ProActive NUTRITION
HEALTH ◆ WELLNESS ◆ PERFORMANCE

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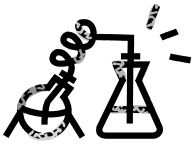
Food and Behavior



Nutrition is a science, not an opinion.
But there can be an art to interpreting and applying it….

I. What's the link between nutrition and behavior?

A. The connection is the effect of nutrition on the brain.
B. Neurotransmitters are primarily composed of amino acids
C. Co-factors are required for metabolic reactions
    1. B-vitamins
    2. Minerals
D. The myelin sheath is composed primarily of omega-3 and omega-6 fatty acids (essential fatty acids)
E. The brain needs adequate fuel to function well.

II. Goal of Nutrition Therapy for ASD, ADHD, etc.

A. To support the structure and function of the child's brain and body to optimize performance thereby enhancing the child's response to other treatments and therapies.

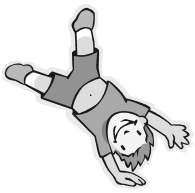
B. Adjunct or stand-alone treatment?

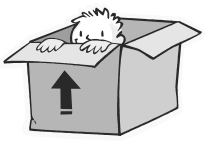
III. Fatty Acids

A. Anti-inflammatory properties.
B. Necessary for normal brain function
C. Essential fatty acids have been reported to be reduced (≥ 20%) in individuals with autism. (8)
D. Recommendation: 3000 -6000 mg omega-3 fatty acids/day.

IV. Reactive Hypoglycemia

A. Blood sugar tends to "crash" easily, especially in response to a simple carbohydrate eaten by itself.
B. common in ADS and ADHD population
C. When blood glucose crashes…behavior crashes.
D. Recommendation: eat at least every 3 hours; couple carbohydrates with protein foods.
E. Blood glucose is the primary fuel for the brain.
F. Medications may not work to their full capacity when body (especially brain) is food restricted.





V. The Gastrointestinal connection

A. Malabsorption of vital nutrients can result in behavioral problems.

1. Inflammation of the gut can lead to malabsorption
2. Studies suggest that many ASD children have inflammation of the GI tract. (3,4,7)
   - Autistic children have less severe inflammation than Crohn's or IBS, but more pervasive.
   - Studies suggest that the majority of children with autism may have a GI disorder.
   - The discomfort from undiagnosed GI disorders alone can cause behavioral problems. The child may not be able to put into words his discomfort.
3. It is likely that this inflammation may be caused by a VARIETY of food allergies and/or food sensitivities.

Gastrointestinal Disorder symptoms:

- Abdominal pain
- Abdominal distension
- Gaseousness/ Flatulence
- Diarrhea
- Constipation
- Food refusal
- Limited variety of foods
- Mealtime tantrums
- Self abuse
- Sleep disturbances

B. Food Allergies and Sensitivities

1. Food Allergy – IgE
   a) Usually immediate
   b) Can result in anaphylaxis
   c) Overall, a relatively small number of patients with IgE mediated allergies - 2-4%
   d) Peanut, milk, egg, fish, wheat, nuts, soy

2. Food Intolerance – Non-immunologic
   a) Irritant
   b) Malabsorption issues
   c) Enzymatic
   d) Non-Immunologic Food Intolerance
   e) Lactose intolerance
   f) Fructose intolerance – 60 lbs/year average

3. Food Sensitivity – Non-IgE –But still a gut immune response (GALT)
   Naming is Controversial – Non-IgE immune related responses called 'non-IgE allergy' by some
   a) Non-IgE/IgG immune response
   b) Involves different mechanisms, different cells, different mediators
   c) Much more common than allergy - 15-20%

- Foods and food additives trigger non-allergic (non-IgE mediated) immune reaction causing mediator release by immunologic cells

  - Histamine
  - Serotonin
  - Prostaglandins
  - Leukotrienes
  - Cytokines
  - Dopamine
  - Others

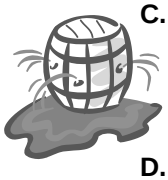
- This in turn leads to physiologic effects of released pro-inflammatory and pro-algesic mediators

