount of coffee drunk daily and the number of cigarettes smoked, and only a small minority of the subjects drank six or more cups per day.[120] In contrast, the Boston collaborative investigation did show a significant increase in the standardized mortality ratio particularly when subjects consuming six or more cups of coffee daily were compared with abstainers. In this study, the significance remained even after allowing for traditional risk factors.[121] Andrea Z LaCroix and her colleagues studied 1,130 white males who were followed for periods ranging from nineteen to thirty-five years. Subjects were questioned every five years about the amount of coffee drunk in the recent past. The investigators found only a non-significant association between coffee consumption in excess of two cups daily and the incidence of coronary heart disease. Seven per cent of the study population who drank more than four cups of coffee daily had a relative risk of 2.77 (CL 1.37–5.59) when corrected for smoking habits and 2.49 when corrected for hypertension. The confidence limits were wide and, with multivariate analysis, the relative risk no longer reached significance, having declined to 1.77.[122] On the other hand, the results of a meta-analysis reported by Kawachi and co-workers yielded more positive results. The pooled relative risk of case controlled subjects drinking five or more cups of coffee a day was 1.63 (CL 1.50–1.78) as opposed to 1.00 (by definition) among abstainers.[123]

There is evidence to suggest that apparent inconsistencies can be explained by changes over time in the way coffee was prepared being introduced during the period covered by the studies and the differing methods having differing consequences. In this respect, Michael J Klag and his co-workers' findings were confirmatory. They initiated a study of the relationship between coffee intake and coronary heart disease in 1947 with an entry cut-off in 1964. 1,160 males and 111 females were enrolled and followed until 1986, with a median follow-up time of some thirty-two years.

[119] D J Naismith *et al.*, 'The effect, in volunteers, of coffee and decaffeinated coffee on blood glucose, insulin, plasma lipids and some factors involved in blood clotting', *Nutr Metab*, 1970, **12**: 144–51, p. 147.

[120] Thomas R Dawber, William B Kannel and Tavia Gordon, 'Coffee and cardiovascular disease, observations from the Framingham study', *N Engl J Med*, 1974, **291**: 871–4, pp. 872, 873.

[121] Hershel Jick *et al.*, 'Coffee and myocardial infarction. A report from the Boston Collaborative Drug Surveillance Program', *N Engl J Med*, 1973, **289**: 63–7, p. 65.

[122] Andrea Z LaCroix *et al.*, 'Coffee consumption and the incidence of coronary heart disease', *N Engl J Med*, 1986, **315**: 977–82, p. 979.

[123] Ichiro Kawachi, G A Colditz, C B Stone, 'Does coffee drinking increase the risk of coronary heart disease? Results from a meta-analysis', *Br Heart J*, 1994, **72**: 269–75, p. 270.

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Table V.11
Coffee consumption, serum cholesterol and CHD mortality.
4–6 year follow-up
Norwegian men aged 35–54 at entry

Number of cups of coffee per day	<1	1–2	3–4	5–6	7–8	≥9
Number of subjects	870	1,651	4,995	5,845	3,481	2,556
Mean total serum cholesterol (mmol/L). Adjusted for age	5.80	5.96	6.15	6.25	6.37	6.56
Deaths. Number	3	6	29	45	42	43
Deaths/100,000 observed years. Adjusted for age	62	61	92	119	186	244
Adjusted for age and cigarettes per day	100	83	111	121	158	179
Adjusted for age and serum cholesterol	81	73	96	121	177	203

Adapted from Aage Tverdal *et al.*, 'Coffee consumption and death from coronary heart disease in middle aged Norwegian men and women', *Br Med J*, 1990, **300**: 566–9, p. 567. (With permission from the BMJ Publishing Group.)

