Discussion of Research Recommendations:
DRIs for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids

Dietary Reference Intake Research Synthesis Workshop

DRI Report of Macronutrients

- Research recommendations listed at the end of each of eight chapters.
- An entire chapter devoted to “A Research Agenda”.
- Research issues are raised throughout the 1,331 page report.

Criteria for Selection

- Research must have a direct effect on:
  - Changing a current DRI value or the criterion upon which that value was established.
  - Includes providing sufficient data to promote an AI to an RDA.
  - Establishing a new DRI value where current research suggests one may be needed.
Criteria for Selection (Cont.)

- Those aspects of the Macronutrient Report that resulted in the greatest scientific challenge.
- Those recommendations which presented obstacles when attempting to incorporate DRI values from nutrients into food patterns in the 2005 Dietary Guidelines.

DRI Report of Macronutrients

- Carbohydrates
- Fiber
- Fat, Fatty Acids, and Cholesterol
- Protein and Amino Acids
- Energy and Physical Activity

Carbohydrates: Existing DRI Values

- AMDR of 45-65% of Kcals.
- RDA of 130 g carbohydrate/day.
- Recommendation that "added sugars" be less than 25% of Kcals.
- Recommendation to revisit the difference between high glycemic vs. low glycemic diets on diabetes and CHD.
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130 g x 4 = 520 Kcals
520/2000 = ~25%
25% of Kcals is below the AMDR and a 25% Kcal carbohydrate diet is not a healthy diet.

Carbohydrates: Changing an Existing DRI Value

- Recommendation: RDA for carbohydrate should be based on the overall diet, not on glucose needed by the brain.
- Research question: What level of carbohydrate intake is commensurate with a healthy diet?
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Calcium intake in children 4-8 Y as a function of added sugar intake

Longitudinal studies since the Macronutrient Report show an increase in weight gain with added sugars from certain sources

- Berkey et al. Obesity Research 2004
- Phillips et al. Obesity Research 2004
- Mrdjenovic and Levitsky J Pediatrics, 2003
If our mandate is to meet all of our nutrient requirements from foods we have very few “discretionary calories”

- Recommendation: Revisit the <25% of Kcals from “added sugars”
- Consider longitudinal studies on weight gain
- Consider how many “discretionary calories” we can eat without gaining weight

Recommendation to revisit the glycemic load of the diet

- AMHR of 45-65% of Kcals
- RDA of 130 g carbohydrate/day
- Recommendation that added sugars be less
- Recommendation to revisit the difference between high glycemic vs. low glycemic diets on diabetes and CHD.

Relative risk of type 2 diabetes

From Salmeron et al. JAMA, 1997
Relationship of Dietary GI or Load to risk of Type 2 diabetes

- What are needed now are clinical intervention trials with high dietary GI/load vs low dietary GI/load diets and appropriate endpoints:
  - Diabetes
  - Hemoglobin A1c
  - Blood glucose/insulin

Fiber: Existing DRI Values

- AI is 14 g fiber/1000 Kcals
- Definition of total fiber separates fiber from foods (dietary fiber) from fiber synthesized or extracted and added to food (functional fiber)
- No UL for fiber

DRI value based on three epidemiological studies

<table>
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<tr>
<th>Study Type</th>
<th>Number</th>
<th>Sex</th>
<th>RR</th>
<th>Average Intake for Best Group</th>
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<tr>
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<td>21,930</td>
<td>Finnish men</td>
<td>0.68</td>
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References:
To change the AI for fiber to an RDA would require…

- A randomized trial with preferably three levels of fiber intake and surrogate markers for CHD.
- Or, changing the endpoint from CHD to a more physiological endpoint, such as "healthy laxation".
- In addition, there is considerable concern that the 14 g/1000 Kcals is too high for children.
- Recommendation is to study the effect of fiber intake specifically in children.

