What Is A Food Craving?

- Intense desire to eat a particular food
- Approx 60% of people experience food cravings every day
- Frequently reported food craving for women... CHOCOLATE
## Foods Craved by College Students

<table>
<thead>
<tr>
<th>FOOD</th>
<th>FEMALES (%)</th>
<th>MALES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate</td>
<td>39</td>
<td>14</td>
</tr>
<tr>
<td>Pizza</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>Salty Foods</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Ice Cream</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Sweets and Desserts</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Meat and chicken</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Bread and pasta</td>
<td>3</td>
<td>2</td>
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</tbody>
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The Neurotransmitter Connection

- Nerve cells contain tiny sacs at the end of axons filled with chemicals
  - Neurotransmitters (NT)
- NT pass messages from one nerve to another
How Food Affects How You Feel

- Neurotransmitters: (NT) amino acids and a fat like substance called choline
- If deficient in one of these chemicals, you experience changes in mood, appetite or cognitive status
How Food Affects How You Feel

- Vitamins and minerals (B, C, E, Fe, Sel, Mg) assist NT activity and some protect NT from damage.
- If diet is lacking or in small amounts, this may lead to mood disturbances.
How Food Affects How You Feel

- NT become more/less active depending on diet
- This activity can stimulate imbalances, lead to depression, irritability, & mood swings
How food Affects How you Feel

- Protein, zinc, Vit B6, B12, iodine, & folic acid are essential for normal development of nervous system.
- Insufficient intake >> permanent damage, may alter personality & behavior.
How Food Affects How You Feel

- Food additives, MSG and tyramine (aged cheeses) can affect brain activity & result in mood changes.
- Other additives change the structure or block the neurotransmitter.
Neurotransmitters

- Regulate many body functions
  - Nerve transmission & memory
  - Appetite & Mental function
  - Movement, wake-sleep cycle
  - MOOD
“Big 4” Diet Made Chemicals

1. Serotonin: Mood Regulator
2. Dopamine
3. Norepinephrine
4. Acetylcholine
Serotonin

- NT w/ most significant impact on diet
- Made in the brain from amino acid tryptophan along with Vitamin B6, B12 and folic acid
Serotonin

- Serotonin levels rise & fall based on diet & Vitamin intake
- **High levels**
  1. Boost mood/curb cravings
  2. Increase pain tolerance
  3. Help provide restful sleep
Serotonin

- **Low levels**
  1. Food cravings
  2. Insomnia
  3. Depression
  4. Increased pain sensitivity
  5. Aggressive behavior
  6. Poor body temperature regulation
Diet and Serotonin Levels

Sugar and Refined Starches
- Milled: contains only endosperm
- White bread, white rice, pasta, potato
- Sweets: cookies, cakes, pies

Whole grains
- Contain bran, germ, endosperm
- Whole wheat bread, pasta, crackers, brown rice, and oatmeal
Sugars and Refined Starches

- Cause serotonin levels to rise
- Blood sugar levels to rise & fall very quickly
- May cause blood sugars to go too low, risk hypoglycemia
Sugars and Refined Starches

- Trigger quick release of insulin that lowers blood levels of amino acids except tryptophan.
- Tryptophan stays in the blood and can enter the brain.
Whole grain starches

- Trigger a slow release of insulin that lowers blood levels of most amino acids except tryptophan
- Serotonin levels rise gradually, and blood sugar levels remain stable
Protein-Serotonin Connection

- Eat protein-rich meal, blood becomes flooded with tryptophan & other aa
- Tryptophan gets crowded out, & only a small amount gets through the blood-brain barrier
- Serotonin levels do not rise much after a meal that has protein, even if that food is high in tryptophan
Protein-Serotonin Connection

- Consuming a high protein meal lowers brain tryptophan & serotonin levels
- Eating a high carbohydrate snack has the OPPOSITE effect
Effect of High Protein Meal

Person consumes a protein-rich snack or meal.

Blood levels of all amino acids rise (including tryptophan).

All blood and amino acids compete for entry into the brain.

Relatively low amounts of tryptophan enter the brain.

Person feels depressed, irritable, and/or craves a carbohydrate-rich snack.

Only moderate amounts of serotonin are made and stored.
Effect of High Carbohydrate Meal

Person consumes carb rich snack / meal.

