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Editorial: Nutrition Research Reviews

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Editorial

This is the time of year when pumpkins are in season, and are incorporated into traditional festivals in Europe and North America (Harvest, Halloween, Thanksgiving). If you have previously considered pumpkins as good only for carving into grinning Jack O'Lanterns then the short review from Yadev *et al.*⁽¹⁾ might shed a little light on some of its potential medicinal properties, including antioxidant, anti-inflammatory, anti-carcinogenic and anti-diabetic. However, the active compounds, possibly various alkaloids and flavonoids, have yet to be isolated and characterised, and much of the work cited has been done in animal or *in vitro* models, so the beneficial effects need to be confirmed in human subjects before pumpkin can graduate from traditional herbal remedy to new, safe, effective therapeutic agent. Pumpkin, along with its fruit and vegetable colleagues, has been linked with reduced risk of oesophageal adenocarcinoma and its precursor, Barratt's oesophagus; this relationship is explored by Kubo *et al.* in their review⁽²⁾. The epidemiological evidence is apparently strongest for a protective effect of vitamin C, β -carotene, raw fruit and dark green, leafy and cruciferous vegetables, carbohydrates, fibre, Fe and possibly folate, while red meat and processed foods are associated with increased risk. Red and processed meats have long been dietary suspects in breast cancer carcinogenesis, though the evidence has been controversial, prompting Alexander *et al.* to conduct a review and meta-analysis⁽³⁾ of all available prospective cohort studies, incorporating over 25 000 cases of breast cancer. The consensus the authors arrive at is that there is no strong independent association between intake of red meat or processed meat and breast cancer, though they note that results were sensitive to the choice of model (fixed or random effects). Hypotheses concerning the possible role of diet early in life need further (very long-term!) prospective studies, while investigation of the (conflicting) evidence from studies suggesting that meat intake could affect cancer risk through tumour hormone receptor status, whether positive or negative, is also required before unequivocal conclusions can be drawn.

Arguably, according to popular perceptions, the main contender for dietary public enemy number one is fat. Nevertheless, fats form a significant component of most Western diets, and helping individuals choose a diet containing the correct balance of fats to help reduce mortality due to CVD is a challenge here taken up by Bester *et al.*⁽⁴⁾, who compare the cardiovascular effects of four edible oils. In addition to the widely known cholesterol-lowering effects of olive oil and sunflower-seed oil, fish oil has been shown to reduce cardiac arrhythmias (in rats – the evidence from human studies is mixed), together with having some beneficial effects on serum lipids. Recently, it has been reported (also in rats) that red palm oil may be

beneficial in the recovery of the heart from ischaemia–reperfusion injury; in addition, this oil has a neutral or positive effect on the serum lipid profile (in contrast with the belief, unfounded as it turns out, that this oil would have a detrimental effect on blood lipids due to its relatively high saturated fat content). Obesity is a major risk factor for CVD, and the review by Hariri & Thibault⁽⁵⁾ explores how the amount and type of dietary fat can affect weight gain, body composition and adipose tissue cellularity in animal models (and humans). The picture emerging shows that high-fat diets promote overconsumption of energy due to their high palatability and low satiating effects, while resistance to high circulating levels of leptin and insulin together with lowered suppression of ghrelin also promote hyperphagia. Adiposity is promoted by the low energy costs of storing dietary fat in adipose tissue, but all fats are not equal – saturated fat may be more readily stored (especially the longer-chain fatty acids) and less thermogenic than mono- or polyunsaturated fats; the latter may also be more satiating. Other contributing factors discussed include genetics, sex, feeding patterns, social factors, stress and the reversibility of obesity (often unsuccessful in animals as in humans, even on a low-fat diet when this is provided *ad libitum*).

In humans, a major risk factor for cardiometabolic disease is abdominal obesity, which can be defined in terms of waist circumference. However, deciding on the optimal cut-off value to be used in population screening is a problem, since there are variations among different ethnic groups (as suggested by the observation that Europeans need a higher cut-off than Asians to obtain the same prevalence of diabetes) and regionally within an ethnic group. Wang *et al.*⁽⁶⁾ express concern that the approach used by most workers in the field is over-simplified, since the cut-offs used invariably correlate with population waist circumference levels, meaning that the true extent of the prevalence of 'abdominal obesity' is masked in populations with higher waist circumferences because a higher cut-off is being applied than in populations with a lower waist circumference. If genetic differences are responsible for regional differences in waist circumference, then region-specific cut-offs would be appropriate, whereas if the variation between regions is due to differences in lifestyle then a uniform cut-off across regions is preferable; these authors suggest that calculating the absolute risk corresponding with increasing waist circumference cut-off values in different regions would clarify the issue and help to identify the cut-off value above which action should be taken. Browning *et al.* take the debate further in their systematic review⁽⁷⁾ of the usefulness of waist-to-height ratio as a screening tool for the prediction of CVD, diabetes and related diseases. Taking height into account prevents over-evaluating the

risk for tall individuals who have the same waist circumference as short individuals, and potentially offers the advantage that a single cut-off could be applied in different populations, including both sexes and across all ages. On balance, the data from the seventy-eight studies considered show that waist circumference and waist-to-height ratio are stronger predictors of disease risk than BMI, though a supporting meta-analysis would be required to confirm this. For the sake of simplicity, these authors argue in favour of adopting a boundary value of 0.5 for waist-to-height ratio above which there is increased disease risk for all adults, pointing out that this can be presented as a straightforward public health message 'keep your waist circumference to less than half your height', and which can be measured easily without the need for weighing equipment. The remaining challenge for future studies is to identify the clinically relevant boundary value for children.

