Is milk a coronary health hazard?

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From London

SUMMARY Epidemiological and clinical evidence is presented on an association between the quantity of milk consumed and the incidence of ischaemic heart disease. It is suggested that the daily intake of liquid milk for adults should be at most one-third of a pint (less than 0.21)

The observation by Yudkin and Roddy (1964) that patients with ischaemic heart disease (IHD) took on average more cups of tea and coffee than did controls was considered by them to reflect an aetiological relationship with intake of sucrose, which they found was also higher in the patients. However, Bennett et al. (1970) found a positive correlation between cigarette smoking and consumption of both sugar and cups of hot drinks and concluded that it was the cigarettes that were aetiologically implicated. Other investigations have suggested that coffee consumption is an aetiological factor (Paul et al., 1963; Boston Collaborative Drug Surveillance Program, 1972; Jick et al., 1973; Mann and Thorogood, 1975). Surprisingly, in none of these communications was the possibility considered that milk taken in the drinks of tea and coffee might be the primary factor in the relationship between the amount of beverages consumed and the incidence of IHD. This possibility is strengthened by reports that have failed to confirm the aetiological significance of sucrose (Elwood et al., 1970; Medical Research Council, 1970; Keys, 1971) and coffee (Dawber et al., 1974). Even the role of cigarette smoking, which is widely accepted (World Health Organisation, 1971; Royal College of Physicians of London and British Cardiac Society, 1976), seems uncertain (Dayton and Pearce, 1970), or has at least been diminished by the findings in the investigation in seven countries that cigarette smoking influenced the incidence of myocardial infarction only in the USA (Keys, 1970).

Statistical epidemiological evidence

To assess epidemiologically a possible relationship between the quantity of milk consumed and the incidence of IHD the following data have been used:

(a) The IHD mortality rates in 43 countries given in the Demographic Yearbook 1973 (United Nations, 1974). The rates refer variously to the years 1969, 1970, 1971, or 1972. The only countries excluded were those with data stated to be from 'civil registers which are incomplete or are of unknown reliability'.

(b) The daily per caput consumption in these 43 countries of total milk, sugar, meat, fats and oils, protein, and calories given in the Statistical Yearbook 1972 (United Nations, 1973). The figures selected were the averages for the years 1967-69, or if not available, the closest to these years chronologically. Total milk consumption refers to milk and milk products excluding butter, computed in terms of fresh milk. Sugar consumption refers to refined sugar and sugar products and is expressed in terms of refined sugar.

(c) The daily per caput consumption in the 21 countries of the Organisation for Economic Co-operation and Development (1975) of total dairy products (excluding butter), whole milk, refined sugar, butter, and animal fats. The figures selected were the average for the years 1965-69, or if not available, the closest chronologically to them.


(e) The daily adult per caput consumption of all forms of tobacco and of manufactured cigarettes in various countries for the year 1970 (Beese, 1972).

(f) A WHO study in 16 countries of the acute myocardial infarction rates in 21 defined areas (19 in Europe, Perth, and Tel-Aviv) during the calendar year 1971 (World Health Organisation Regional Office for Europe, 1976).
Findings

Data were available for only 12 countries to compare the consumption of whole milk and refined sugar (c), tea and coffee (d) and tobacco (e) with IHD mortality rates (a). The correlation coefficients are shown in Table 1, and suggest that milk and sugar are more likely than coffee or cigarettes to be responsible for the relationship between the number of cupfuls of hot beverages consumed and the occurrence of IHD.

Table 1  Correlations between IHD mortality rates (y) and per caput consumption of certain commodities (x) in 12 countries

<table>
<thead>
<tr>
<th>Commodity</th>
<th>r</th>
<th>(P)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole milk</td>
<td>0.75</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Refined sugar</td>
<td>0.75</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Coffee</td>
<td>0.48</td>
<td>NS</td>
</tr>
<tr>
<td>Tea</td>
<td>0.28</td>
<td>NS</td>
</tr>
<tr>
<td>Total tobacco</td>
<td>0.22</td>
<td>NS</td>
</tr>
<tr>
<td>Manufactured cigarettes</td>
<td>0.17</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS = not significant at the 5% level.