Pancreas releases insulin

Blood levels of all aa, except tryptophan ↓ when aa go into the muscle cells

Tryptophan levels ↑ & enter the brain

Mood improves and carbohydrate cravings reduced

Tryptophan, with B6, B12 and folic acid converted to serotonin
Vitamin B6 and Serotonin Levels

Vitamin B6:

- Assists with manufacturing serotonin
- A deficiency of B6 affects mood & cravings
- Good sources: chicken, fish, pork, eggs, banana
Estrogen, Omega 3’s & Serotonin

**Estrogen:**
- May inhibit Vitamin B6 status &
  - ↓ brain serotonin levels: PMS

**Fat:**
- Omega – 3 fatty acids in fish oil
  - ↑ serotonin levels
Take Home Message: Serotonin

- Choose whole grains most often
- Consume whole grains with a lean protein source (tuna sand on wwt)
- Choose foods high in omega 3 fatty acids and fatty fish ≥2x per week
Dopamine and Norepinephrine

- Made from aa tyrosine with folic acid, magnesium, & Vit B12
- Dopamine & NE stimulate CNS
- ↑ energy, improve concentration, alertness & performance
The Neurotransmitter Connection

- A deficiency of norepinephrine (NE) results in depression
- Too much nor epinephrine = mania
Tryptophan and Tyrosine

- Tryptophan & tyrosine are working opposite of each other
- To increase tryptophan/serotonin levels, tyrosine must be low
- To increase tyrosine & assistant neurotransmitters, tryptophan levels are moderate to low
To ↑ tyrosine levels, consume grilled chicken, fish or beef

- Improvement in mood within 2-3 hours
Acetylcholine and Memory

- Choline is UNLIKE amino acids: no other competitors to enter the brain
- Choline is converted to the neurotransmitter acetylcholine
Acetylcholine

- Low levels of acetylcholine are associated with aging & memory loss
- Increasing choline levels may be a possible treatment for Alzheimer’s disease
Acetylcholine

- Food sources to increase brain concentrations of choline
  - Wheat germ
  - Eggs
Do You Crave Carbohydrates?

- 97% of people find it hard to say “no” to sweet treats
- Cravings are not always a sign of lack of willpower: It could be a biological imbalance
Carbohydrate Cravings

- Biological cravings
- When? Mid-afternoon & continue until late into the evening
- Cravings increase with ↑ levels of stress, depression, or premenstrual
Biological Cravings & Serotonin

- Cravings may occur due to an imbalance of serotonin.
- Chronic dieters, battling obesity, & carbohydrate cravers have lower levels of serotonin than lean people who prefer high protein snacks.
Are carbohydrates evil?

- People in weight loss program in SC who ate more carbs tend to be less anxious & depressed.
- Carb cravers tend to eat desserts, donuts, pastries, breads, and pasta to boost energy, reduce hunger, alleviate depression, and reduce stress from lower serotonin levels.
## Carbohydrate Cravings

- Carbs $\uparrow$ serotonin levels, curb cravings, & $\uparrow$ energy levels
- Carb sensitive people become conditioned to crave high carb foods when tired, depressed or anxious
- OK to indulge sometimes, but if often. Can lead to malnutrition and wt gain
How Do I Treat My Carbohydrate Cravings?

- Limit refined sugar to 10% kcals
- Try some whole grain snacks: whole grain crackers with low fat cheese
- Be patient... may take 2-3 weeks to alter body chemistry
Our love for fat

- Even though we feel that we crave sugar, research shows that we crave sugar & fat
- Due to the texture, flavor, & aroma
- Think about how you feel when you hear these words: a croissant vs. orange carrot stick vs. potato chips
Fat for Survival

- Several hours of fasting or dieting releases free fatty acids into the blood
  - hypothalamus ➔ Galanin
- Galanin ➔ fat containing foods
- Galanin ↑ the day proceeds and ↑ desire fatty foods in mid-after and pm
The Galanin Connection

- As galanin $\uparrow$ metabolism slows = weight gain $\Rightarrow$ why obese people prefer fattier foods, although they consume same kcals as lean people
- Galanin levels $\uparrow$ when estrogen levels are $\uparrow$, which $\Rightarrow$ PMS cravings
Fad Diets and Galanin

- Very strict or ↓Kcal diets signal the appetite control center in hypothalamus to ↑ galanin levels
- Increased galanin triggers craving for fat, & may contribute to weight gain
Stress and Galanin levels

- Stress hormones (NE and corticosterone) secreted from the adrenal gland during stress
- These ↑ galanin levels, which ↑ cravings for high fat foods, overeating & weight ↑
- Treatment: ↑ physical activity to boost endorphins & reduce stress hormones
Researchers working on diet pills to turn OFF galanin production

Should ↩ cravings for cheeseburgers, fries, brownies, donuts without affecting our healthy appetites
True chocoholics?

What makes chocolate appealing?

