Food for the Brain
Sugar, Inflammaging and Dementia
DEBORAH COLSON MSc DipION
Food Matters Live, Thursday 19th November 2015, 13.15 – 13.35

Food for the Brain

- Educational charity championing the importance of nutrition for mental well-being
- We work to inform organisations and empower individuals to make nutrition and lifestyle changes – enabling us all to take better control of our own mental health
- Supported by a Scientific Advisory Panel, led by the eminent Professor Emeritus David Smith from the University of Oxford
- Our not-for-profit services include:
  - Food for the Brain Catering Accreditation
  - Brain Bio Centre Clinic
  - Employee Well-Being Services

Deborah Colson MSc DipION MBANT CNHC
Registered Nutritional Therapist

- Specialist in disorders of nervous system
- Author of Alzheimer’s Prevention Plan, Optimum Nutrition for Your Child and Optimum Nutrition for your Child’s Mind
- MSc Nutritional Therapy (University of Westminster, 2014)
- AFMCP-UK – London (Institute for Functional Medicine, 2011)
- Institute for Optimum Nutrition (DipION, 2002)
- Regulator: Complementary and Natural Healthcare Council (CNHC) - Professional Standards Authority Accredited Register
- Professional Association: British Association for Applied Nutrition and Nutritional Therapy (BANT)

What is Nutritional Therapy?
“the application of nutrition and health science to enable individuals to maximise their health potential”

- Full case history
- Biochemical / nutritional tests recommended
- Practical dietary, lifestyle and supplement advice given, tailored to the individual
- Optimise biochemistry
- Address risk factors
- Manage drug-nutrient interactions
- Informed by evidence base
- Favourable risk:benefit ratio
- ‘Wholistic’ – benefits are broad

Nutrition and lifestyle-related factors

- blood glucose control
- essential fatty acids
- minerals
  - Mg, Se, Zn, Cr, Mn, I, Cu, Ca
- vitamins
  - D, Bs, C, E, A, K
- amino acids
- phytonutrients
- Mediterranean diet
- microbiome
- homocysteine
- drug-nutrient interactions
- food intolerances
- oxidative stress
- environmental toxins
- stress
- sleep
- exercise
- social activity

Overall diet predicts how you age

“Eating a less healthy diet is associated with an increased risk of death.
Those eating a more “Western-type” diet have lower odds of ideal ageing, independently of other health behaviours.”

Western-type diet = high intakes of fried and sweet food, processed food and red meat, refined grains, and high-fat dairy products

**Well-established dementia risk factors**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Modifiable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>X</td>
</tr>
<tr>
<td>Type II Diabetes</td>
<td>✓</td>
</tr>
<tr>
<td>Overweight</td>
<td>✓</td>
</tr>
<tr>
<td>High blood pressure (mid-life)</td>
<td>✓</td>
</tr>
<tr>
<td>High cholesterol etc (mid-life)</td>
<td>✓</td>
</tr>
<tr>
<td>Smoking, lack of physical activity</td>
<td>✓</td>
</tr>
<tr>
<td>Less education, low cognitive reserve</td>
<td>✓</td>
</tr>
<tr>
<td>Lack of mental and social stimulation</td>
<td>✓</td>
</tr>
<tr>
<td>Genetics – ApoE et al</td>
<td>?</td>
</tr>
</tbody>
</table>

**Other nutrition & lifestyle risk factors**

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Modifiable?</th>
</tr>
</thead>
<tbody>
<tr>
<td>↑ Blood glucose (w/out diabetes)</td>
<td>✓</td>
</tr>
<tr>
<td>↓ Adherence to Mediterranean diet</td>
<td>✓</td>
</tr>
<tr>
<td>↓ Omega-3 / fish consumption</td>
<td>✓</td>
</tr>
<tr>
<td>↑ Homocysteine / ↓ B vitamins</td>
<td>✓</td>
</tr>
<tr>
<td>↓ Vitamin D</td>
<td>✓</td>
</tr>
<tr>
<td>↑ Oxidative stress / ↓ antioxidant nutrients</td>
<td>✓</td>
</tr>
<tr>
<td>↑ Alcohol</td>
<td>✓</td>
</tr>
<tr>
<td>↓ Polyphenols (curcumin et al)</td>
<td>✓</td>
</tr>
<tr>
<td>↑ Stress</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Can you reverse cognitive decline?**

- Personalised, intensive diet, lifestyle, supplement programme
- 10 patients
  - Alzheimer’s, amnestic mild cognitive impairment (aMCI), or subjective cognitive impairment (SCI)
- 9 out of 10 had improved cognition within 3-6 months of starting the programme (1/10 = very late stage AD)
- 6 out of 10 were able to return to work or continue working with improved performance (had had to discontinue working or were struggling with their jobs at the start)
- The improvements were sustained
  - Longest follow-up is 2.5 years from initial treatment, with sustained and marked improvement.

Aging (Albany NY) 6(9):707-27.

**Sugar**

- Diabetes is established risk factor for dementia
- In a prospective study of 2,000 older adults.....
  ....those with higher blood glucose readings at baseline (but not diabetes) had a 20% increased risk of dementia after 5 years (6.4 vs 5.5 mmol/l), HR 1.18 (95% CI 1.04 - 1.33) p=0.01

Crane et al (2013) Higher glucose levels may be risk factor for dementia (even in absence of diabetes). NEJM 369(6):540-8

**Glucose and cognitive performance**

- Persons with glucose levels in the prediabetes range had nearly twice as many errors as those with normal glucose, a large effect that was independent of BMI (p = .004)
- Higher glucose levels were associated with poorer cognitive performance on tests of inhibitory control, especially among individuals with prediabetes levels.


