

DAIRY- GOOD OR BAD FOR YOUR BONES?

It appears that there is still (and will always be!) confusion about the health benefits of cow's milk and this is being perpetuated by many health advisors who tell the public and their clients that cow's milk is only good for calves and the evil source of many an unexplained ailment!

Milk makes a very valuable contribution to a healthy diet as it contains all the macro-nutrients (protein, carbohydrates and fat). Milk protein has a high biological value because it contains the essential amino acids needed by the body. The carbohydrate, lactose, supplies energy and aids the absorption of calcium. Milk is considered by many national and international opinion-leaders in the bone field as the best source of calcium because of the high calcium content, the absence of factors that may influence the absorption (such as phytates and oxalates in green, leafy vegetables) and the presence of lactose which aids in the absorption of calcium.

Milk also contains significant amounts of minerals and trace-elements calcium, phosphate, magnesium and selenium and vitamins A, D and B (riboflavin and niacin) – needed for bone health as well as general health.

Calcium intake is especially important during childhood and adolescence as this is the time when bone is formed quicker than it is removed, causing bones to become larger and denser. This is also the time to put calcium in the bone bank in order to achieve a higher peak-bone density (where one's bones reach their maximum density at +/- age 25-30), so that when you start losing bone density as a natural part of ageing, you have enough to lose! Calcium intake remains an important part of bone health throughout life.

Milk and bone health

The two key nutrients to consider for bone health are the mineral calcium and vitamin D. Calcium is a major structural component of bone tissue. It is deposited in bone in the form of hydroxy-apatite which confers strength to the skeleton. Approximately 99% of calcium is stored in the bones and teeth (the calcium bank).

Milk and other dairy foods are the most readily available sources of calcium in the diet. Dairy foods also have the additional advantage of being a good source of protein and other micro-nutrients. Vitamin D is essential for the development and maintenance of bone, both for its role in assisting calcium absorption from food in the intestine, and for ensuring the correct renewal and mineralization of bone tissue. Vitamin D will be dealt with in more detail in a next issue.

The importance of nutrition to bone health has been demonstrated in a number of research studies, in human subjects across the age range. Intervention trials (the gold standard in supplying scientific evidence), carried out over three years in children and adolescents have shown that supplementation with either calcium, dairy calcium-enriched foods, liquid milk, or calcium-enriched milk powder enhances the rate of bone mineral acquisition, compared

with un-supplemented (placebo) control groups (1-4). In general, these trials increased the usual calcium intake of the supplemented children from about 600-800mg/day to around 1000-1300mg/day. Although these studies were short term, it is likely that were these higher calcium intakes maintained until the subjects were in their mid- twenties, this would have an impact on peak bone mass. Some retrospective observational studies suggested that adults who consumed milk regularly during childhood had a higher bone mass than those who did not, although such studies are a weaker form of scientific evidence than intervention trials. At the population level, it is estimated that a 10% increase in peak bone mass could reduce the risk of osteoporotic fractures during adult life by 50%.

In studies among adults, one three-year intervention study in healthy young women aged 30-42 years showed that supplementing the usual diet with dairy foods prevented bone loss in the spine, compared with control subjects who did not increase their dairy intake (5). In post-menopausal women and the elderly, several intervention studies have shown that calcium or milk supplementation slows the rate of bone loss (6-15). In a study carried out in healthy, elderly women living in nursing homes, calcium (1200mg/day) and vitamin D (800IU/day) supplementation over 18months reduced the risk of hip fractures and other non-vertebral fractures (7). A similar intervention over three years of calcium (500mg/day) and vitamin D (700IU/day) was shown to reduce bone loss and the incidence of non-vertebral fractures in elderly men and women living at home and not in institutions (6). In comparative intervention studies, dairy food supplements and calcium supplements were equally effective in preserving hip-bone mass in postmenopausal women (13,15), although these studies were not designed to evaluate reductions in fracture rates.

Does the protein in milk cause calcium loss?

In the Framingham study, elderly men and women with lower total and animal protein intakes had greater rates of hip and spine bone loss than those consuming higher amounts of protein (16). There is also evidence that increasing protein intake has a favourable effect on bone mineral density in elderly men and women receiving calcium and vitamin D supplements, suggesting synergistic effects of these nutrients in improving skeletal health (17). Randomized clinical trials in elderly people with hip fractures have demonstrated the beneficial effects of giving protein supplements on the clinical outcomes following surgery to repair the fracture. Protein supplementation resulted in fewer deaths, shorter hospital stays and a greater likelihood to return to independent living (18-20).