Correlations for the 43 countries of IHD mortality rates with consumption of milk (as defined in source (b)) calories, meats, fats and oils, protein, and sugar (as defined in source (b)) are shown in Table 2. Milk gave the strongest correlation and sugar the weakest. The correlation with milk is shown in Fig. 1.

The correlation of IHD mortality rates with consumption of total dairy products (excluding butter) in the 21 countries of the OECD (source (c)) was only slightly weaker than for the 43 countries and exceeded the correlations for animal fats and butter (Table 2).

Table 2  Correlations between IHD mortality rates (y) and per caput consumption of dietary items (x) in 43 countries

<table>
<thead>
<tr>
<th>Dietary item</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total milk</td>
<td>0.75</td>
</tr>
<tr>
<td>Calories</td>
<td>0.72</td>
</tr>
<tr>
<td>Meat</td>
<td>0.65</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>0.62</td>
</tr>
<tr>
<td>Protein</td>
<td>0.62</td>
</tr>
<tr>
<td>Total sugar</td>
<td>0.57</td>
</tr>
</tbody>
</table>

All the correlation coefficients are statistically significant, P <0.001
*Total dairy products excluding butter expressed in terms of fresh milk.

Correlation of the acute myocardial infarction rates in the 21 defined areas (source (f)) with their respective national per caput milk consumptions (source (b)) gave similar values to those obtained in the mortality correlations. The correlation coefficient for age-standardised attack rates was 0.79 (Fig. 2) and for incidence rates (first attacks) it was 0.72 (P <0.001).

![Fig. 2 Correlation between age-standardised myocardial infarction attack rates in 21 defined areas and national per caput total milk consumption.](http://jech.bmj.com/)

r = 0.79 (P <0.001).

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CIRCUMSTANTIAL STATISTICAL EVIDENCE

In certain countries a particularly high or low frequency of IHD is paralleled by milk consumption. Finland has the highest coronary mortality rate for middle-aged men (British Medical Journal, 1976a) and Helsinki had the highest rate of acute myocardial infarction in the WHO study of 21 defined areas (source (f)). The consumption data show that Finland has the highest per caput intake of total milk (source (b)) and whole milk (source (c)). The Finnish level of consumption...
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is not among the highest for the other items (including calories) in source (b), and it occupies second place for consumption of butter, ninth for animal fats and refined sugar (source (c)), third place for coffee (source (d)), and sixteenth and nineteenth places respectively for total tobacco and manufactured cigarettes (source (e)).

In Japan the IHD mortality rate is only 12% of that in the UK (source (a)). The comparable consumption of whole milk per caput is 15% (source (c)), animal fats 23% (source (e)), sugar 42% (source (b)) and calories 77% (source (b)). Coffee consumption is 20% but tea is also only 24% (source (d)). The consumption of manufactured cigarettes is 92% and total tobacco 105% (source (e)). Moreover, high blood pressure and urban stresses are common (British Medical Journal, 1976b). The Greenland Eskimos, who have a very low incidence of IHD, have a high fat, high protein diet, but a very low intake of milk and milk products (Bang et al., 1971).

CLINICAL EVIDENCE
There are some clinical reports to support the epidemiological evidence. In a clinicopathological investigation carried out by Briggs et al. (1960) at 10 hospitals in the USA and five in the UK the incidence of myocardial infarction was found to be double in peptic ulcer patients treated with milk diets as compared with both ulcer patients not so treated and non-ulcer patients. The difference was statistically significant. Brooks et al. (1963) found a relatively small, but statistically significant, increased incidence of coronary occlusion at necropsy in patients with duodenal ulcers, and considered that diets used in the treatment of peptic ulcer might be contributory to coronary occlusion.

