Behavioral Influences on What We Eat:
what we can,...we need, or just for the pleasure

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Why do we eat?  The list can be longer !!!

- What we can eat, only what we can afford ?
- What our genes demand from us?
- What we need to please our brain?
- What our body needs for energy balance?
- What we need to keep us content ?
- What tempts our senses ?
- For the fun of it, for plain pleasure ?
- What ever our mothers made us eat ?
- What ever we have time to eat?
- What we are forced to eat ? (social forces)
BMI changes during Crisis

Males

Females

Dietary factors in epidemic neuropathy on the Isle of Youth, Cuba.

Gay J, Porrata C, Hernandez M, Clua AM, Arguelles JM, Cabrera A, Silva LC.

Institute of Nutrition and Food Hygiene, Havana, Cuba.


An epidemic neuropathy that broke out in Cuba in late 1991 has exhibited clinical manifestations similar to those of other poly neuropathies of nutritional origin, ...

.....a broad range of specific dietary deficiencies, a sugar intake exceeding 15% of total caloric intake, ....and smoking.....

Dietary energy Supply (DES)

<table>
<thead>
<tr>
<th>Year</th>
<th>DES Kcal/kg/d</th>
<th>GNP US $ per caput</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1999</td>
<td></td>
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</table>

% Obesity by GNP & Education

- Less educated
- More educated

% of total DALYs lost

- <0.5%
- 0.5-1.9%
- 2-5.9%
- 6-9.9%
- 10-16%

Energy excess

Under nutrition

Gene/Nutrition Interactions in Human Obesity

- Even if the OBESITY epidemic is due to changes in the environment, genes are interacting with the environment to cause weight gain.
- Studies of twins reared apart suggest that around 2/3 of the variability in BMI is attributed to genetic factors, for non twins around 40%.
- Prospective studies in Pima Indians suggest that 12% of the variability in BMI to metabolic rate, 5% to fat oxidation, and another probable 10% to the level of spontaneous physical activity.
- Control of obesity will include targeting the genes that regulate food intake and activity level in conjunction with environmental changes that make the healthy choice the easy choice, and favouring active lives.

We Eat: what we our genes demand
We Eat: to please our brains

The mutated agouti protein binds to melanocortin receptors MCR-1 in the mouse's skin and hinders the production of black pigment, also blocks MCR-3 and MCR-4, that quell feeding.

It's the perfect drug for a midlife crisis: Lose weight, get a tan, and boost your sex life, all in one pill. The target for the drug is melanocortin receptor-1 (MCR-1), based on mutant mouse called agouti that is fat and bears a coat of shockingly yellow fur (Science 1997).

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**Effects of Glycemic Load on Body Weight**

- 16 obese adolescents, 13 - 21 yrs old studied for 12 mo
- Intervention for 6 months:
  - Ad lib low GL vs energy-restricted reduced -fat diet
  - Total of 14 treatment visits with a dietitian
- Treatment intensity, behavioral approaches, physical activity
  prescription identical between groups
- Changes in diet assessed by 3 and 7 day food records
- Follow up for 6 m, > 85% completion rate at 12 months

**Effects of Glycemic Load on BMI and Body Fat**

**USDA Food Based Dietary Guidelines**

- in a dietary pattern of any calorie level, if consumers eat the recommended amounts of vegetables and fruits, low-fat meats and beans, low-fat dairy & additional fats, they should have a few calories left over. These extra calories may be filled with added sugars.

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**Graphs and Figures**

- Suppression of insulin secretion with drug
- Effects of Glycemic Load on Body Weight
- Effects of Glycemic Load on BMI and Body Fat
- USDA Food Based Dietary Guidelines
How else can we Suppress Excess Insulin Secretion

- Eating less or eating smaller meals more often will decrease pancreatic insulin secretion.
- Increasing physical activity will burn up fuels, enhance insulin sensitivity and decrease need for insulin.
- Reducing total intake of sugars and or increasing % complex carbohydrates (NSP/fiber) relative to sugars.
- Food processing/preparation making starches more resistant to enzymatic hydrolysis or increasing proportion of NSP in diet.

<table>
<thead>
<tr>
<th>Tissue</th>
<th>n-6 / n-3 AA / (EPA+DPA+DHA) WT</th>
<th>n-6 / n-3 AA / (EPA+DPA+DHA) TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Muscle</td>
<td>49.0 0.7</td>
<td>11.3 0.4</td>
</tr>
<tr>
<td>Milk†</td>
<td>32.7 5.7</td>
<td>15.7 2.5</td>
</tr>
<tr>
<td>Erythrocyte</td>
<td>46.6 2.9</td>
<td>27.0 1.6</td>
</tr>
<tr>
<td>Heart</td>
<td>22.8 1.8</td>
<td>14.3 0.9</td>
</tr>
<tr>
<td>Brain</td>
<td>3.9 0.8</td>
<td>3.6 0.7</td>
</tr>
<tr>
<td>Liver</td>
<td>26.0 2.5</td>
<td>12.5 0.9</td>
</tr>
<tr>
<td>Kidney</td>
<td>16.5 1.7</td>
<td>11.9 1.2</td>
</tr>
<tr>
<td>Lung</td>
<td>32.3 2.2</td>
<td>19.8 1.2</td>
</tr>
<tr>
<td>Spleen</td>
<td>23.8 2.4</td>
<td>17.3 1.5</td>
</tr>
</tbody>
</table>

The n-6 : n-3 fatty-acid ratio is given by (18:2 n-6 & 20:4 n-6 & 22:4 n-6 & 22:5 n-6) : (18:3 n-3 & 20:5 n-3 & 22:5 n-3 & 22:6 n-3).