  - IBS: Inflammation, smooth muscle contraction, diarrhea, cramping, and visceral hypersensitivity
  - Migraine: Changes in blood flow (vasoconstriction or vasodilatation), inflammation, WBC activation, pain receptor activation
  - Other symptoms including fibromyalgia: Muscle and joint aches and pain, fatigue, anxiety, depression, acne, insomnia, mood swings, food cravings

- Inflammatory Mediators can affect the central nervous system.
  - Some mediators can open and/or crosses the blood brain barrier
  - Systemic cytokines can alter such neurologic functions as food intake and temperature
  - Importantly, cytokines are potent regulators of the neuroendocrine system that regulates the body's response to stress

- Conditions That May Be Associated with Food Sensitivity

∗ Celiac disease	∗ Migraines	∗ ADHD
∗ Ulcerative colitis	∗ Interstitial cystitis	∗ Hives
∗ Crohn's disease	∗ Tinnitus (ears ringing)	∗ Edema (puffy swelling)
∗ GERD (heart burn)	∗ Rhinitis/Sinusitis	∗ Rheumatologic disorders
∗ Asthma	∗ Excessive ear wax	∗ Eczema



C. "Leaky Gut Syndrome"

1. Undigested food particles have been found in the urine of autistic children.
2. An inflamed gut can become "leaky" allowing peptides to enter the blood stream
3. These peptides can cause an immune response leading to additional food allergies.

D. Probiotics

1. To help correct imbalance of dysbiotic flora resulting from immune dysregulation and maldigestion
2. May help improve carbohydrate enzyme action.
3. May help increase nutrient absorption and decrease G.I. upset.
4. May help decrease inflammation in the gut.

VI. Picky Eaters vs. Careful Eaters (see last 2 pages of handout)

VII. The Opioid Excess Theory

A. The opioid excess theory of autism says that autistic children are symptomatic due to excess opioid-like substances whose effects on the brain produce the symptoms of autism.

- Though naturally occurring in the CNS from endogenous origin, these substances (Dermorphin, Casomorphine, A-Glaidin, Deltophin II, Morphine modulating peptide, Novel Autism Peptides I and II, and sauvagine), have been found in significantly higher levels in the urine of autistic children vs normal controls.
- In theory, the majority of these peptides are dumped in the urine, but a small portion may cross the blood brain barrier causing interference of normal brain activity.

B. The postulation is that excessive opioid peptides are derived from an exogenous source, the incomplete breakdown of certain proteins.

- The only known enzyme to break down these opioid-like compounds, DDP-IV, appears to be absent or reduced in autistic children. The deficiency is theorized to be either genetic or auto-immune in nature.
- Gluten and casein are 2 of the proteins from which these opioids can be produced. (Others?)

C. These opioid-like peptides may also affect GI function

- Delayed gastric emptying
- Decreased gastric acid secretion
- Decreased secretin released in duodenum
- Decreased hepatic glutathione

D. Naltrexone (an opioid antagonist) is sometimes used in autistic children. Results vary.

E. **Conclusion**: The Opioid execess theory is **NOT supported by solid research**. My guess is that by eliminating such a vast variety of foods there is a good chance you will eliminate food(s) your child may be sensitive to. Toss a wide enough net and you are bound to catch something!

- *Personally, I believe there is no reason to eliminate more food choices than absolutely necessary.*
- *FYI, I believe the same principle holds true for the Feingold diet and the Specific Carbohydrate diet… these both toss a VERY wide net, eliminating many foods, likely more than necessary.*

VIII. Enzyme Therapy (Gut-Brain connection;6)

A. Secretin is a polypeptide neurotransmitter involved in controlling digestion. It's action is to increase the bicarbonate content of secreted pancreatic juices.

1. One theory is that the apparent "secretin deficiency" observed in many autistic pts results from insufficient acidity in the upper duodenum to stimulate the release of secretin.
2. There are no double-blind placebo studies to date, and only one study using children has been published. This study included 3 subjects and administered the secretin via I.V. (5)
3. Secretin is approved by the FDA for single dose diagnostic purposes only at this time.