Despite this evidence, there has been speculation that a higher dietary intake of protein could have negative effects on calcium metabolism and could possibly induce bone-loss. This relates to the hypothesis that the 'acid-base balance' of the diet is a potential risk factor for osteoporosis and if a diet contains predominantly acidic foods (which include key protein sources) and does not contain sufficient alkali-rich basic foods (fruits and vegetables), the alkaline salts of the skeleton may be drawn on to buffer this effect and in the long term lead to bone loss (21). Although there is some evidence from observational studies that a more alkaline diet is beneficial to bone health in pre- and post-menopausal women (22), the theory has not been proven in more definitive clinical trials.

In summary, the majority of scientific evidence supports the beneficial effects of protein intake on bone health, and highlights the risks associated with protein insufficiency and malnutrition. Although protein is needed for healthy bones, it is recommended that you limit your total protein intake to 75 grams/day.

What if I am lactose intolerant?

Lactose intolerance needs to be diagnosed by a doctor by doing certain tests as the abdominal symptoms can be confused with other digestive disorders such as irritable bowel syndrome. It is more common in Asians and Africans than in other races.

Lactose intolerance is a potential risk factor for osteoporosis as patients tend to avoid dairy products. Being lactose intolerant does not necessarily preclude all dairy products from the diet and some people can even tolerate small quantities of milk (< 12grams/meal) without symptoms. There are even some lactose reduced milks available (e.g. EasyGest®, Parmalat). Fermented milk products like yoghurt can be well tolerated as the live cultures actually produce the enzyme lactase which helps in breaking down lactose to more digestible sugars glucose and galactose.

Why are some populations less prone to develop osteoporosis even though their dairy intakes are low?

It is well known that certain population groups are less prone to develop osteoporosis and osteoporotic fractures. This is not because they do not consume dairy products and milk, but rather because of their genetic make-up.

Is salt and coffee bad for me?

A high sodium (salt) intake promotes urinary calcium excretion and is therefore considered to be a risk factor for osteoporosis. The Dietary Approaches to Stopping Hypertension (DASH) study showed that lowering salt intake was beneficial for bone metabolism (23).

Coffee is often implicated in the development of osteoporosis, but there is no convincing evidence that this is the case (24). Caffeine does however produce a small increase in urinary calcium excretion and a very small decrease in calcium absorption, but the body appears to balance this out by reducing calcium excretion later in the day. However, if calcium intake was already low (< 800mg per day), more than three cups of brewed coffee a day was associated with more bone loss (25).

In Summary

Dairy is good for you in more ways than one - being important in helping preserve bone mass and strength in the young and elderly, it speeds and aids healing in those who have had a fracture and it helps prevent further fractures.

Good nutrition alone will neither prevent nor cure osteoporosis, but in the context of a bone friendly lifestyle (exercise, stop smoking, limit alcohol intake) it is probably the more pleasurable and less onerous task on the list!

Recommended calcium allowances

AGE GROUP	CALCIUM PER DAY(mg)
Infants	500-700
Children and adolescents	1300
Young adults	1000
Pregnant and lactating females	1500
Post-menopausal women	
■ on hormone replacement	1000
■ not on hormone replacement	1300
The elderly (> 65 years)	1300

Approximate calcium levels in foods

FOOD	SERVING SIZE	CALCIUM(mg)
Milk, whole	236 ml	278
Milk, semi-skimmed	236 ml	283
Milk, skimmed	236 ml	288
Goats milk, pasteurized	236 ml	236
Yoghurt, low fat, plain	150 g	243
Yoghurt, low fat, fruit	150 g	210
Yoghurt, Greek style, plain	150 g	189
Cream, single	15	13
Cheese, cheddar type	40 g	296
Cheese, cottage	112 g	142
Cheese, mozzarella	28 g	101
Cheese, Camembert	40 g / average portion	94
Ice cream, dairy, vanilla	75 g / average serving	75
Tofu, soya bean, steamed	100 g	510
Soya drink	236 ml	31
Soya drink, calcium-enriched	236 ml	210
Broccoli, cooked	112 g	45
Curley kale, cooked	112 g	168
Apricots, raw, stone removed	160 g / 4 fruit	117
Orange, peeled	160 g / 1 fruit	75
Figs, ready to eat	220 g / 4 fruit	506
Almonds	26 g / 12 whole	62
Brazil nuts	20 g / 6 whole	34
Sardines, canned in oil	100 g / 4 sardines	500
Pilchards, canned in tomato sauce	110 g / 2 pilchards	275
Whitebait, fried	80g / average portion	688
Bread, white, sliced	30 g / 1 medium slice	53
Bread, wholemeal, sliced	30 g / 1 medium slice	32
Pasta, plain, cooked	230 g / medium portion	85
Rice, white, basmati, boiled	180 g / medium portion	32

Calcium levels from reference 7: Food Standards Agency (2002) McCance and Widdowson's The Composition of Foods, Sixth summary edition. Cambridge: Royal Society of Chemistry.

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