How Sugar Shrinks Your Brain

The brain usually relies on glucose because, unlike the muscles, it cannot burn fat. Ketones are a terrific alternative source of fuel, but the brain has access to them only when the body runs out of glucose and enters ketosis or if they are supplemented in the diet. Therefore, under normal circumstances, the brain needs a constant, consistent supply of glucose to keep it ticking over. So it's no surprise to learn that blood sugar problems – which often culminate in diabetes – are linked to worsening mood and poor memory.

For instance, one recent trial measured HbA1c and glucose levels in more than 2,000 elderly people over the course of almost seven years.[i] In that time, slightly more than a quarter of the participants developed dementia, and the bottom line was that rising glucose levels were associated with increased risk of developing the condition, irrespective of whether the participants also had diabetes. Non-diabetics who experienced a modest increase in blood sugar levels had an 18 per cent increased risk of dementia, whereas those who already had diabetes at the start of the study or developed it within the trial period had a 40 per cent increased risk.

Other studies have found similar evidence of a link between diabetes and dementia. Back in 2004, researchers at Columbia University stated that people with high insulin levels – the principal hallmark of losing blood sugar control – were twice as likely to develop dementia as those with healthy levels. Moreover, those with the highest insulin levels had the worst memories.[ii] The same year, an Italian study also established a link between heightened insulin levels and declining mental function.[iii]

Similarly, a Puerto Rican study found that people who consumed the large amounts of sugar doubled their risk of suffering poor cognitive function,[iv] while another US study discovered a strong correlation between blood sugar level and memory loss.[v] Finally, two recent studies – one in Ireland[vi] and the other in the United States[vii] –established a link between high dietary GL and cognitive decline. Indeed, both of these reports suggested that high GL is even more predictive of the pathological changes associated with Alzheimer's than either high carb or high sugar intake.
While some initial decline in cognitive function is known as 'mild cognitive impairment' (MCI), the next stage is termed 'dementia'. Alzheimer's – which accounts for two-thirds of all cases of dementia – is diagnosed only when a scan reveals shrinkage in certain areas of the brain. One long-term study found evidence that this sort of shrinkage is more common among people with high blood glucose levels, even when those levels are still within what are considered 'normal' (i.e. non-diabetic) limits.[viii]

Will Adolescents Develop Dementia?

It's not just adults who are suffering. In just the same way as younger and younger patients are being diagnosed with type 2 diabetes every year, ever more overweight and obese children are experiencing cognitive decline. Although this is not as severe as full-blown dementia, it certainly affects their school performance. Once again, the link to high GL diets seems strong, and the rise in childhood MCI parallels the massive increases in sugar, fructose and sweetened drinks in the Western diet over the past forty years.[ix] Up to now, the youngest person to be diagnosed with dementia was

just thirty-two years old, but if this trend continues, we may well see adolescents developing the condition in the near future.

Sugar Shrinks Your Brain

The way in which sugar shrinks brains lends further credence to the theory that diabetes and dementia are very close cousins. As you will see in Chapter 13, one of the principal effects of a high carb diet and spiralling insulin resistance is that production of an enzyme called mTOR is cranked up, and excess mTOR arrests growth. In fact, a number of animal studies have found that it's linked to brain shrinkage and therefore cognitive decline.[x] There is also clear evidence of this dysfunctional enzyme's activity in Alzheimer's patients, to such an extent that it may even be part of the disease's pathology.[xi]

Sugar Makes You Angry

You may be furious that the food industry, governments, doctors and health officials have all allowed the situation to reach this stage. However, part of your anger may be attributable to a high sugar, high GL diet, which researchers have found increases aggression and even contributes to criminal behaviour. For instance, a ground-breaking study in the *British Journal of Psychiatry* discovered that excessive consumption of confectionery at the age of ten is strongly associated with convictions for violence in adulthood.[xii] Similarly, in Finland, Dr Matti Virkkunen discovered that every single one of a sample group of sixty-nine habitual offenders had blood sugar problems.[xiii]

The good news is that a low carb diet provides an almost immediate remedy. When 1,382 detained juvenile offenders were placed on a reduced sugar diet, there was a 44 per cent reduction in their antisocial behaviour.[xiv]

But it's not only offenders who suffer as a result of unhealthy diets. A study of eighty A-level students in West Midlands found that skipping breakfast was associated with a 30 per cent shorter attention span.[xv] Similarly, when 133 US elementary school students attended a breakfast programme for four months, their maths grades increased and their rates of absenteeism and lateness both decreased.[xvi]
Once again, the most important aspect of a child's diet seems to be GL. Researchers in Washington found that the cognitive performance of eighty-three hyperactive eight–thirteen-year-olds declined significantly when they ate a high GL breakfast (two slices of buttered white toast) rather than a low GL breakfast.[xvii] High sugar, high GL diets have also been linked to social withdrawal, anxiety, depression, delinquency and aggression.[xviii] One study of dyslexic children even found that a high sugar diet caused more erratic eye movements than a sugar free diet.[xix]
Sugary sweets may be the universal currency for treats, but what sort of treat is it to give a child this sort of start in life? A wise parent and child would say, 'No sugar thanks, I'm sweet enough already!'

