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## Outline

- I.      **Nutrition Transition** - *What are we eating?*
- II.     **Ancestral Diets** – *What did we eat?*
- III.    **The Gut-Brain-Microbiome Axis** – *What should we eat?*

## Take Home Message: Eat Real Food\*

\* Fresh, whole food, free from industrial processing or ultra-processing.

## Challenge: Three common nutritional beliefs:

- 1) Energy in must equal energy out
- 2) Low-fat is healthy
- 3) Any food such as sugar is okay in “moderation”

## Definitions:

**Food processing:** all methods and techniques used by the food, drink and associated industries to turn whole fresh foods into food products.

**De Novo Lipogenesis:** the process of creating fat. DNL occurs in the liver primarily from the breakdown of dietary carbohydrates.

## Key facts:

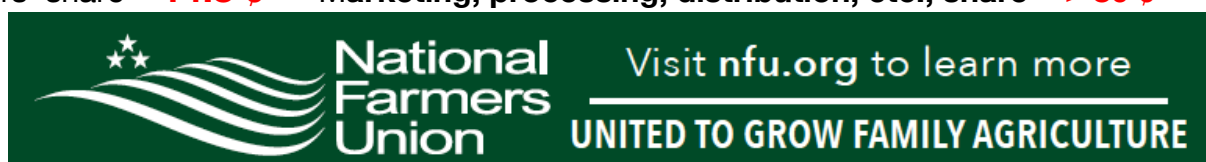
The digestive tract is exposed to more foreign substances (antigens) in one day than the entire immune system encounters in a lifetime.

There are between 200 and 600 million neurons in the digestive tract (Enteric Nervous System), which is equal to the number of neurons in the spinal cord.

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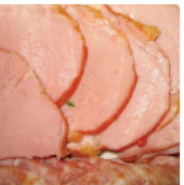





**FOOD DOLLAR:**

Farmers' share = **14.8 ¢**      Marketing, processing, distribution, etc., share = **> 80 ¢**



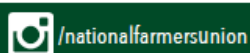
# The Farmer's Share

Did you know that farmers and ranchers receive only 14.8\* cents of every food dollar that consumers spend? According to the USDA, off farm costs including marketing, processing, wholesaling, distribution and retailing account for more than 80 cents of every food dollar spent in the United States.





<b>Bacon</b> 1 lb.  Retail: \$4.99 Farmer: \$0.68	<b>Top Sirloin Steak</b> 1 lb.  Retail: \$8.99 Farmer: \$2.01	<b>Bread</b> 2 lbs.  Retail: \$3.49 Farmer: \$0.12	<b>Fresh Carrots</b> 5 lbs.  Retail: \$4.49 Farmer: \$1.40	<b>Beer</b> 6-pack cans  Retail: \$8.99 Farmer: \$0.04
<b>Cereal</b> 18 oz. box  Retail: \$5.09 Farmer: \$0.05	<b>Tomatoes</b> 1 lb.  Retail: \$3.99 Farmer: \$0.40	<b>Eggs</b> 1 dozen  Retail: \$2.89 Farmer: \$2.01	<b>Flour</b> King Arthur, 5 lbs.  Retail: \$6.09 Farmer: \$0.43	<b>Boneless Ham</b> 1 lb.  Retail: \$3.99 Farmer: \$0.68
<b>Lettuce</b> 1 lb.  Retail: \$2.79 Farmer: \$0.47	<b>Milk</b> 1 gallon, fat free  Retail: \$4.49 Farmer: \$1.34	<b>Fresh Apples</b> 1 lb.  Retail: \$2.19 Farmer: \$0.34	<b>Fresh Potatoes</b> Russet, 5 lbs.  Retail: \$3.99 Farmer: \$0.56	<b>Soda</b> 2 liters  Retail: \$2.19 Farmer: \$0.05

Farmers' share derived from USDA, NASS "Agricultural Prices," 2018 | Prices based on March 2018 data.  
Retail prices based on Safeway (SE) brand except where noted. | \*Figure according to U.S. Department of Agriculture Economic Research Service