Research Questions for Functional vs. Dietary Fibers

- Is there a difference to overall health in a high fiber diet from foods vs. fiber supplements (or functional fibers).
- Each fiber source suggested as a "functional fiber" needs to be tested for efficacy.
- There is the potential for a UL for extracted or synthesized fibers when added to foods in amounts not likely to be found from the diet.

Fats: Existing DRI Values

- AMDR Total fat 20-35% of Kcals
- AI for linoleic acid (17 g/d youg men; 12 g/d young women)
- α-linolenic acid (1.6 and 1.1 g/d for men and women)
- No ULs
Fats: Basis for the AIs for the essential fatty acids

- Median intake in the US “Where n-6 and n-3 fatty acid deficiencies are non-existent in healthy individuals.”
- Clinical symptoms of deficiency that were considered are rough and scaly skin.

Recommendations for the essential fatty acids

- Need to revisit the AIs and consider health promotion rather than deficiency symptoms
  - Particularly true for the n-3 fatty acids
- Given the literature since the Macronutrient Report consider separate recommendations for DHA and EPA

Recommendation: Consider ULs for specific fats

- Currently there is no UL for saturated fat, trans fat or cholesterol
- The rationale is that “A UL is not set for saturated fatty acids, trans fatty acids or cholesterol because any incremental increase in intake increases CHD risk.”
- A UL is defined as “the highest average daily nutrient intake level that is likely to pose no risk of adverse health effects…”
- Note: There are ULs for choline, (fishy body odor), niacin (flushing).
Research Recommendation:

- Determine the lowest levels of saturated fat, trans fat, and cholesterol that are consistent with a healthy diet and cause a low amount of harm.

Protein and Amino Acids: Existing DRI Values

- AMDR 10-35% of Kcals
- RDA 0.8 g/Kg BW/d
- RDAs for the essential amino acids
- No ULs for protein or amino acids

Recommendation: Consider ULs for individual amino acids

- AMDR 10-35% of Kcals
- RDA 0.8 g/Kg BW/d
- RDAs for the essential amino acids
- No ULs for protein or amino acids

“Since ULs could not be established for any of the amino acids (some of which are known to result in toxic effects at high doses) due to insufficient data on dose-response relationships, more data are needed on adverse effects of high intake of amino acids.”
Energy and Physical Fitness: Existing DRI Values

- Estimated Energy Requirements (EER)
  - For all ages, both genders and four levels of activity
- Physical Activity – 1 h moderate intensity/d to maintain normal BMI
  - Based on doubly labeled water experiments

Energy and Physical Fitness: Research Recommendations

- Expand the doubly labeled water database
- Determine the effect of physical activity on overall health and wellness rather than solely on body weight and/or risk of disease
- Decide on the place and significance of physical activity in the overall arsenal of efforts to promote public health
  - The DRI process
  - The Dietary Guidelines
  - Food Intake Surveys

Summary

- Carbohydrates:
  - Consider a different endpoint for the RDA
  - Revisit the recommendation on “added sugars” by including prospective studies with weight gain as an endpoint, and also consider the amount of “discretionary calories” available to most people
  - Review new data on the metabolic effect of the overall diet with respect to diabetes
  - Support clinical trials with appropriate endpoints

- Fiber:
  - Attempt to upgrade the DRI value from an AI to an RDA by supporting a randomized trial of three levels of fiber intake with surrogate markers of CHD
  - Alternatively, choose “healthy laxation” as an endpoint, and determine what level of fiber supports this
  - Revisit the amount of fiber recommended for children
  - Determine differences in health effects between dietary fiber and functional fiber
Summary

- **Fats**
  - Choose different endpoints for the AIs for the essential fatty acids
  - Consider establishing DRI values for EPA and DHA
  - Re-evaluate the lack of ULs for saturated fat, trans fat and cholesterol

- **Protein and Amino Acids**
  - Review existing studies and consider more where gaps are concerned for ULs for amino acids and total protein

- **Energy and physical activity**
  - Expand the doubly labeled water data base on energy expenditure
  - Determine the effect of physical activity on overall health and wellness

- **The DRI process**
  - The Dietary Guidelines
  - Food intake surveys