Facts & Fiction about Pediatric Obesity Treatment: Nutrition & Metabolic Health Improvement

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Disclosures

- I have nothing to disclose

Outline

- Adult and Pediatric Obesity Trends
- Health Consequences Associated with Obesity
- Genetics vs. Environmental Changes
- Fats, Proteins and Carbohydrates (sugars)
- Meal Trends, and Locations
- Screening Obesity and Metabolic Markers
- Nutritional Recommendations
- Other Recommendations
- Summary

Pediatric Obesity Epidemic

(M. de Onis et al., 2010)
Pediatric Obesity Epidemic

Immediate Health Problems
- Asthma
- Sleep Apnea
- Skin Infections
- Joint Pain

Chronic Health Conditions
- Hypertension
- Type 2 Diabetes
- Hypercholesterolemia
- Hepatic Steatosis
- Menstrual Abnormalities
- Heart Disease
- PCOS
- Lower Self-Esteem and Confidence

Health Consequences Associated with Childhood Obesity and Unhealthy Eating

- Genetics and Hormonal Defects
  - Genetic Syndromes
    - Prader-Willi
    - Laurence-Moon/Bardet-Biedl
    - Albstrom
    - Turner’s
    - Ruvalcaba

  - Developmental Programming
    - Prenatal Undernutrition (SGA) (Barker, 2004)
    - Dutch Famine Study (Roseboom et al., 2003)
    - Prematurity
    - Overnutrition (LGA, GDM) (Boney et al., 2005)

  - Direct relationship of maternal obesity with child obesity.
    (Whitaker, 2004)

- Environmental Changes
  - Food Supply Macronutrient Changes
    - Fats
    - Proteins
    - Carbohydrates
  - Meal Trends, and Locations
  - Food Addictions?
  - Decreased Physical Activity Levels
Dietary Energy in Food Supply

Kcal/day per person


1340 kcal/day

(Putnam, 2002)

Macronutrient Changes over past 3 Decades

- **Fat**
  - Total Kcal % decreased from 40% → 30% since 1980's

- **Protein**
  - Stable at about 15%

- **Carbohydrate**
  - Starch 49 → 51%
  - Fructose 8 → 12-15%

(Fanmugam et al., 2003)

Fats

<table>
<thead>
<tr>
<th>Dietary Fat</th>
<th>Dietary Source</th>
<th>Medicinal Value or Danger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omega-3 Fatty Acids</td>
<td>Wild fish, flaxseed oil</td>
<td>Anti-inflammatory, lowers serum IL, repairs membranes</td>
</tr>
<tr>
<td>Monounsaturated Fatty Acids</td>
<td>Olive and canola oil</td>
<td>Stimulates Liver Metabolism, reduces atherogenesis</td>
</tr>
<tr>
<td>Polyunsaturated Fatty Acids</td>
<td>Vegetable oil</td>
<td>Anti-inflammatory, easy absorption via non-insulin dependent pathways</td>
</tr>
<tr>
<td>Saturated Fatty Acids</td>
<td>Lean beef, veal, milk and dairy products, egg yolks</td>
<td>Atherogenic in Familial Hypercholesterolemia</td>
</tr>
<tr>
<td>Medium-chain triglycerides</td>
<td>Palm oil, coconut oil, palm kernel oil</td>
<td>Antioxidant, some suggestion of stimulation of atherosclerosis</td>
</tr>
<tr>
<td>Omega-6 fatty acids</td>
<td>Farm-raised animals and fish</td>
<td>Atherosclerosis, insulin resistance, immune dysfunction, pro-inflammatory</td>
</tr>
</tbody>
</table>

(Lustig, 2012; Perito et al., 2013)

Proteins

- Branched Chain Amino Acids (L, I, V)
- Essential Amino Acids
- High concentration in corn
- Increased insulin resistance d/t bypassing glycogen storage
- Patients with metabolic syndrome have higher bloodstream levels

(Lustig, 2012; Newgard et al., 2009)

Sugar (Fructose)

- Increases nutrient consumption
- Attenuated Ghrelin response
- Reduced Insulin response, low Leptin rise.
  
  (Teff et al., 2004)
- NASH pathogenesis and progression
  - Liver is primary site for metabolism
  - Fructose bypasses rate-limiting step of glycolysis
  - Preferentially metabolized to acetyl coA
  - Provides substrate for FFA

(Porto et al., 2013)

- Increases Visceral Fat

(Ello, 2002; Lustig, 2012)
Fructose

- Increased consumption
  - 37gm fructose/day (1977-1978) 8% Kcal Intake
  - 55gm fructose/day 10.2% Kcal Intake
  - 78gm fructose/day 12% Kcal Intake (Adolescents) (Vos et al., 2008)

Sugar (Fructose)

- American Heart Association Recommendation for Optimal Cardiovascular Health
  - Women 21gm sugar/day (1,800 Kcal/day)
  - Men 38gm sugar/day (2,200 Kcal/day) (Johnson et al., 2009)

Fiction

- “Beating obesity will take action by all of us, based on one simple common sense fact: All calories count, no matter where they come from, including Coca-Cola and everything else with calories…”
  - The Coca Cola Company, 2013

Calories

<table>
<thead>
<tr>
<th>Fiction</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Calorie is A Calorie</td>
<td>Calorie output is tightly regulated and dependant on the quantity and quality of ingested calories.</td>
</tr>
</tbody>
</table>

- A Calorie Burned is a Calorie Burned.

Where Do People Eat When They Eat Out?

