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Milk and cardiovascular disease

a review of the epidemiological evidence.

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Milk has had a bad press........

MILK

The NOTMILK Home Page
MILK is a bad-news substance
Milk is a deadly poison
another web site

Milk causes 'serious illness for 7m Britons'
headline in the Independent 22nd June 2003

Don't be a Milk Sucker!
Got milk? Then you're likely to have a few other things, too—.. including heart disease and cancer…. *From a web site*

'Every cow should carry a government health warning'

I'm full of natural badness!

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At least ten mechanisms are given in the medical literature as a basis for the harm milk is supposed to cause, and why it is a factor in heart disease, stroke and other diseases:

'it raises cholesterol'   *'it increases arterial calcification'*
'it raises homocysteine'   *'it is low in copper'*
'it contains xanthine oxidase   *'it contains phytoestrogens'*
'it can carry bacteria'   *'it can carry fungi'*
'it can substitute for alcohol'   *'it enhances atherogenesis'*
'some subjects are lactose intolerant'

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On the other hand, milk does have benefits….

- it enhances growth in children
- it increases bone mass during growth
- it reduces bone resorption in the elderly
- it lowers blood pressure

but what about vascular disease?

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Milk and vascular disease:

Sources of evidence:

quick easy & cheap!

1. **Effects on biological mechanisms**
2. **Ecological data**
3. **Case-control studies**
4. **Prospective, cohort studies**
5. **Intervention trials**

great difficulty and cost

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Milk and vascular disease:

Sources of evidence:

1. **Effect on biological mechanism**
   - cholesterol
   - blood pressure
   - homocysteine

Slide 1

Milk and vascular disease:

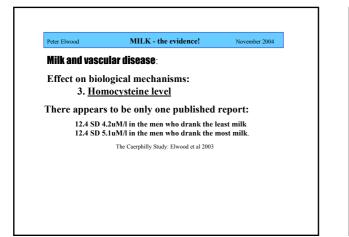**Effects on biological mechanisms:**
    1. Cholesterol level

Cholesterol level in lowest and highest milk drinkers:

Abbott et al (1996)	**5.6**	**5.7 mmol/L**
Ness et al (2001)	**5.87**	**5.90**
Nagaya et al (1996)	**5.20**	**5.28**
Caerphilly	**6.05**	**6.14**

(That is, a difference of about 8-10% of a SD)

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Milk and vascular disease:

Effect on biological mechanisms:
    2. Blood pressure

An overview of a large number of randomised trials concluded that milk drinking reduces blood pressure by about

2.16 mmHg systolic

1.28 mmHg diastolic

(Griffith et al 1999).

A study of 8,000 men in Puerto Rico found a twofold increase in hypertension in men who drank no milk compared with those who consumed 1 quart+ per day.

Garcie-Pameieri et al 1984

Slide 3

Milk and vascular disease:

Effect on biological mechanisms:
    3. Homocysteine level

There appears to be only one published report:

12.4 SD 4.2uM/l in the men who drank the least milk
12.4 SD 5.1uM/l in the men who drank the most milk.

The Caerphilly Study: Elwood et al 2003

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A model for research:

'DETERMINANTS' — Life style, smoking, diet activity body weight etc.

↓

'PREDICTORS' — Cholesterol level, blood pressure, homocysteine etc

↓

DISEASE — Heart disease, stroke, etc.

Slide 5

A model for research:

'DETERMINANTS' — Life style, smoking, diet activity etc.

← Biological mechanisms

'PREDICTORS' — Cholesterol level, blood pressure, homocysteine etc

DISEASE — Heart disease, stroke, diabetes, cancer etc.