Consumption estimates were based on periodic questionnaires. Overall there was a significant stepwise positive relationship between coffee consumption and CHD incidence in all of its manifestations, the extent being directly related to the amount consumed. The results were not affected significantly by correction for traditional risk factors. Of particular importance, in view of the association of coffee with cigarettes, the relationship was significant among non-smokers. Most striking, however, was the impact of temporal factors. The risk associated with coffee drinking before 1975 was markedly higher than in later time periods and could not be attributed to changes in the amount being drunk. Consumption of subjects enlisted in their twenties rose till their early forties and then declined, but not below the level of their twenties. The declining risk coincided with changes in method of preparation with instant, percolating and filtering replacing simple boiling.[124]

The results of Scandinavian studies were similar. A survey in Norway involved 19,398 men and 19,166 women aged from thirty-five to fifty-four years and with no cardiovascular disease at entry. The study extended for a mean of about six years. Comparisons were based on the sixty-eight men and sixteen women who died from this cause during the follow-up period. The relative risk was corrected for age, serum total and HDL cholesterol concentrations, systolic blood pressure and smoking. The CHD mortality rate rose progressively and systematically with each step up in the number of cups drunk each day (Table V.11). Although not proven for women whose numbers were low, the increase in coronary heart disease mortality rates among men was significant.[125] However, the same investigating group found that six further years

[124] Michael J Klag *et al.*, 'Coffee intake and coronary heart disease', *Ann Epidemiol*, 1994, **4**: 425–33, pp. 427–9.

[125] Aage Tverdal *et al.*, 'Coffee consumption and death from coronary heart disease in middle aged Norwegian men and women', *Br Med J*, 1990, **300**: 566–9, p. 567.

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Table V.12
Relative risks of death from coronary heart disease according to coffee consumption: 6 and 12 year follow-up

	6 Years		12 Years	
No. of Cups/Day	Relative risk*	Relative risk**	Relative risk*	Relative risk**
<1	1.0	1.0	1.0	1.0
1–2	1.8	1.7	0.8	0.9
3–4	1.8	1.6	0.9	0.9
5–6	2.2	1.8	1.1	1.0
7–8	3.0	2.5	1.1	1.1
≥9	3.3	2.6	1.4	1.3

* Adjusted for age, systolic, B.P., no. of cigarettes per day and HDL level.
** Adjusted additionally for total cholesterol level.

Adapted from I Stensvold, A Tverdal and B K Jacobsen, 'Cohort study of coffee intake and death from coronary heart disease over 12 years', *Br Med J*, 1996, **312**: 544–5, p. 545. (With permission from the BMJ Publishing Group.)

of follow-up greatly weakened the association between coffee consumption and CHD mortality (Table V.12). During the twelve years encompassed by the two studies, there had been a considerable change in Norwegian ways of preparing the drink. Straightforward boiling had been supplemented in large measure by filtering.[126] This raised the possibility that of all possible methods of preparation, boiled coffee has the closest association with increase in risk of CHD. The direct relationship between the quantity consumed and the total serum cholesterol level shown in the earlier Norwegian study was found to be an effect of boiled coffee that could be countered by filtration.[127] In a Finnish cross-over investigation with twenty-one healthy volunteers, I Ahola and colleagues found similarly that a minimum of six cups of boiled coffee daily for four weeks resulted in significant increases in total serum and LDL cholesterol and triglyceride levels, but there were virtually no changes in the lipid profile if the coffee was filtered as well (Table V.13).[128] The differences suggest that one or more potentially triglyceride and cholesterol-elevating constituents present in a cup of the boiled preparation are removed by filtration. It was in fact possible to identify fatty acids in the material retained in the filter. The findings with respect to serum lipids were subsequently confirmed in a study conducted in Holland by Rob Urgert and his associates.[129] Peter Zock and his co-workers also reported that the

[126] Inger Stensvold, Aage Tverdal and Bjarne K Jacobsen, 'Cohort study of coffee intake and death from coronary heart disease over 12 years', *Br Med J*, 1996, **312**: 544–5.
[127] Tverdal *et al.*, op. cit., note 125 above, p. 567.
[128] I Ahola, M Jauhiainen and A Aro, 'The hypercholesterolaemic factor in boiled coffee is retained by a paper filter', *J Intern Med*, 1991, **230**: 293–7, p. 295.
[129] Rob Urgert *et al.*, 'Comparison of the effect of cafetière and filtered coffee on serum concentrations of liver aminotransferases and lipids: six month randomised controlled trial', *Br Med J*, 1996, **313**: 1362–6, p. 1364.