- 1/3 of U.S adults eat fast food
- Longitudinal studies show fast food intake predicts weight gain and increased risk for T2D
- Fast food restaurants overrepresented in poorer neighborhoods; healthy alternatives harder to find
  - Prevalence: 2.5/mile² vs. 1.5/mile²
- Low SES associated with increased fast food consumption

Fast Food

Is Fast Food Addictive?

- Sugar
  - Rodent models demonstrate binging, withdrawal (teeth chattering, tremors, shakes and anxiety)
  - Seeking and craving
  - Cross-sensitization
  - Human studies also suggest sugar is addictive with withdrawal
  - Fructose increases liver and muscle insulin resistance (Sung et al., 2011; Perito et al., 2013)
  - Blocks leptin’s ability to extinguish mesolimbic dopamine signaling

Photo from: cbsnews.com

(Carrier, Lustig, 2011)

Is Fast Food Addictive?

- Caffeine
  - “Flavoring agent”
  - Increases salience of high rewarding beverage
  - Well-established psychological & physiological dependence across age spectrum

Photo from: http://www.islandcrisis.net

(Carrier, Lustig, 2011)

Is Fast Food Addictive?

- Environmental Cues
  - Required to create addictive patterns
  - Powerful external stimuli trigger reward in animal and human
  - Vulnerability to environmental cues may explain differences in ability to follow a "diet"

(Garber, Lustig, 2011)

- Ads
  - 3-5 per 30 minutes during prime time TV.

(Brown, 2002)

Exercise

- 33%
  - Percentage of youth who are actual couch potatoes, engaging in little or no leisure-time physical activity whatsoever

- 5/6
  - Proportion of teens that don’t meet the minimum recommended levels of physical activity of one hour a day of moderate to vigorous activity

- >2-3
  - Daily number of hours children spend watching TV, more time than on any other single activity except sleeping

- <6%
  - Percentage of high schools requiring daily PE

Screening and Identification of Pediatric Obesity

- Children 0-24 months use WHO Growth Standards
  - >97th%ile for weight for length

- Children >2 years use CDC BMI curves
  - 85-95th%ile: Overweight
  - >95th%ile: Obese

Exercise

<table>
<thead>
<tr>
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<th>Facts</th>
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<tbody>
<tr>
<td>Exercise alone causes significant weight loss</td>
<td>• Exercise—even in absence of weight loss—decreases hepatic steatosis, and other lipotoxicity markers. (Perito et al. 2013)</td>
</tr>
<tr>
<td>Exercise builds muscle and stimulates new mitochondrial development and improves insulin sensitivity</td>
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</tr>
<tr>
<td>Increases liver’s Krebs cycle speed</td>
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(Lustig, 2012)
### Metabolic Markers

- **Physical Assessment**
  - Acanthosis Nigricans (Axilla, neck, flexural areas)
  - Marker of hyperinsulinemia

- **Lab values**
  - Fasting insulin, fasting BG, HgA1C
  - ALT
  - Uric Acid
  - Fasting Cholesterol Panel

### Unhealthy Food Patterns

- **Beverages**
  - Soda, Juice (any kind), energy drinks, coffee drinks

- **Foods**
  - Fast food, pre-packaged, processed foods

- **Food environment**
  - Eating in front of TV, chaotic environment, on the go

- **Stress eating, binge eating, disordered eating**

### Clinical Treatment

**DIET AND EXERCISE!**

**...WHAT?**

### WATCH Clinic

*(Weight Assessment for Teen and Child Health)*

### Nutritional Recommendations

- **½ of your plate non-starchy Vegetables and Fruit**
- **¼ of your plate Whole Grains**
  - Cereals >5gm fiber/serving
  - Breads >5gm fiber/serving
  - Other packaged >3gm fiber/~100Kcal
- **¼ of your plate Proteins High in Fiber or Healthy Fat**
  - Legumes, Nuts, wild fish, free range beef/poultry, egg and dairy
  - Plain, added-sugar free dairy
- **Healthy Fats**
  - Olive/Canola Oils

### Meals

- **Breakfast**
  - Veggie Omelet, fruit, whole grain toast
  - Old Fashion oatmeal, nuts, banana, milk

- **Lunch**
  - Cold Sandwich on whole grain bread, chicken breast/roast beef, vegetables, cheese, fruit, water to drink
  - Mixed greens salad with olive oil and vinegar, beans, tomatoes, cucumbers, whole grain bread

- **Dinner**
  - Wild salmon/free range beef or poultry, brown rice, mixed sautéed vegetables
  - Whole grain pasta with tomatoes, bell peppers, onion, grilled chicken, mixed greens salad with olive oil/vinegar
Snacks

- Mix a protein with a non-starchy vegetable or fruit
  - Mixed nuts with carrots
  - Plain yogurt, with banana
  - Cottage cheese with mixed berries
  - Plain milk or milk substitute with fruit
  - Hummus with bell peppers, cucumbers
  - Celery with peanut butter
  - Cheese stick with cherry tomatoes

Other Recommendations

- Wait 20 minutes before offering 2nd portions
- Control home environment by limiting “treats”
- Everyone at home follows same recommendations
- Remove TV from Child/Teenage Room
- Enroll in any type of entertaining, fun, sustainable, regular physical activity with goal of 60 minutes/day

Summary

- Calories are NOT created equal. Unique nutrients contribute to metabolic disease, even in absence of obesity—trans fats, fructose.
  - Follow WATCH Clinic Plate Model
  - Avoid processed foods (trans fats, low fiber, high sugar)
  - Avoid all sweetened beverages; only drink water, plain milk or plain milk substitutes, and plain teas
- Exercise improves cardiometabolic health, even in the absence of weight loss.

References

References