Slide 6

A model for research:

'DETERMINANTS' — **Life style, smoking, diet activity etc.**

Biological mechanisms

'PREDICTORS' — Cholesterol level, blood pressure, homocysteine etc

DISEASE — **Heart disease, stroke, diabetes, cancer etc.**

Milk and vascular disease:

Sources of evidence:

1. Effects of milk on biological mechanisms
2. **Ecological data**
3. Case-control studies
4. Prospective, cohort studies
5. Intervention trials

The 'ecological' approach::

'DETERMINANTS' — Total milk production in a number of countries

'PREDICTORS' — Cholesterol level, blood pressure, homocysteine etc

DISEASE — Heart disease & stroke in those countries

The 'ecological' approach::

Heart disease deaths and milk consumption in 17 European countries

CHD death rates (y-axis)

Average milk protein consumption per head per day (x-axis)

From: The cow and the coronary Freed & Moss (2001)

The 'ecological' approach::

Heart disease mortality and various factors:

Whole milk	**r = 0.75** *(?50% of heart disease explained?)*
Refined sugar	**r = 0.75**
Coffee	**r = 0.48**
Tea	**r = 0.28**
Total tobacco	**r = 0.22**
Manufactured cigs.	**r = 0.17** *(?3% of heart disease explained?)*

(From: Is milk a coronary health hazard? (JJ Segal 1977)

Milk and vascular disease:

Sources of evidence:

1. Effect on biological mechanisms
2. Ecological studies
3. **Case-control comparisons**
4. Cohort studies
5. Intervention trials

Milk and vascular disease:

Case-control comparisons:

In one study 300 women in hospital with acute heart attack and 600 controls were questioned. (Gramenzi et al 1990)

In another, 500 'cases' and 500 'controls were questioned (Tavani et al 2002).

Previous milk drinking was associated with a 10-20% <u>reduction</u> in the risk of a heart attack.

Milk and vascular disease:

Sources of evidence:

1. Effect on biological mechanisms
3. Ecological studies
4. Case-control comparisons
5. **Prospective, cohort studies**

6. **Intervention trials** - *would they be possible?*

Milk and vascular disease:

A possible clinical trial of milk consumption and vascular disease

Design: Volunteers identified, half asked to consume lots of milk, half asked to take no liquid milk or milk containing food items.

Numbers required: Probably at least 5,000 in each group

Duration of the trial: Probably at least five years

Compliance required: Would have to be very high throughout the trial

UNACCEPTABLE

Milk and vascular disease:

Sources of evidence:

1. Effect on biological mechanisms
2. Ecological studies
3. Case-control comparisons
4. **Prospective, cohort studies**

5. Intervention trials

COHORT STUDIES

Determinants — Milk consumption at base-line

Predictors ← **Confounding factors** age, BMI, activity, smoking, social class, calorie intake, alcohol consumption etc.

Disease — MI and stroke during the following 10-20 years

There have been 10 cohort studies reported:

- **four from the UK, four from the USA, one each from the Netherlands and Japan**

- **together these comprise almost 400,000 subjects; over 8M man-years; 8,500 vascular events***

*4,533 heart attacks; 4,030 strokes

Cohort studies of milk drinking:

Year	Subjects	Events	Reference
1986:	35K US women:	**387 events**	(Bostic 1999)
1981:	7K UK men	**608 events**	(Shaper et al, 1991)
1980	11K UK vegetarians	**63 events**	(Mann et al, (1997)
1979	2.5K Welshmen	**613 events**	(Elwood et al, 2003)
1976	86K US nurses	**1,088 events**	(Iso et al 1999)
1970	6K Scotsmen	**1,599 events**	(Ness et al, 2001)
1966	223K Japanese	**544 events**	(Kinjo et al, 1999)
1965	3K Hawaiins	**347 events**	(Abbott et al, 1996)
1960	25K US subjects:	**3,085 events**	(Snowden et al, 1984)
1953	2.6K Dutchmen	**229 events**	(Vijver et al, 1992)

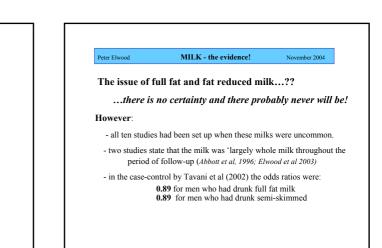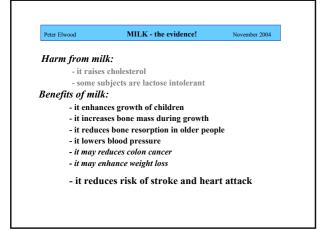## Cohort studies: <u>Displaying the results</u>:

The risk of a heart attack in subjects
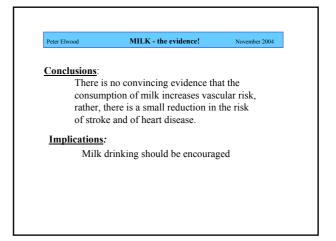who drank the most milk is calculated.