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Table V.13
Comparative effects of 4 week consumption of boiled and unfiltered or boiled and filtered coffee on serum lipid profile (mmol/L). Mean values ± standard error of means

	Baseline	After 4 weeks		P value (comparison at 4 weeks)
		Unfiltered	Filtered	
Total cholesterol	5.6 ± 0.9	5.93 ± 0.24	5.57 ± 0.18	0.027
LDL cholesterol	3.8 ± 0.9	4.01 ± 0.19	3.68 ± 0.16	0.014
HDL cholesterol	1.4 ± 0.9	1.40 ± 0.08	1.46 ± 0.09	0.180
Triglycerides	0.9 ± 0.3	1.38 ± 0.22	1.12 ± 0.17	0.008

Source: I Ahola, M Jauhiainen and A Aro, 'The hypercholesterolaemic factor in boiled coffee is retained by a paper filter', *J Intern Med*, 1991, **230**: 293–7. (With permission Blackwell Sciences Ltd).

material retained on the filter paper includes lipids and its administration results in elevation of the serum total cholesterol and LDL levels (Figure V.4).[130] Other studies have implicated fatty acids esterified with the diterpenes cafestol and kahweol as the offending constituents, present in a variety of coffee beans and removed by filtration. H Heckers and his colleagues, for example, showed that when diterpenes were given orally to healthy volunteers their serum cholesterol levels rose.[131] Urgert and his colleagues found that the concentration of cafestol in percolated coffee was maximally 0.5 mg per cup and in instant coffee 0.2 mg, in contrast with a much higher average of 3.4 mg per cup of the boiled preparation.[132] These differences may account in some part for a negative association between coffee consumption and CHD incidence found in the United States where filtered coffee as well as instant preparations have largely replaced the boiled form.[133]

When assessing a possible relationship between coffee consumption and CHD incidence, the length of follow-up too may be of critical importance. Positive associations found in several relatively long-term studies have been described in previous pages. Table V.14 shows the results of a meta-analysis undertaken by Martin

Figure V.4: (*opposite*) Mean levels of serum total cholesterol, LDL, HDL and triglycerides before, during and after supplementation with lipid-rich coffee filtration fraction. Reproduced from P L Zock *et al.*, 'Effect of a lipid-rich fraction from boiled coffee on serum cholesterol', *Lancet*, 1990, **335**: 1235–7, p. 1236. (Permission granted by The *Lancet* Ltd.)

[130] Peter L Zock *et al.*, 'Effect of a lipid-rich fraction from boiled coffee on serum cholesterol', *Lancet*, 1990, **335**: 1235–7, p. 1236.

[131] H Heckers, U Göbel and U Kleppel, 'End of the coffee mystery: diterpene alcohols raise serum low-density lipoprotein cholesterol and triglyceride levels' (letter), *J Intern Med*, 1994, **235**: 192–3.

[132] Rob Urgert *et al.*, 'Levels of the cholesterol elevating diterpenes cafestol and kahweol in various coffee brews', *J Agric Food Chem*, 1995, **43**: 2167–72, pp. 2169–70.

[133] D E Grobbee *et al.*, 'Coffee, caffeine, and cardiovascular disease in men', *N Engl J Med*, 1990, **323**: 1026–32, pp. 1030–1.

