Nutrition Research and Managing Diabetes – in a nutshell

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University of South Australia | Nutritional Physiology Research Centre
Almost 1 in 4 Australians aged over 25 years has either diabetes or pre-diabetes.

Food choices to help manage diabetes

- High fibre / low GI carbohydrate
- Lean protein
- Vegetables / salad

Secrets of the Mediterranean diet

- Olive oil
- Oily fish
- Fruit and vegetables
- Wine in moderation
- Nuts
NUTS

- Nuts have a wide variety of nutritional benefits
- **Tree nuts** include

<table>
<thead>
<tr>
<th>Almonds</th>
<th>Hazelnuts</th>
<th>Pistachios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil Nuts</td>
<td>Macadamia</td>
<td>Walnuts</td>
</tr>
<tr>
<td>Cashews</td>
<td>Pecans</td>
<td></td>
</tr>
<tr>
<td>Chestnuts</td>
<td>Pine Nuts</td>
<td></td>
</tr>
</tbody>
</table>

- **Peanuts**, a legume grown in the ground also share these good nutritional properties
What makes nuts so good?

• Nuts are energy dense foods
  ~2200–3000 kJ/100g

• Nuts are nutrient-rich foods
  – High in protein, MUFA and PUFA

• Nuts are low GI
  – Rich in fibre

• Nuts contain antioxidants
  – Vit E, polyphenols

• Nuts have healthy electrolytes
  – Low in Na⁺, Rich in K⁺ and Mg²⁺

Just 30g can make all the difference
In Australian diets, nuts contribute

- only 1% of total energy intake
- 2% of total fat intake
  - 3% of MUFA intake
  - 4% of PUFA intake
- 1.5% of fibre intake

Australians on average consume 1 serve (~30g) per week

National Nutrition Survey
Australia, 1995
Heart Health Benefits
Epidemiological evidence of heart health benefits

Prospective cohort studies of diet and cardiovascular disease

Nuts
Albert et al\textsuperscript{101}
Ellsworth et al\textsuperscript{100}
Brown et al\textsuperscript{99*}
Hu et al\textsuperscript{98}
Fraser and Shavlik\textsuperscript{97}
Fraser et al\textsuperscript{96}

Fruits and Vegetables
Bazzano et al\textsuperscript{110}
Liu et al\textsuperscript{108}
Joshipura et al\textsuperscript{107}
Liu et al\textsuperscript{109}
Joshipura et al\textsuperscript{106}
Gaziano et al\textsuperscript{105}
Gillman et al\textsuperscript{104}
Knekt et al\textsuperscript{103*}

Whole Grains
Liu et al\textsuperscript{113}
Liu et al\textsuperscript{112}
Jacobs et al\textsuperscript{111}
Fraser et al\textsuperscript{96}

Hu FB & Willett WC JAMA 2002;281:2569
Physicians Health Study

21,454 men 40-84 years
began 1982 - diet questionnaire in 1983
17 year follow-up - 201 sudden deaths

Frequency of nut consumption

<table>
<thead>
<tr>
<th>Relative Risk</th>
<th>&lt;1/mth</th>
<th>1-3/mth</th>
<th>1/wk</th>
<th>&gt;2/wk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coronary Heart Disease</td>
<td>1.0</td>
<td>0.89</td>
<td>0.90</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.9-1.2)</td>
<td>(0.9-1.0)</td>
<td>(0.5-0.9)</td>
</tr>
<tr>
<td>Sudden Death</td>
<td>1.0</td>
<td>0.98</td>
<td>0.85</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.7-1.4)</td>
<td>(0.6-1.3)</td>
<td>(0.4-1.0)</td>
</tr>
</tbody>
</table>

Albert CM. Arch Intern Med 2002;162:1382-1387
Nurses Health Study

86,016 women aged 34-59 years
began 1976 - diet Questionnaire in 1980
14 year follow-up - 1255 major CHD events

Frequency of nut consumption

<table>
<thead>
<tr>
<th>Relative Risk</th>
<th>Almost never</th>
<th>1-3/mth to 1/wk</th>
<th>2-4/wk</th>
<th>&gt;5/wk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coronary Heart Disease</strong></td>
<td>1.0</td>
<td>0.91 (0.8-1.0)</td>
<td>0.78 (0.6-0.9)</td>
<td>0.66 (0.47-0.93)</td>
</tr>
<tr>
<td><strong>Fatal Coronary Heart Disease</strong></td>
<td>1.0</td>
<td>0.76 (0.6-0.9)</td>
<td>0.60 (0.4-0.96)</td>
<td>0.60 (0.3-1.1)</td>
</tr>
</tbody>
</table>

