Lecture 21: Nutrition for Infants

Nutrition 150
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Infants

- Age 0 - 1 yrs
- Massive weight gain
  - Weight doubles by 5 months
  - Weight triples by 12 months
- Calorie, vitamin and mineral needs are high

Infants’ Metabolic Rate

- Require 100cal/kg body weight
  - Adults need just 40cal/kg body weight
  - With the energy needs of an infant, a 170 lb man would need 7000cal/day!
- Newborns need about 450 cal per day

Weight Gain of Infants in Their First Five Years of Life

In the first year, an infant’s birth weight may triple, but over the following several years, the rate of weight gain gradually diminishes.
Infants’ Metabolic Rate

• Metabolic needs decrease at about 6 months
  - Growth rate declines
  - But activity increases...

Why so many calories?

• Support weight gain and growth

  • Infant respiration rate: 20-40 breaths/min
    - Adult’s: 15-20 breaths/min

  • Infant heart rate: 120-140 beats/min
    - Adult’s: 70-80 beats/min

What to feed infants?

Women are encouraged to breastfeed whenever possible because breast milk offers infants many nutrient and health advantages.
Why Breastfeed?

• Breast milk is the optimal source of nutrients for infants
• Breast milk is digested more easily and quickly than formula
• Many long-term health benefits

Contents of Breast Milk

• Different macronutrient composition than guidelines for adult intake
• High in fats
  - Lots of essential fatty acids
  - These fatty acids may be crucial to development of brain and eyes

Percentages of Energy-Yielding Nutrients in Breast Milk and in Recommended Adult Diets

- Carbbohydrate: 55% in breast milk, 55% in recommended adult diets
- Fat: 39% in breast milk, 28% in recommended adult diets
- Protein: 6% in breast milk, 23% in recommended adult diets

The proportions of energy-yielding nutrients in human breast milk differ from those recommended for adults.

Contents of Breast Milk

• Vitamin and mineral content is more than adequate
• EXCEPT for vitamin D
  - Recommend keeping infants out of direct sunlight
  - Recommend vitamin D supplementation
• AND iron and flouride post 6 months
  - Recommend supplementation after 6 mo
Breast Milk and Immune System

• Breast milk is sterile

• Colostrum
  - Produced for first 2-3 days
  - Mostly serum
  - Contains lots of antibodies and white blood cells
  - Reduces risk of intestinal infections

Breast Milk and Digestive System

Breast milk contains:

• Growth factors: Stimulates development and maintenance of digestive tract

Breast Milk and Immune System

Breast milk contains:

• Bifidus factors: Favor growth of healthy intestinal flora

• Lactoferrin: Helps infant absorb iron and prevents bacteria from getting iron the bacteria need to grow

• Lactadherin: Fights viruses that cause diarrhea

Health Benefits of Breast Feeding

• Protects against cardiovascular disease

• Lowers blood cholesterol as adults

• Protects against excessive weight gain

• Lowers incidence of allergic reactions
  - Asthma, wheezing, skin rash

• Potential positive effects on intelligence
How Long to Breastfeed?

- Exclusive breastfeeding for first 6 months
- Breastfeeding with complementary foods for at least 12 months

Infant Formula

Sometimes breast feeding is not possible
- Health of mother
- Allergies or other health conditions of child
- Social factors

Infant Formula

- Attempts to copy breast milk
- Contains more vitamin D and iron than breast milk
- National and international standards for formulas have been set
- Cow milks and other soy beverages etc are not appropriate substitutes for infant formula

Percentages of Energy-Yielding Nutrients in Breast Milk and in Infant Formula

- Carbohydrate: 55% (Breast milk) vs. 39% (Infant formula)
- Protein: 6% (Breast milk) vs. 9% (Infant formula)
- Fat: 42% (Breast milk) vs. 49% (Infant formula)
Problems with Formula

- Lack immune contributions
- Lack hormones from mother
- Contamination
  - Lead
  - Bacteria and viruses in water
- Sucking on bottle for extended period of time can damage teeth

Introducing Foods

- Controversy over when it is appropriate
- Most sources agree that infants can begin eating solid food between 4-6 months
- Still questioning what is best timing for child