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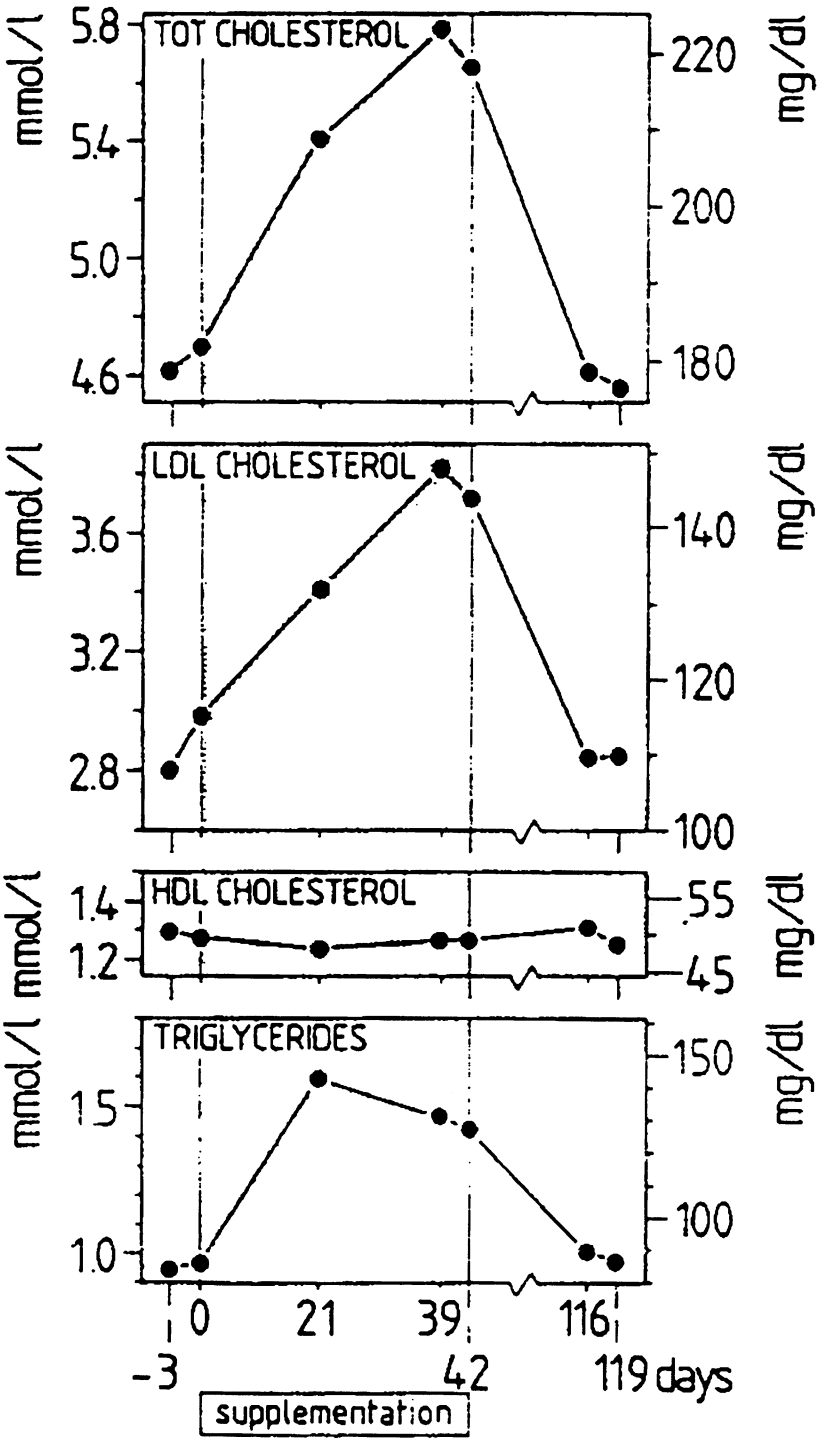

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Table V.14
Coffee consumption and coronary heart disease: male subjects

References	Numbers	Age at entry	CHD history	Follow-up (years)	Endpoint	Outcome
a	7,194	46–65	none	15	Fatal CHD Non-fatal MI	+
b	851	50	none	12	All MI	—
c	16,911	>35	none	11.5	Fatal CHD	—
d	1,040	19–49	not stated	19–35	Fatal CHD, Non-fatal MI, Angina	+
e	13,664	not stated	not stated	11.5	IHD death	—
f	1,910	40–56	none	19	Fatal CHD	+
g	44,736	40–75	none	2	All CHD	—
h	6,765	51–59	no MI	7.1	Fatal CHD All MI	—