Hu FB. BMJ 1999;317:1341-1345
The Good Oil
Nuts are a good source of Monounsaturated Fatty Acids
More monounsaturated fat associated with a healthier cholesterol profile

Overall improvement of blood lipid profiles with regular consumption of tree nuts

- pecans (72g/d) 4 wks
- almonds (66g/d) 6 wks
- almond oil (35g/d)
- hazelnuts (40g/d) 4 wks
- walnuts (56g/d) 6 wks
- macadamia (40-90g/d) 4 wks
- pistachio (20% calories) 3wks

What about peanuts?

Hazel handed in her notice, because she was tired of working for peanuts........
Peanuts are better than approved low fat diets (Step 1 and 2) for improving blood lipid profiles.

<table>
<thead>
<tr>
<th></th>
<th>LDL</th>
<th>HDL</th>
<th>Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>% change</td>
<td>-10</td>
<td>-15</td>
<td>-5</td>
</tr>
</tbody>
</table>

Step 1 and Step 2:
- Olive Oil
- Peanut Oil
- Peanuts & peanut butter

Kris-etherton et al 1999
But doesn’t eating high fat foods cause weight gain?

The good news....nut-eaters weigh less.
Low nut consumption linked to greater weight gain

8865 Men aged 23-54 years
began 1999 - diet Questionnaire in 2005

Frequency of nut consumption (50g serve)

<table>
<thead>
<tr>
<th>Nut Consumption (g/d)</th>
<th>Almost never</th>
<th>1-3/mth to 1/mth</th>
<th>1/wk</th>
<th>&gt;2/wk</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number/group</td>
<td>1,847</td>
<td>4,097</td>
<td>1,772</td>
<td>1,149</td>
<td></td>
</tr>
<tr>
<td>Number who gained weight</td>
<td>214</td>
<td>444</td>
<td>194</td>
<td>85</td>
<td></td>
</tr>
</tbody>
</table>

Relative risk
1.00 0.93 0.94 0.61 <0.001

adjusting for age, gender, smoking, leisure time physical activity

Nuts can enhance weight loss in people with insulin resistance or diabetes on a low calorie diet (LCD)


Both diets reduced insulin resistance

Almond-LCD: -66%
CHO-LCD: -35%  (P<0.0001)
Nurses Health Study

83,818 women aged 34-59 years
began 1976 - diet questionnaire in 1980
16 year follow-up - 3206 new cases of type 2 diabetes

Risk of Type 2 Diabetes reduced as frequency of nut consumption increased

<table>
<thead>
<tr>
<th></th>
<th>Almost never</th>
<th>&lt;1/wk</th>
<th>1-4/wk</th>
<th>&gt;5/wk</th>
<th>P for trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR</td>
<td>1.0</td>
<td>0.82 (0.76-0.89)</td>
<td>0.69 (0.63-0.76)</td>
<td>0.55 (0.45-0.66)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Jiang R et al JAMA 2002;288:2554
Addition of nuts improves blood glucose response

• Similar effects also seen with mixed nuts and pistachios

Replacing Carbohydrate with nuts improves $\text{HbA}_{1c}$

- 3 month parallel study in 117 people with type 2 diabetes
- Supplements provided ~2000 KJ

$\text{HbA1c}$ (%) vs Time (week)

- 38g (mixed nuts) + $\frac{1}{2}$ muffin
- 75g (mixed nuts)

-0.21% absolute $\text{HbA1c}$ units

FDA considers $>0.3\%$

Circulatory function is altered in diabetes

Arginine is important for maintaining healthy blood vessels

Arginine Content of Nuts (g/100g)

- Beef
- Peanuts
- Almonds
- Walnuts
- Brazils
- Hazelnuts
- Cashews
- Pistachios
- Macadamias
- Pecans

mg
Blood vessel function improves after 4 weeks of consuming walnuts.
Can peanuts improve endothelial function and does this impact on cognition?

Cognitive decline
Depression
Neuro-degenerative disorders

impaired blood flow

Peanut Company of Australia

HiVeic
Peanuts by PCA
Why Nuts?

• great source of healthy nutrients
• favourably influence blood lipids
• help to reduce or control body weight
• help to control blood glucose
• should be part of your daily diet

but avoid the salt!!!
Nutritional Physiology Research Centre

http://www.unisa.edu.au/nutritional.physiology/