B. DPP-4

1. The enzyme involved in digestion of casein and gluten.
2. If the deficiency is 2^{o} to an auto immune rxn, adding more DPP-4 won't fix this.
3. Possible connection to mercury. Hg may inhibit production of DPP-4
4. Results are mixed, but often significant. Worth a trial in many pts.

"Be open minded, but not so open minded that your brains fall out of your head."

Groucho Marx

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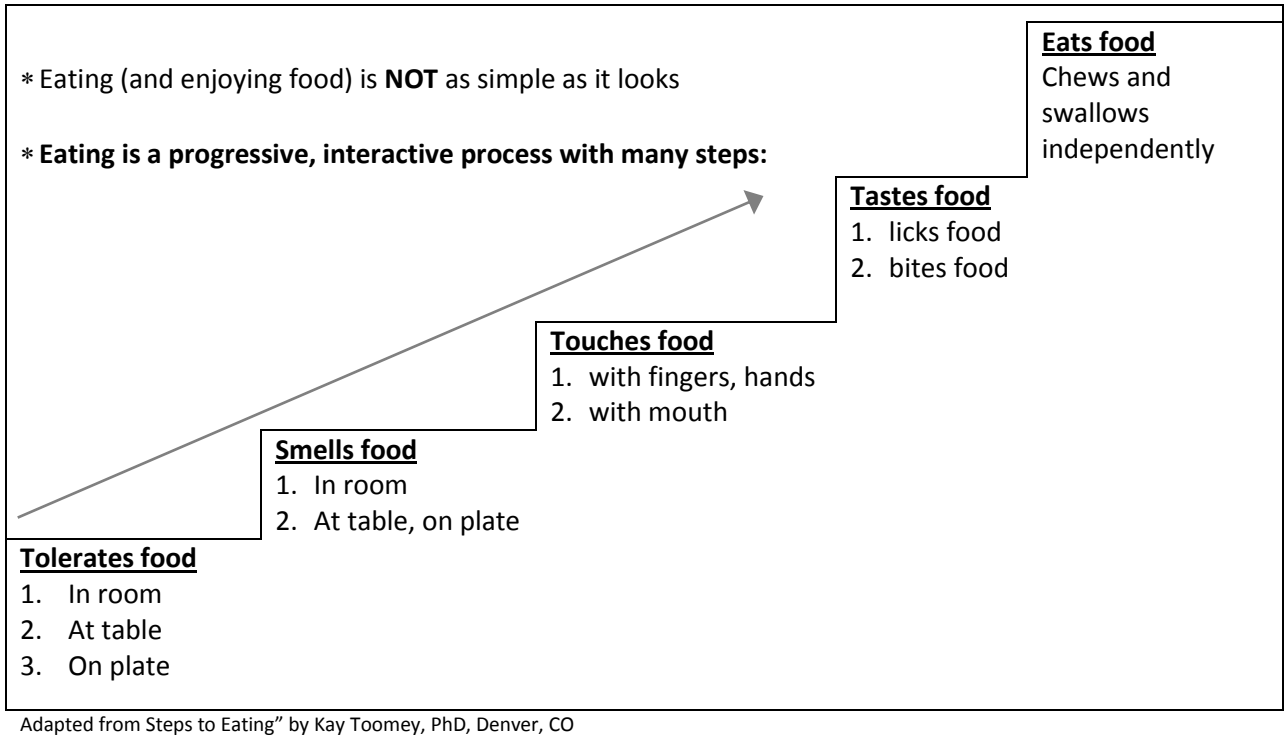
Autism, Nutrition, and Picky Eating…

- Some common behaviors in children with autism can cause problems around food and eating (your child may or may not have these behaviors)

BEHAVIOR	HOW IT MIGHT RELATE TO CHILDREN'S EATING
Hypersensitivity to texture, smell, taste	Refuses to eat foods with specific textures, smells, tastes
Need for routine	Refuses to eat food that looks "different"…or is in a new bowl or is at a different place at the table…
Over-stimulated or over-whelmed by the environment	Distracted from meal and does not eat

- Typically developing children may need 20 or more exposures to a new food before they will eat it.