a) Katsuhiko Yano, D M Reed and C J MacLean, 'Coffee consumption and incidence of coronary heart disease', *N Engl J Med*, 1987, **316**: 946.
b) S Heyden *et al.*, 'Coffee consumption and coronary heart disease mortality', *Arch Intern Med*, 1978, **138**: 1472–5.
c) S S Murray *et al.*, 'Coffee consumption and mortality from ischemic heart disease and other causes: results from the Lutheran Brotherhood Study 1966–1978', *Am J Epidemiol*, 1981, **113**: 661–7, p. 664.
d) Andrea Z LaCroix *et al.*, 'Coffee consumption and the incidence of coronary heart disease', *N Engl J Med*, 1986, **315**: 977–82, p. 979.
e) Bjarne K Jacobsen *et al.*, 'Coffee drinking, mortality and cancer incidence: results from a Norwegian prospective study', *J Nat Cancer Inst*, 1986, **76**: 823–31, p. 825.
f) Dan LeGrady *et al.*, 'Coffee consumption and mortality in the Chicago Western Electric Company study', *Am J Epidemiol*, 1987, **126**: 803–12, p. 807.
g) D E Grobbee, 'Coffee, caffeine, and cardiovascular disease in men', *N Engl J Med*, 1990, **323**: 1026–32, p. 1028.
h) A Rosengren and L Wilhelmsen, 'Coffee, coronary heart disease and mortality in middle-aged Swedish men: findings from the Primary Prevention Study', *J Intern Med*, 1991, **230**: 67–71.

Adapted from M G Myers and A Basinski, 'Coffee and coronary heart disease', *Arch Intern Med*, 1992, **152**: 1767–72, p. 1768. (Copyrighted (1992) American Medical Association.)

G Myers and A Basinski.[134] It will be noted that although there is a preponderance of negative results, their longest follow-up was fifteen years. The two longest follow-ups, reported by Andrea Z LaCroix and her co-workers and by Dan LeGrady and associates were both positive. Follow-ups of nineteen to thirty-five and nineteen years respectively showed a significant association between coffee consumption and

[134] Martin G Myers and A Basinski, 'Coffee and coronary heart disease', *Arch Intern Med*, 1992, **152**: 1767–72, p. 1768.

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the incidence of CHD.[135] This all suggests that such untoward effects of coffee consumption may take very many years to become manifest. Shorter studies could well fail to show a positive association, however many subjects are entered into the trial. An example is provided by the negative results reported by Grobbee and his co-workers, who followed a cohort of 45,589 men but for only two years.[136]

In conclusion, the introduction of coffee into England in the seventeenth century was followed by a considerable increase in its consumption, especially by male members of the upper and middle classes. The evidence implicating coffee as a risk factor for development of coronary heart disease only appears to be inconclusive if it is considered without regard to other risk factors, method of preparation, duration and extent of consumption. Review of the recent literature suggests that drinking strong boiled coffee has an untoward effect on the serum lipid profile and its consumption in large amounts over a very long period, as was usual in the eighteenth century, is associated with increased risk of developing coronary heart disease. Moreover, the contribution of increasing coffee consumption during the Georgian era to the emergence of angina pectoris must be assessed not in isolation but rather in association with other risk factors. In this connection, any statistical consequences of dissociating the effects of coffee consumption from liberal indulgence in cream and sugar and exposure to tobacco smoke are not strictly relevant to the present postulate. What *is* relevant is the consequence of the eighteenth-century male consumption of very large amounts of concentrated boiled coffee over many years, usually in a smoke-filled atmosphere and in conjunction with excessive sugar intake and occasional use of cream. The evidence from the studies cited suggests that with this combination of factors coffee could have contributed to the emergence of angina pectoris upon the medical scene of Georgian England.

Menus and Meals

Thus far, eighteenth-century changes in agricultural practice and their effects on the availability and composition of food have been reviewed. In the final analysis, however, the impact on cardiac health in Georgian England was determined by the meals that were actually eaten. Fortunately, data about this are readily available in cookery books of the time, in lists of food ordered for special occasions, records completed by diarists and descriptions of eating habits by foreign observers of the English scene.

Gargantuan meals that included large amounts and great varieties of animal foods had been usual among the nobility and gentry during many centuries preceding the Georgian era. The well recognized frequency of gouty arthritis may well have had among its causes grossly excessive consumption of high protein animal foods. It was observed of Charles V, the sixteenth-century King of Spain and Emperor of the Holy Roman Empire, that his inability to control either his appetite or the resulting

[135] LaCroix *et al.*, op. cit. note 122 above, pp. 979; Dan LeGrady *et al.*, 'Coffee consumption and mortality in the Chicago Western Electric Company study', *Am J Epidemiol*, 1987, **126**: 803–12, pp. 806–7.
[136] Grobbee *et al.*, op. cit., note 133 above, pp. 1030–1.

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