**Higher ‘normal’ blood glucose and brain shrinkage**

“These findings stress the need to ... consider the role of higher normal blood glucose as a risk factor for cerebral health, cognitive function and dementia. A better lifetime management of blood glucose levels may contribute to improved cerebral and cognitive health in later life...”

- Higher glucose levels in the normal range associated with greater hippocampal and amygdalar atrophy in older community-dwelling individuals free of diabetes.
- 210 cognitively healthy individuals (68-73 years) without diabetes, glucose intolerance or metabolic syndrome
- Baseline blood glucose levels in the normal range (3.2-6.1 mmol/l) were used to determine regional brain volumes and associated cognitive function.
- Higher glucose levels in the normal range were associated with lower grey/white matter regional volumes in the frontal cortices (middle frontal gyrus, inferior frontal gyrus precentral gyrus). Moreover, identified cerebral regions were associated with poorer cognitive performance and the structure-function associations were gender specific to men.

Mortby ME et al., (2013) High “normal” blood glucose is associated with decreased brain volume and cognitive performance in the 60s: the PATH through life study. PLoS One. 8(9):e73697
Higher 'normal' blood glucose and brain shrinkage

“even in the absence of manifest type 2 diabetes mellitus or impaired glucose tolerance, chronically higher blood glucose levels exert a negative influence on cognition, possibly mediated by structural changes in learning-relevant brain areas.”

- 141 individuals (72 women, mean age 63.1), memory was tested.
- Peripheral levels of fasting HbA1c, glucose, and insulin and 3-tesla MRI scans were acquired to assess hippocampal volume and microstructure, as indicated by gray matter barrier density.
- Lower HbA1c and glucose levels were significantly associated with better scores in delayed recall, learning ability, and memory consolidation.


Protein: Carbs and inflammation

- 24, obese, premenopausal women (20-50yrs)
  - no diabetes or prediabetes, randomised to:
    - HP (30% protein, 40% carbohydrates, 30% fat), or
    - HC (15% protein, 55% carbohydrates, 30% fat)
- 6 months, 500 kcal/day


High protein (HP) vs high carbohydrate (HC)

<table>
<thead>
<tr>
<th>Marker</th>
<th>HP vs. HC</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP</td>
<td>0.2 vs. 0.8 mg/L</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>TNFα</td>
<td>0.18 vs. 0.9 g/L</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>IL-6</td>
<td>0.12 vs. 0.4 mg/L</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>E-selectin</td>
<td>0.3 vs. 0.7 mg/L</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>β-cell function</td>
<td>0.7 vs. 2.0</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>insulin sensitivity</td>
<td>0.8 vs. 0.9</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>adiponectin</td>
<td>0.12 vs. 0.5 mg/L</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>free fatty acid</td>
<td>0.13 vs. 0.16 mg/L</td>
<td>&lt;0.0002</td>
</tr>
<tr>
<td>RER</td>
<td>0.26 vs. 0.36 kcal</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>dichlorofluorescein</td>
<td>0.8 vs. 0.3 µmol/L</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>malondialdehyde</td>
<td>0.24 vs. 0.2 µmol/L</td>
<td>&lt;0.0004</td>
</tr>
</tbody>
</table>


Alzheimer’s Disease

Type 3 Diabetes ???


Sugar

- Sugar is the pure form of carbohydrate
- It is found in many 'healthy' and low fat foods
  - Eg fruit yoghurts, breakfast cereals, juices and smoothies
- Refined carbohydrates such as white bread/pasta/rice have a marked sugar effect
Taking the sting out of sugar

• Protein, fat and fibre slow gastric emptying, thereby slowing the entry of glucose into the bloodstream
• So, adding protein and fibre to food is helpful
• But, fat is unhealthy, right?

For decades, it has been the most vilified nutrient in the American diet. But new science reveals fat isn’t what’s hurting our health…….

June 23, 2014

Superfoods?

• Berries (flavonoids, anthocyanins)
• Brassicas (sulphoraphane)
• Turmeric (curcumin)
• Green tea (catechins)
• Grapes / wine (resveratrol)
• ..........

Cocoa flavanol consumption improves cognitive function

• 90 elderly w/out cognitive dysfunction, 8 weeks, RCT
• Quicker completion of Trail Making Tests in HF (7.7 ± 1.1 words/60 s) vs IF (6.7 ± 0.5 and -14.2 ± 0.5 s, respectively) (P < 0.0001) and LF (7.8 ± 1.6 and -11.1 ± 0.7 s).
• Greater improvement in Verbal Fluency Test (P < 0.0001) in HF group (7.7 ± 1.1 words/60 s) vs IF (3.6 ± 1.2 words/60 s) and LF (1.3 ± 0.5 words/60 s) groups.
• Greater improvements in insulin resistance (P < 0.0001), blood pressure (P < 0.0001), and lipid peroxidation (P = 0.001) in HF and IF groups vs LF group.
• 993mg high flavanol (HF), 520mg intermediate (IF), 48mg low (LF)
• Cognitive function was assessed at baseline and after 8 weeks by using the Mini-Mental State Examination (MMSE)

Optimal brain performance

Physical exercise
Critical thinking
Intermittent fasting


Alternative sweeteners

- Acesulfame Potassium
- Aspartame
- Neotame
- Saccharin
- Sorbitol and Mannitol
- Sucralose
- Stevia
- Xylitol
- Fructose

Cognitive Function Test

- Food for the Brain offers a FREE online test at www.foodforthebrain.org
- 230,000 people have now taken the test
- It gives the earliest indication of your memory status
- And tells you what to do about it

Food for the Brain

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