The Cognitive Function Test

<P1>One of the many problems with cognitive decline is that sufferers are often unaware that it is happening. Also, since the brain shrinks irreversibly as Alzheimer's

develops, it's vital to find out sooner rather than later. That's why we encourage everyone over 40 to take the Cognitive Function Test. Please tell your friends.

---

[i] P.K. Crane *et al*., 'Glucose levels and risk of dementia', *New England Journal of Medicine* (2013), vol 369(6):540–548.

[ii] J.A. Luchsinger *et al*., 'Hyperinsulinemia and risk of Alzheimer disease', *Neurology* (2004), vol 63(7):1187–1192.

[iii] A.M. Abbatecola *et al*., 'Insulin resistance and executive dysfunction in older persons', *Journal of the American Geriatrics Society* (2004), vol 52(10):1713–1718.

[iv] X. Ye *et al*., 'Habitual sugar intake and cognitive function among middle-aged and older Puerto Ricans without diabetes', *British Journal of Nutrition* (2011), vol. 106(9):1423–1432.

[v] S. Seetharaman *et al*., 'Blood glucose, diet-based glycemic load and cognitive aging amongst dementia-free older adults', *Journals of Gerentology Series A: Biological Sciences and Medical Sciences* (2015), vol 70(4):471–479.

[vi] S.E. Power *et al*., 'Dietary glycaemic load associated with cognitive performance in elderly subjects', *European Journal of Nutrition* (2015), vol 54(4):557–568.

[vii] M.K. Taylor *et al*., 'A high-glycemic diet is associated with cerebral amyloid burden in cognitively normal older adults', *American Journal of Clinical Nutrition* (2017), vol 106(6):1463–1470.

[viii] M.E. Mortby *et al*., 'High "normal" blood glucose is associated with decreased brain volume and cognitive performance in the 60s: the PATH through Life Study', *PLoS One* (2013), vol 8:e73697.

[ix] S.E. Lakhan and A. Kirchgessner, 'The emerging role of dietary fructose in obesity and cognitive decline', *Nutrition Journal* (2013), vol 12:114.

[x] M.E. Orr *et al*., 'Mammalian target of rapamycin hyperactivity mediates the detrimental effects of a high sucrose diet on Alzheimer's disease pathology', *Neurobiology of Aging* (2014), vol 35(6):1233–1242.

[xi] S.C. Yates *et al*., 'Dysfunction of the mTOR pathway is a risk factor for Alzheimer's disease', *Acta Neuropathologica Communications* (2013), vol 1:3.

[xii] S. Moore, *et al*., 'Confectionary consumption in childhood and adult violence', *British Journal of Psychiatry* (2009), vol 195(4):366–367.

[xiii] M. Virkunnen, 'Reactive hypoglycemic tendency among habitually violent offenders', *Nutrition Reviews* (1986), vol 44(S):94–103.

[xiv] S.J. Schoenthaler, 'Alabama diet-behavior program: an empirical evaluation at the Coosa Valley Regional Detention Center', *International Journal of Biosocial Research* (1983), vol 5(2):888–898.

[xv] N. Morris and P. Sarll, 'Drinking glucose improves listening span in students who miss breakfast', *Education Research* (2001), vol 43(2):201–207.

[xvi] J. Murphy *et al*., 'The relationship of school breakfast to pshychosocial and academic functioning: cross-sectional and longitudinal observations in an inner-city school sample', *Archives of Pediatrics and Adolescent Medicine* (1998), vol 152(9):899–907.

[xvii] *Science News* (1987), vol 132:11.

[xviii] M. Haapalahti *et al*., 'Food habits in 10–11-year-old children with functional gastrointestinal disorders', *European Journal of Clinical Nutrition* (2004), vol 58(7):1016–1021.

[xix] P. Hardman *et al*., 'The effects of diet and sublingual provocative testing on eye movements with dyslexic individuals', *Journal of the American Optometric Association*, vol 60(1):10–13.