*British Journal of Nutrition* (2007), **98**, 456–457
doi: 10.1017/S0007114507791869


## *Invited Commentary*

# Nut consumption and change in weight: the weight of the evidence

An important source of plant protein, antioxidants, dietary fibre, vitamins and minerals, nuts have been traditionally viewed as a nutrient-dense food. In recent years, consumption of nuts has been increasingly evidenced to have a beneficial effect on CHD[1]. Yet at the same time, nuts are also a high-fat (50–75 % of their weight) and, thus, energy-dense food. Understandably, in light of the current obesity epidemic, questions arise as to whether the reported beneficial effects of nuts on coronary risk reduction and lipid serum and lipoprotein profile outweigh the detrimental effects of possible weight gain. Does current evidence bear out this concern?

There is growing literature suggesting that regular consumption of nuts does not have the expected impact on body weight. Epidemiological data do not support the disquiet regarding weight gain and nut consumption. In fact, in diet patterns where nuts are an integral part, such as in Mediterranean countries, an inverse association with BMI and obesity is seen[2]. A similar relationship is found in the United States, where nuts are not part of the traditional diet. Based on US national data on nut intake, we have previously reported[3] that nut eaters have a lower BMI than those not consuming nuts regularly. Interestingly, energy intake among nut consumers is higher. Also, among nut eaters, the amount of nuts in their diet shows no association with BMI[3]. Results from the Adventist Health Study[4], the first longitudinal study relating nut consumption to decreased risk of CHD, further support these findings but also suggest that those who included nuts in their diet more frequently were thinner than those who did not. Three other cohort studies have found an inverse or no relationship between nut consumption and BMI[5–7]. Ecological and observational epidemiological data relating nut consumption and lower BMI, although interesting, could be partially explained by reverse causation: obese people may tend to avoid nuts while lean individuals may have fewer reservations about consuming them.

A recent review of over twenty studies noted that no increase in body weight occurs when nuts are added to participants' diets in well-controlled feeding trials[2]. These studies, it must be noted, had a primary objective to investigate the effect of nuts on CVD risk factors. In these types of studies, the impact of nuts on body weight may be arguably related to the fact that researchers carefully adjust the energy level based on body weight changes. Although differing in methodology and dietary control, collectively these investigations provide substantial evidence that short-term consumption of moderate to large amounts of nuts does not increase body weight[3].

Few intervention studies have specifically investigated the connection between nut consumption and body weight as a main outcome. In this issue of the *British Journal of Nutrition*, Hollis & Mattes[8] add to the evidence of two previous studies specifically investigating body weight changes after introducing a moderate consumption of nuts into the daily diet of free-living individuals. Fraser[9] studied the effect of raw or dry-roasted almond supplementation (42–70 g/d) for 6 months on body weight changes in about eighty men and women. In another study, walnuts (28–56 g/d) were included in the daily diet of ninety men and women over the course of 6 months in a crossover fashion[10]. These studies showed no increase or a slight increase in body weight.

Similarly, in the report of Hollis & Mattes, 60 g/d raw, unsalted almonds were provided to twenty free-living women to be incorporated into their daily diets for 10 weeks without further dietary instructions. After this simple intervention, participants did not experience a change in body weight or body composition measures. This report adds to the previous ones, a rigorous attempt to quantify the different channels through which the extra energy from the daily nut allotment is dissipated, since no apparent change in body weight occurred. To this effect they used doubly labelled water measurements.

Multiple mechanisms of energy dissipation have been advanced to explain the lack of change in body weight after incorporating nuts into the diet[3], which can be summarized to two routes: decreased energy intake (from other foods) or increased energy expenditure (through physical exertion, metabolic rate or fecal residues). In the Hollis & Mattes trial, the largest route of energy dissipation was a decrease in energy intake. The 'dietary compensation' accounted for 74 % of the energy dissipation. This is in accordance with the previous studies[9,10]. The remainder was dissipated through increased energy expenditure. A greater fecal fat excretion accounted for 7 % and through the doubly labelled water measurements the investigators were able to explain the remaining energy expenditure.

Nuts share many physical and nutritional attributes[1]. What has been learned about walnuts and almonds with regard to body weight may also apply to other nuts but needs to be evaluated. The unique matrix of nuts endows them with properties that may not be transferable to other man-made high-fat, energy-dense foods.

After evaluating the epidemiological, metabolic and free-living studies on nut supplements, the weight of the evidence with regard to the effect of nuts on body weight leans in favour of safely incorporating them into the daily diet.

However, the evidence will not be complete until rigorous studies under strict metabolic conditions with body weight as the primary outcome are conducted.

Joan Sabaté

*Department of Nutrition*
*Loma Linda University*
*Loma Linda*
*CA 92350*
*USA*
email jsabate@llu.edu

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