The Role of Protein for Health

CSIRO Proteins for Food and Health Seminar Series
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Lessons from longevity hotspots

- Protein intakes vary 10-25% of energy requirements
- One size does not fit all regarding effective strategies for management of health and wellbeing
- There is a need for personalized solutions!
Key functions of dietary protein

• Adequate protein intake is vital for building and repairing structural component of cells and tissues
  – Bone
  – Muscle
  – Antibodies
  – Enzymes
  – Hormone messengers
  – Transport & storage

• Excess protein is stored as body fat

Current protein intakes

<table>
<thead>
<tr>
<th>GENDER</th>
<th>AGE</th>
<th>BREAKFAST</th>
<th>LUNCH</th>
<th>DINNER</th>
<th>OTHER</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females</td>
<td>14-18</td>
<td>11.5</td>
<td>18.3</td>
<td>32.1</td>
<td>14.6</td>
<td>76.5</td>
</tr>
<tr>
<td></td>
<td>19-70</td>
<td>11.2</td>
<td>20.6</td>
<td>34.1</td>
<td>12.8</td>
<td>78.7</td>
</tr>
<tr>
<td></td>
<td>71+</td>
<td>11.2</td>
<td>20.7</td>
<td>30.5</td>
<td>9.2</td>
<td>71.5</td>
</tr>
<tr>
<td>Males</td>
<td>14-18</td>
<td>13.1</td>
<td>23.7</td>
<td>43.1</td>
<td>21.3</td>
<td>101.2</td>
</tr>
<tr>
<td></td>
<td>19-70</td>
<td>15.7</td>
<td>27.7</td>
<td>44.6</td>
<td>19.0</td>
<td>107.0</td>
</tr>
<tr>
<td></td>
<td>71+</td>
<td>15.4</td>
<td>23.6</td>
<td>34.4</td>
<td>9.2</td>
<td>82.6</td>
</tr>
</tbody>
</table>

Current daily protein recommendations

<table>
<thead>
<tr>
<th>Age</th>
<th>EAR</th>
<th>RDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-30 yr</td>
<td>52 g/day (0.68 g/kg)</td>
<td>64 g/day (0.84 g/kg)</td>
</tr>
<tr>
<td>31-50 yr</td>
<td>52 g/day (0.68 g/kg)</td>
<td>64 g/day (0.84 g/kg)</td>
</tr>
<tr>
<td>51-70 yr</td>
<td>52 g/day (0.68 g/kg)</td>
<td>64 g/day (0.84 g/kg)</td>
</tr>
<tr>
<td>&gt;70 yr</td>
<td>65 g/day (0.86 g/kg)</td>
<td>81 g/day (1.07 g/kg)</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-30 yr</td>
<td>37 g/day (0.60 g/kg)</td>
<td>46 g/day (0.75 g/kg)</td>
</tr>
<tr>
<td>31-50 yr</td>
<td>37 g/day (0.60 g/kg)</td>
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<td>51-70 yr</td>
<td>37 g/day (0.60 g/kg)</td>
<td>46 g/day (0.75 g/kg)</td>
</tr>
<tr>
<td>&gt;70 yr</td>
<td>40 g/day (0.75 g/kg)</td>
<td>57 g/day (0.84 g/kg)</td>
</tr>
</tbody>
</table>

Guidelines may not optimal for many

Protein intakes need to be personalised:
- Age
- Gender
- Actual body weight
- Physical activity
- General health/medications
- Weight loss

- Female
  - 71 kg
  - 85-114 g/protein/day
  - 1.1-1.6 g/kg/day for weight loss

- Male
  - 86 kg
  - 103-138 g/protein/day
  - 1.2-1.6 g/kg/day for weight loss
Evidence of health benefits of increased protein

Who benefits most from $> 0.8 \text{ g/kg/day}$

**Overweight/Obese** aiming to reduce weight, optimise body composition, maintain strength/function & reduce disease

**For Healthy Ageing:** Individuals fighting sarcopenia/age related muscle loss and/or hospitalisation

**People choosing vegetarian and mainly plant based diets**
Key physiological effects of higher protein intakes for weight loss