Diet is a key component in the prevention and treatment of obesity, and finding a food that is protective would be highly beneficial. Ready-to-eat cereals (RTEC) could represent such a food, being associated with lower BMI in many reports; but the question as to whether it is just the whole-grain versions that are good for you (and not those made from refined cereals) needs to be addressed, and is here tackled by Kosti *et al.* ⁽⁸⁾, who review the evidence on the health benefits of RTEC, both refined and unrefined. Perhaps surprisingly, eating even sweetened, low-fibre 'children's cereals' is associated with lower adiposity in children and adolescents, while other studies have shown that it is high-fibre wholegrain cereals that are best for weight control among adults. Notwithstanding specific effects of the cereals themselves, it is possible that their consumption may simply be a marker for a generally healthier lifestyle (less snacking, more exercise), while at the same time they replace higher-fat/high-sugar foods in the diet such as meat/eggs, sweets/soda. Furthermore, RTEC are often fortified with micronutrients (Fe, thiamin, riboflavin, niacin, folic acid, and vitamins B₆, B₁₂ and D) and are usually consumed with milk, which contains useful nutrients such as Ca and may confer additional anti-obesity benefits. Further work is needed to distinguish the effects of the various wholegrain *v.* refined RTEC, but in the meantime dietary advice should probably focus on promoting intake of the more nutrient-dense, high-fibre, low-sugar versions for obesity prevention, with food labelling to help the consumer choose. Cereals that have been specially processed can perform a therapeutic role by stimulating secretion of antisecretory factor, and Ulgheri *et al.* ⁽⁹⁾ describe how this could be useful in the treatment of inflammatory bowel disease, gastroenteritis and Ménière's disease. Post-weaning diarrhoea in piglets can also be counteracted by this means, reducing the requirement for antibiotics.

Bacterial fermentation of fibre in the caecum and colon generates SCFA, including butyrate, which are responsible for some of the beneficial effects (including anticancer) conferred by dietary fibre, discussed here by Guilloteau *et al.* ⁽¹⁰⁾. Butyrate is the preferred metabolic fuel of colonocytes and is essential for the health of the colon; thus the finding that resistant starch is the most butyrogenic substrate is important in the context of preventing certain

digestive diseases such as diverticulosis. Butyrate reaching the liver affects glucose metabolism and could help prevent insulin resistance; it may also affect energy balance via the hypothalamus. Early postnatal development of the gastrointestinal tract is also controlled by butyrate, and it can be given as a feed additive, especially to young animals, to optimise nutrient digestibility, feed efficiency, growth rate and adiposity, as well as to control gut pathogens; these authors recommend the investigation of similar potential benefits of supplementary butyrate in human infants. A substance certainly not beneficial to infants is acrylamide, a toxic (mutagenic, genotoxic, carcinogenic, neurotoxic) contaminant detectable in infant formulae and commercial baby foods. It is generated in starchy foods prepared by baking, frying or microwaving, and is also present in purified drinking water in which it is used as a flocculating agent. Children probably consume two or three times the amount that adults do when expressed per unit body weight, and thus need to be protected from high exposure. Based on their investigations, Erkekoğlu & Baydar ⁽¹¹⁾ recommend that manufacturers must follow good manufacturing practices to minimise levels of this (and other) contaminants, while routine testing and strict law enforcement are also necessary. Parents can also reduce children's exposure to acrylamide by avoiding giving them fried and fatty foods, concentrating instead on boiled and raw foods, including plenty of fruit and vegetables.

At the other end of the life-course, age-related cognitive decline is the focus of the review by Macready *et al.* ⁽¹²⁾ which examines the evidence provided by randomised controlled trials for the effects of diet on cognition. A major difficulty in interpreting the results of these trials is the disparities among the cognitive domains being explored and the tests used; so these authors attempt to identify the domains (for example, episodic memory) and tasks (for example, common objects recall) most sensitive to chronic supplementation, to facilitate researchers in their study design. Frustratingly, though a few nutrients (for example, flavonoids, B vitamins) show some promise, methodological shortcomings (for example, using cognitive tests that were not sufficiently sensitive, inadequate statistics) make firm conclusions impossible in many cases. Thus these authors suggest that a more consistent approach is required for future chronic dietary studies, using standardised, sensitive, appropriate and discriminatory cognitive tasks and suitable statistical treatment, so that the public can be given accurate dietary advice.

Finally, this is my last Editorial as Editor-in-Chief of *Nutrition Research Reviews*, and I would like to welcome Graham Burdge to the role – I hope he enjoys it as much as I have!

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