Cow's Milk

- Not appropriate during first year of life
- May be linked with diabetes type 1
- In first 6 month:
  - Can cause intestinal bleeding
  - Poor source of iron
  - High levels of vitamin C and calcium inhibit iron absorption
  - High protein content can stress kidneys

Infants and Solid Food

- Digestive secretions gradually increase over the first year of life
- Exposure to some foods too young may increase chance of developing an allergy to the food
Introducing Solid Foods

• Provide variety, balance and moderation
• Vegetables first, then fruits  
  - Helps avoid preference for sweets
• Choose food high in iron and vitamin C
• Introduce one food at a time  
  - Assures no allergic reaction to new food

Introducing Solid Foods

• Do not restrict fat  
  - Fat content is not on labels of baby food
• If preparing at home:  
  - Use fresh foods  
  - Don’t use sugar, salt, seasonings  
  - Be careful about cleanliness
• Limit fruit juice  
  - Not energy or nutrient dense

Age and Solid Foods

0-4 months  
  breast milk or formula

4-6 months  
  begin iron-fortified cereal  
  begin pureed vegetables and fruits

Age and Solid Foods

6-8 months  
  begin textured vegetables and fruits  
  begin unsweetened, diluted fruit juices from cup
Age and Solid Foods

8-10 months
- begin breads and cereals from table
- begin yogurt
- begin pieces of soft, cooked veggies and fruits from table
- gradually begin finely cut meats, fish, casseroles, cheese, eggs, and mashed legumes

10-12 months
- At least 4 servings of breads and cereals from table, in addition to infant cereal
- At least 2 servings of fruits and 3 servings of vegetables
- 2 servings of meat, fish, poultry, eggs, and legumes

Sample Meal Plan for a One-Year-Old

<table>
<thead>
<tr>
<th>Sample Menu</th>
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<tbody>
<tr>
<td><strong>Breakfast</strong></td>
</tr>
<tr>
<td>½ c iron-fortified breakfast cereal</td>
</tr>
<tr>
<td>¼ c whole milk (with cereal)</td>
</tr>
<tr>
<td>½ c orange juice</td>
</tr>
<tr>
<td><strong>Morning snack</strong></td>
</tr>
<tr>
<td>1 to 2 oz cheese cubes</td>
</tr>
<tr>
<td>Teething crackers</td>
</tr>
<tr>
<td>¼ c vitamin C-fortified fruit juice</td>
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<tr>
<td><strong>Lunch</strong></td>
</tr>
<tr>
<td>½ sandwich: 1 slice bread with 2 lbs tuna salad or egg salad</td>
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<tr>
<td>½ c vegetables³ (steamed carrots)</td>
</tr>
<tr>
<td>1 c whole milk</td>
</tr>
<tr>
<td><strong>Afternoon snack</strong></td>
</tr>
<tr>
<td>1 slice toast</td>
</tr>
<tr>
<td>1 to 2 tbs apple butter</td>
</tr>
<tr>
<td>½ c whole milk</td>
</tr>
<tr>
<td><strong>Dinner</strong></td>
</tr>
<tr>
<td>2 to 3 oz chopped meat or well-cooked mashed legumes</td>
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<tr>
<td>¼ c potato, rice, or pasta</td>
</tr>
<tr>
<td>¼ c vegetables³ (chopped broccoli)</td>
</tr>
<tr>
<td>¼ c fruit⁴ (sliced strawberries)</td>
</tr>
<tr>
<td>1 c whole milk</td>
</tr>
</tbody>
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³Include dark green, leafy and deep yellow vegetables.
⁴Include citrus fruits, melons, and berries.

Foods to Omit

- Risk of botulism infection is high with corn syrup and honey
- Canned vegetables contain too much salt
- Sugar alcohols like sorbitol cause diarrhea
- Dessert
Foods to Omit: Choking Hazard

- Raw carrots
- Cherries
- Gum
- Hard and gel-type candies
- Hot dog slices
- Marshmallows
- Nuts
- Peanut butter
- Popcorn
- Raw celery
- Whole beans
- Whole grapes