- **Reduces** body weight, particularly fat mass.
- **Retains** fat-free mass during weight loss/ promotes accretion of lean mass during weight maintenance
- **Retains** bone mass during weight loss
- **Increases** fullness and **reduces** hunger and energy intake, at least in people aged < 65 years but not > 65 years
- **Curbs cravings** – namely at breakfast
- **Increases** thermogenesis and **blunts** the fall in resting energy expenditure during weight loss
- **Increases** strength when combined with resistance exercise

For Overweight/Obese Adults (~20 – 62 years)

- 30% calorie restricted diets for > 1 yr
- ~1.4 g of Protein/ kg/d vs ~1 g of Protein/kg/d
  - 0.44 kg > reduction in fat mass
  - FFM preserved
  - 0.17 mmol/L > reduction in triglycerides
  - 0.22 mU/L > reduction in insulin
- = improvements in lipids, blood pressure, glucose control, inflammation

Wycherley T P et al. AJCN 2012; Leidy H et al. AJCN 2015; Paddon-Jones AJCN 2015; Geizenaar C et al.

Clifton PM et al. 2013
For Overweight/Obese Adults –European Diogenes Study

• Largest study comparing LP vs HP diets for weight-loss maintenance after 1 year of weight loss.
  - 938 adults.
  - the parents completed an initial 8-week energy restriction period.

• High protein low glycemic index vs Low protein diet
  • less weight regain (mean difference of -0.93 kg)
  • improved many metabolic risk factors

Larsen et al., 2010a; Larsen et al., 2010b; Damsgaard et al., 2013; Papadaki et al., 2014.

Adults > ~60 plus years need even more

Key Recommendations

- ~1.4 g/kg of BW/day for healthy
- ~1.2-1.6 g/kg BW/day for pre-frail/frail
- ~0.8 g/kg BW/day for those with GFR < 30 ml/min

Increased Protein Found to Prevent

- Preserve muscle protein synthesis after hospitalisation
- Increase lean mass, particularly when combined with resistance exercise
- Improve some aspects of physical function (i.e. namely grip and gait speed) & quality of life
Does timing of protein matter?

Protein distribution – does it matter?

‘Westerners’ have unbalanced protein distribution

Protein distribution – does it matter?

Aim for a balanced protein distribution and have protein after resistance training for maximal protein synthesis


Muscle breakdown

Muscle synthesis

max. muscle protein synthesis ~30 g

Weaker suppression of energy intake with higher protein in healthy old compared to young men

Giezenaar C et al. AJP-Regul Integr comp Physiol 2015

N = 8 young (18-34 years) vs 8 older (69-80 years) men
Protein loads in ~450ml:
120 kcal = 30 g Protein
280 kcal = 70 g Protein
*Both cf water control 0kcal/min

But in both groups ~30 g protein per meal is also optimal for appetite regulation
Does source of protein matter?

How Australians consume their protein – needs correction!!

Opportunities
- Reduce indulgence foods
- Create healthier meats, cereals and grain based food
- Fortify some core foods with protein
- More plant based proteins
Anabolic effects of some proteins are better than others

Published randomised clinical trials are heavily biased to investigation of dairy proteins

Opportunities for the food industry

- Overweight/obese, elderly or hospitalised adults have great potential health benefits from increased protein intake.
- Evidence indicates need >1.1 to 1.6 g/kg/d for above populations
  - aim for ~30 g of protein at every eating occasion
  - protein intake at breakfast and lunch meals need most attention
- Timing of protein intake should be considered on an individual basis
- Variety of high-quality proteins
  - dairy, eggs, fish, lean meat, legumes and pulses
  - Fortified products including oral nutritional supplements may required
    - Dairy-based protein supplements appear most effective for enhancing muscle mass/strength
Opportunities for the food industry

- Protein-dense meals & snacks:
  - sustainable, ethical, affordable
  - appetising, convenient
  - increase variety plant- or flexitarian-protein foods
  - Provide array of other nutrients, vitamins, minerals, trace elements

- For frail/hospitalised older adults:
  - minimise the calories and volume of each meal/snack
  - protein + resistant starch + healthy fatty acids

Thank-you

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