†The milk was taken from the stomach contents of 5-day-old neonatal mice born to wild-type or transgenic mothers.

We eat: to keep Energy Balance

Primitive Life
- Energy Intake < Energy Expenditure
- Limited Intake
- Low Energy Stores (body fat)
- Increase in Energy Stores
- Energy balance established at unhealthy weight.

Modern Life
- Energy Intake > Energy Expenditure
- Unlimited Intake
- Increase in Energy Stores
- Reduce Intake
- Energy balance established at unhealthy weight.

We Eat: what we “forced” to eat
Food Standards Agency to examine the current research evidence on:

- the extent and nature of food promotion to children
- the effect, if any, that this promotion has on their food knowledge, preferences and behaviour.

http://www.foodstandards.gov.uk/

- 'Big Four': pre-sugared breakfast cereals, soft-drinks, confectionary and savoury snacks. In the last years due to fast food it is now the 'Big Five'. The advertised diet contrasts sharply with that recommended.
- Themes of fun and fantasy or taste, rather than health and nutrition, are used to promote snacks to children. The recommended diet gets little promotional support.
- Seeing soft drink and cereal adverts reduced young children's ability to determine whether certain products contained fruit.
- Exposure to advertising influenced which foods they claimed to like; labelling and signs on vending machine affect what is bought.
- Food advertising can influence what children eat. Advertising influenced a primary class's choice of daily snack at playtime.

G Hastings et al FSA Sept 22 2003

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**We Eat:** to make the most with what we have

Elasticity of demand for different foods according to income

- low income <15% of US
- middle income 15-50% of US
- high income >50% of US

- cereals
- meat
- dairy
- oils & fats
- fruit & veg

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- Consumer Needs (real)
- Consumer Needs enhanced by marketing

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- Production
- Supply
- Demand
- Prices
- Regulations

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- Production
- Supply
- Demand
- Prices
- Regulations
Supply

Increased Production at lower unit cost

Consumer Needs enhanced by marketing

Demand

CDC: Americans eating more than ever

Experts say bigger portion sizes and junk food are partly to blame for the increased calorie consumption in the past three decades.

Women consume 335 more calories a day; carbs mostly to blame Men ate 168 more calories -- slightly more than a 12-ounce Pepsi per day Americans, especially women, are getting fatter because they eat much more of everything than they did 30 years ago, and carbs are the biggest culprit, the government said Thursday.

Study released Thursday Feb 5th by the Centers for Disease Control and Prevention.

Energy dense diets are less expensive and healthy diets cost more adjusting for intake

• A focus on the economics of food choice is greatly overdue. Studies on the obesity epidemic and the contribution of snacks, fast foods, foods away from home and the phenomenon of supersizing, have not addressed the very low energy costs of added sugars and fat.

• Among suggested strategies for reducing the consumption of energy-dense foods are taxes, levies, limits on advertising and outright bans.

• Whether such punitive tactics will steer lower-income consumers toward more costly food choices is an unresolved issue.

• There is a need for additional studies on diet structure and food costs on which to base responsible nutrition interventions and fiscal food policy.

Strengthen Supply of Healthy Choices:

• Optimize chain from farmer to consumer. Improvements in technology to produce and preserve food, less steps in commerce of fruits and vegetables.

• Re-allocation of subsidies to agricultural and industrial food production. Eliminate gradually subsidies to sugar, alcohol and animal food products. Provide incentives to consumption of healthy foods (vegetables and fruits).

• Trade regulations favoring consumption of healthy foods. Prevent dumping of excess fat and sugar in developing countries.

• Government must practice what it preaches: School lunch programs, institutional feeding (hospitals, others) should set standards promoting healthy choices.

Strengthen Demand for Healthy Foods:

• Change relative price of foods: Increase those that are less desirable and decrease price of healthy foods. i.e. low fat milk, subsidize fruits and vegetables

• Facilitate the selection and consumption of healthy foods for lowest price: Consumer cooperatives, “Best buy” nutrient dense energy dilute foods for lowest price.

• Provide information to consumer at place of food sale (Supermarket). Implement dietary guidelines, simple format leaflets. Nutritional Info Booth independent of commercial interests.
Health problems associated with high intake of sweetened drinks

1. Overweight or obesity attributable to additional calories in diet;
2. Displacement of milk consumption, resulting in calcium deficiency with an attendant risk of osteoporosis and fractures;
3. Dental caries and potential enamel erosion.

Contracts with school districts for exclusive soft drink rights encourage consumption directly and indirectly.

Snow's observation

Death rates from cholera, London, 1853-4

<table>
<thead>
<tr>
<th>Water Company</th>
<th>No. of Houses</th>
<th>No. of Deaths from Cholera</th>
<th>Deaths per 10,000 Houses</th>
</tr>
</thead>
<tbody>
<tr>
<td>S&amp;V</td>
<td>40,046</td>
<td>1,263</td>
<td>315</td>
</tr>
<tr>
<td>Lambeth</td>
<td>26,107</td>
<td>98</td>
<td>37</td>
</tr>
<tr>
<td>Rest of London</td>
<td>256,423</td>
<td>1,422</td>
<td>59</td>
</tr>
</tbody>
</table>

WHA 2004

Consultation Process

WHO Strategy on Diet, Physical Activity and Health

Nutrition Risk Related Susceptibility

Nutritional Status