  …. Children with autism and others who are especially sensitive to tastes, textures, smells or new things may need even more exposures!



Adapted from Steps to Eating" by Kay Toomey, PhD, Denver, CO

- It is natural for children to refuse to eat some foods at some times. This is one way to show independence and to make decisions.

- Picky eating can be a nutrition risk when:
  - One or more food groups is excluded from a child's food pattern
  - "Not enough" food leads to weight loss or lack or growth
  - Fights over eating (or not eating) put a strain on parent-child relationships.

Supplement to Lucas B, Pechstein S and Ogata B, Nutrition concerns of Children with Autism Spectrum Disorders. *Nutrition Focus Newsletter* 17 (1): 1-10. January/February, 2002. Center on Human Development and Disability, University of Washington, Seattle, WA

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BEHAVIOR	HOW IT MIGHT RELATE TO CHILDREN'S EATING
"Bribing" your child to eat a food (ex: "If you eat your vegetables, you can have some candy")	Teaches your child that he/she shouldn't like the vegetables as much as candy because vegetables are less desirable.
Forcing your child to "take a bite" or "have at least one taste."	May create negative associations with food and eating; and take control away from your child.

Suggestions to help your child enjoy new foods

∗ Avoid overwhelming your child with too many changes:

1. Keep mealtimes constant. Use the same plates and utensils. Eat at the same place and at the same time.

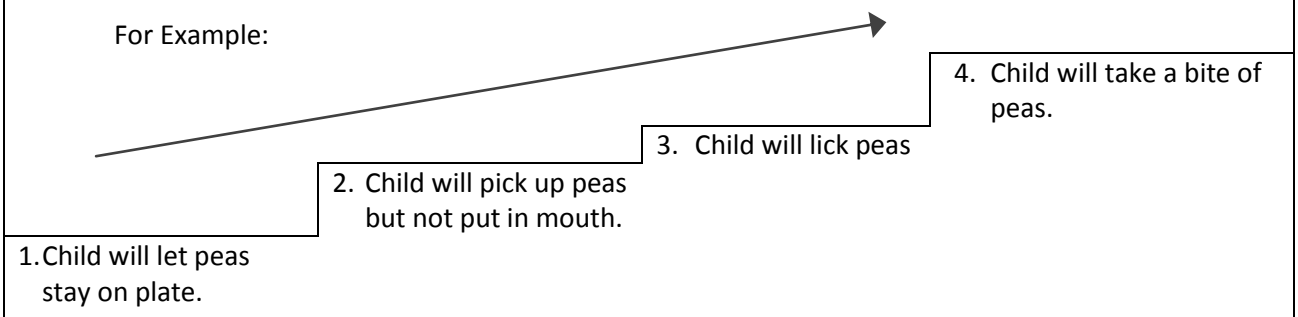
2. Offer small servings of a few (2-3) foods at one time…avoid offering TOO MUCH FOOD and TOO MANY CHOICES.

3. Offer new foods along with foods your child already likes to eat.

∗ Introduce foods in forms that are similar to foods your child already eats, and make changes gradually.
For example, if your child eats crackers, but not sandwiches:
First offer sandwiches made with crackers.
Then offer sandwiches on toast.
Finally, offer sandwiches made with bread.

∗ Expect slow changes. Follow your child through the steps of the process…set realistic goals.

For Example:



Ask your child's teacher for help

1. Pick one "goal food" to offer at snack time and/or lunch. Offer this same food at home.
2. Use non-food reinforcers. Using food as a reinforcer teaches your child to value this food – and can teach your child not to value other foods.
3. Incorporate eating behaviors into your child's token reward system – a token for a "goal behavior" such as leaving peas on the plate. Remember NOT to use food as the reward!

Developed by Beth Ogata, MS, RD and Betty Lucas, MPH, RD
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September 1999

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