- Sugar stimulates serotonin
- Sweet taste releases endorphins
- Fat improves galanin levels
- Drug like constituents
  - Anandamines, caffeine, PEA, mag
Chemicals in Chocolate

Chocolate contains:

- Theobromine & caffeine: act like stimulant > mental lift
- Tyramine & phenylethylamine: ↑ BP & HR amphetamine
- Anandamides: mimics effects cannabis
Emotions and Chocolate

- 37 healthy, normal wt females
- Consume chocolate bar, apple or nothing & rated subjective state at 5, 30, 60, & 90 min
- Chocolate & apple ↓ hunger, but effects of chocolate were stronger
- Chocolate: Joy or Guilt

(Macht, Appetite, 2006, 46:332-6.)
Emotions and Chocolate

- N = 48 normal wt males given choc 2 or 4 hrs after viewing film clips ▶ Anger, fear, sadness & joy
- Motivation to eat chocolate ↑ after 8 h
- ↑ tendency eat ↑ choc w/ joy, tasted better & more stimulating than during sadness (p ↓ 0.001)

(Macht, Appetite, 2002, 39: 147-58)
Is Chocolate an Effective Anti-depressant?

- 2-3 grams of phenylethylamine needed for anti-depressant effect
- 50 gram chocolate bar (1.67 oz) has only 1/3 of a milligram of phenylethylamine
- Some chemicals in chocolate other foods in ↑doses. Tyramine ↑ in cheese, yeast extract & pickled herring, & not craved as often
Chocolate and Hunger State Study

- N= 29 (17 cravers, 12 non-cravers)
- Participants trained to eat chocolate either when hungry or full over 2 wks
- Cravings ↑ in those trained to eat chocolate when hungry
- Cravings reduced in those that ate chocolate only when full

(Gibson, Appetite, 1999, 32: (219-40))
## Tips for Chocoholics

- Small amount of dark (70%)
- Chocolate with meals
- Buy minis
- Daily magnesium supplement (300-500mg) has been reported to curb cravings
Salt Cravings

1. Female: 2 wks prior to cycle: poss effect of estrogen on vasopressin, & aldosterone  ▶ fluid retention

- Water wt ↑ may turn on salt cravings to help maintain normal salt concentrations in body
Salt Cravings

2. \( \downarrow \) Ca intake: Monell Chemical Center report people w \( \downarrow \) Ca intakes most prone to crave salty foods

- Lab animals don’t crave salt but become salt lovers when fed Ca poor diets
Salt Cravings

3. Body’s memory in womb → cravings for salty foods when preg

4. Crunchy textures may satisfy need to bite down & relieve stress or anger
Fishing For Ways to Improve Your Mood?

- As fish consumption ↑, depression rates ↓ (Japan & Taiwan consume ↑↑ amts omega 3 FA & ↓ depression)
- N. America, Europe, & New Zealand: ↓ consumption Omega 3 FA: ↑ depression
- Preg & lactation ↑ demands for omega 3
- Post partum depression rates ↓ as women ↑ consumption of fish

Omega 3 Fatty Acids

- Specific Omega 3: DHA comprises 50% of total fats in nerve tissue
- ↓ levels omega 3’s in nervous system may ↑ likelihood depression
- Fats may affect mood by regulating serotonin: low serotonin = increased rates of depression & suicide
Fish and Mental Health

- New Zealand Health Survey
- 4,644 adults ≥15 yrs
- No fish, or some fish at any frequency
- Difference for mean scores: some fish 8.2, no fish: 7.5
- Significant relationship between fish & mental health ▶ PUFA mood stabilizers

(Silvers, Pub Heal Nutr, 2002, 5: 427-31)
Fish and the Gray Matter

- Interviewed 55 healthy adults to determine average omega 3 intake
- Gray matter volume: High res MRI
- ↑ levels omega 3 higher volumes in areas of brain w emotional arousal & regulation
- Areas linked with mood & behavior

(Tufts Health and Nutrition Letter June 2007)
Good Sources of Omega 3 FA

1. Atlantic salmon
2. Flax (1-3 g/day)
3. Canola Oil
4. Shrimp
5. Halibut
6. Walnuts
Selenium and Mood

- People lacking selenium show signs of anxiety, irritability, & depression
- Deficiency corrected: mood improves
- Rx: 55 micrograms/day (Tox 250mcg)
- Found in brazil nuts, seafood, lean beef or chicken & mushrooms
Feel Good Diet

1. Make slow, gradual changes
2. Choose whole grain starches > refined sugars (3 oz equiv/day)
3. Limit refined sugars to 10% kcals
4. Grains and lean protein
5. Eat more fatty fish, nuts & flax
Feel Good Diet

5. Dark chocolate with meals
6. Add Wheat germ to choline
7. MVI if deficient, Ca, Selenium, or Mg for cravings
8. Maintain physical activity to increase endorphins
Questions???

Enjoy the rest of your day!