This is then related to the risk in the subjects
who drank little or no milk, and expressed as a ratio.

A Risk Ratio of 1.5 means a 50% excess risk in subjects with the highest milk consumption, relative to the risk in subjects with the lowest milk intake

while a risk ratio of 0.7 means a 30% lower risk.

<u>Cohort studies of milk drinking</u>:

Risk in subjects with the highest milk intake, **R**elative to that in subjects with the lowest intakes

Year	Study	Events	RR
1986	35K US women	387 events	**RR = 0.94**
1981	7K UK men	608 events	**RR = 0.88**
1980	11K UK vegetarians	63 events	**RR = 1.50**
1979	2.5K Welshmen	613 events	**RR = 0.84**
1976	86K US nurses	1,088 events	**RR = 0.70**
1970	6K Scotsmen	1,599 events	**RR = 0.90**
1966	223K Japanese	544 events	**RR = 0.85**
1965	3K Hawaiins	347 events	**RR = 0.66**
1960	25K US subjects	3,085 events	**RR = 0.94**
1953	2.6K Dutchmen	229 events	**RR = 0.77**

<u>All 10 cohort studies</u>:

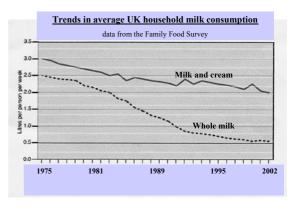**Overall, the risk in those with the highest milk consumption, relative to the risk in those with the lowest consumption:**

0.87 (0.74-1.03) for MI

0.83 (0.77-0.90) for stroke

0.84 (0.78-0.90) for either

The issue of full fat and fat reduced milk…??

…there is no certainty and there probably never will be!

However:

- all ten studies had been set up when these milks were uncommon.

- two studies state that the milk was 'largely whole milk throughout the period of follow-up (*Abbott et al, 1996; Elwood et al 2003*)

- in the case-control by Tavani et al (2002) the odds ratios were:
   0.89 for men who had drunk full fat milk
   0.89 for men who had drunk semi-skimmed

Harm from milk:
   - it raises cholesterol
      - some subjects are lactose intolerant
Benefits of milk:
   - it enhances growth of children
   - it increases bone mass during growth
   - it reduces bone resorption in older people
   - it lowers blood pressure
   - *it may reduces colon cancer*
   - *it may enhance weight loss*

   - it reduces risk of stroke and heart attack

<u>**Conclusions**</u>:
There is no convincing evidence that the consumption of milk increases vascular risk, rather, there is a small reduction in the risk of stroke and of heart disease.

<u>**Implications**</u>*:*
Milk drinking should be encouraged

In fact, milk consumption in the UK, in the USA and in many 'western' countries has been falling for the last 25 years…………..

due no doubt to the focus upon cholesterol………

(and the ignoring of the beneficial effect upon blood pressure and the other benefits of milk!)

Trends in average UK household milk consumption

data from the Family Food Survey

Milk and cream

Whole milk

Litres per person per week

1975   1981   1989   1995   2002

Overall conclusion

Every effort should now be made to increase milk consumption, to reverse the current fall in consumption, and to restore milk to its rightful place in a truly 'healthy' diet.

Postscript….!

In '***The Poets at Tea'*** Barry Pain presents a picture of Alfred Lord Tennyson, evidently suffering a mini-stroke:

> *I think I am drawing to an end,*
> *For on a sudden came a gasp for breath,*
> *A stretching of the hands, and blinded eyes,*
> *And a great darkness falling on my soul,*
> *O Hallelujah! …kindly pass the milk.*

Barry Pain (1864-1928) evidently knew something most clinicians and dietitians don't !