THE POSSIBLE HAZARDS IN MILK
One pint (0·57 l) of milk contains 21·6 g of fat, 26·7 g of lactose, and 18·7 g of protein; it provides 375 calories (Documenta Geigy, 1970). All the fat except about 0·6 g is saturated or mono-unsaturated (United States Department of Agriculture, 1963). It is likely, therefore, that the fat content is at least partly responsible for the association between milk intake and the incidence of IHD. However, the stronger correlation of mortality with milk than with butter (Table 3) suggests that other factors may also be involved. The fairly strong correlation of mortality with calorie intake in the 43 countries (Table 2) could indicate that calorie overnutrition is an aetiological factor. Milk is a relatively cheap source of calories and because of its liquid form may not give commensurate satiation, so it might be contributing considerably to calorie overnutrition.

Lactose accounts for 10% of the carbohydrate consumption in western countries (Gray, 1971). If sucrose is atherogenic (Yudkin, 1974) perhaps lactose is as well. Both sugars yield glucose on hydrolysis, and galactose like fructose can stimulate insulin secretion (Keele and Neil, 1971). The Greenland Eskimos have a high prevalence of lactase deficiency (Gray, 1971) and a low prevalence of IHD (Bang et al., 1971). If a reduced incidence of IHD were shown to be related to lactase deficiency the protective effect would not necessarily be because of lactose malabsorption but might be caused by a low milk consumption.

Anand (1967, 1971, 1972) has presented circumstantial evidence, not against milk as such, but against milk that has undergone prolonged heating either by the Holder method of pasteurisation or domestically. Moreover, from data on 32 countries he demonstrated a closer relationship of IHD mortality with intake of milk protein than with milk fat, and concluded that heated milk protein may be a primary aetiologiolic factor in IHD. Davies et al. (1969, 1974) found antibodies to heat-dried cow's milk protein in a significantly higher proportion of myocardial infarction patients than in controls, antibodies to boiled egg white in a significantly higher proportion only for the patients who died within six months of infarction, and no difference between patients and controls in frequency of antibodies to gluten. They suggested that coronary atherosclerosis might have an immunological basis, but it is possible that the presence of milk protein antibodies in a higher proportion of the patients may be due only to a higher milk consumption than in the controls.

RECOMMENDATION ON MILK CONSUMPTION
The 43 countries in source (a) have been divided into low and high IHD mortality groups respectively below and above the median value of 135 per hundred thousand (Italy). The mean values for daily per caput total milk consumption (source (b)) in the two groups are 283·6 g and 583·4 g. Whole milk averages 82% of total dairy products (excluding butter) in source (c) and is equivalent to 59% of total milk in source (b), in which milk products

<table>
<thead>
<tr>
<th>Dietary item</th>
<th>r</th>
<th>(P value)</th>
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</thead>
<tbody>
<tr>
<td>*Total milk</td>
<td>0·72</td>
<td>(P &lt; 0·001)</td>
</tr>
<tr>
<td>Animal fat</td>
<td>0·70</td>
<td>(P &lt; 0·001)</td>
</tr>
<tr>
<td>Butter</td>
<td>0·50</td>
<td>(P &lt; 0·05)</td>
</tr>
</tbody>
</table>

*Total dairy products excluding butter.
(excluding butter) are expressed in terms of fresh milk. Application of the latter percentage to the low mortality countries in source \( b \) gives an average value for whole milk consumption in this group of 0.16 l or approximately 6 fluid ounces. I suggest, therefore, that adults should keep their usual daily intake of liquid milk to within one-third of a pint (0.19 l). Butter should be used sparingly and cream generally avoided as part of the programme to reduce the intake of saturated fats (Royal College of Physicians of London and British Cardiac Society, 1976).

Conclusion

The evidence presented suggests that a high milk intake may be harmful to coronary health. IHD is a multifactorial disease and milk as a coronary hazard could also be multifactorial: its content of saturated and mono-unsaturated fats, the contribution to calorie overnutrition, antigenicity of heated milk protein, and perhaps lactose. It is suggested that adults should be recommended to limit their daily intake of liquid milk to within one-third of a pint (less than 0.2 l). There is no justification for the campaign to drink at least one pint daily.

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References


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