April 27, 2018



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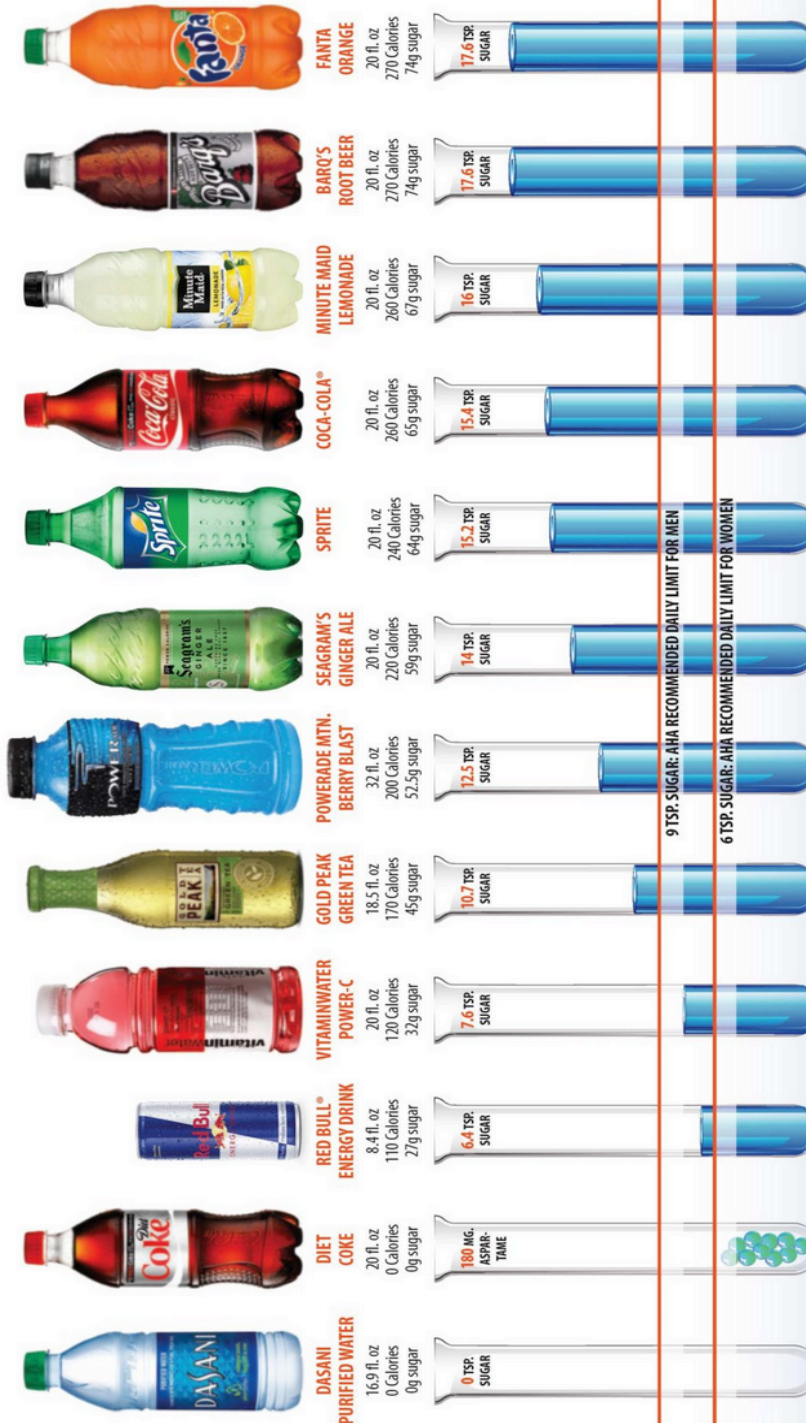
A healthy breakfast: cereals, toast, fruit juice?			
Food item	Serving size in g/ml	How does each food affect blood glucose compared with one 4g teaspoon of table sugar?	
Corn flakes	30	8.4	
Milk	125	1	
Brown toast, 1 slice	30	3	
Pure Apple juice	200	8.6	
<b>Total for breakfast 21 teaspoons</b>			
<b>Useful information for those with T2Diabetes making dietary choices</b>			
*As per calculations derived from the glycaemic index. To be found in: <i>It's the glycaemic response to, not the carbohydrate content of food that matters in diabetes and obesity</i> Journal of Insulin Resistance 2016. Unwin et al			

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# THINK BEFORE YOU DRINK.

The American Heart Association (AHA) recommends consuming no more than 6 teaspoons (tsp.) of added sugars per day for women, and no more than 9 tsp. of added sugars per day for men. How does your drink measure up?



The nutritional information contained in this document was obtained from the following resources: <http://www.productnutrition.thecoca-colacompany.com>, <http://www.dasani.com>, <http://www.seagramsmixers.com/ginger-ale-nutrition-facts.asp>, <http://www.minutemaids.com/lemonade-and-punch/lemonade-20-fl-oz-bottle>, <http://www.usa.powerade.com>, <http://www.vitaminwater.com/vitaminwater>, 2013. Nutrition Facts pdf, <http://www.goldpeaktea.com/Flavors/sweet-tea>, © 2012-2013 The Coca-Cola Company, DASANI, Diet Coke, Vitamin Water, Powerade, GOLD PEAK, Sprite, Coca-Cola, Minute Maid, BARQ'S and FANTA are all trademarks of The Coca-Cola Company. Red Bull Energy Drink is a trademark of Red Bull North America, Inc. Seagrams is a registered trademark of LDI (Cayman) LTD and used under license.



2042    Monteiro CA et al.

Table 1

Food classification based on the extent and purpose of industrial processing.

Food group	Extent and purpose of processing	Examples *
Group 1: unprocessed or minimally processed foods	No processing, or mostly physical processes used to make single whole foods more durable, accessible, convenient, palatable, or safe	Fresh, chilled, frozen, vacuum-packed fruits, vegetables, fungi, roots and tubers; grains (cereals) in general; fresh, frozen and dried beans and other pulses (legumes); dried fruits and 100% unsweetened fruit juices; unsalted nuts and seeds; fresh, dried, chilled, frozen meats, poultry and fish; fresh and pasteurized milk, fermented milk such as plain yoghurt; eggs; teas, coffee, herb infusions, tap water, bottled spring water
Group 2: processed culinary or food industry ingredients	Extraction and purification of components of single whole foods, resulting in producing ingredients used in the preparation and cooking of dishes and meals made up from Group 1 foods in homes or traditional restaurants, or else in the formulation by manufacturers of Group 3 foods	Vegetable oils, margarine, butter, milk cream lard; sugar, sweeteners in general; salt; starches, flours, and "raw" pastas and noodles (made from flour with the addition only of water); and food industry ingredients usually not sold to consumers as such, including high fructose corn syrup, lactose, milk and soy proteins, gums, and preservatives and cosmetic additives
Group 3: ultra-processed food products	Processing of a mix of Group 2 ingredients and Group 1 foodstuffs in order to create durable, accessible, convenient, and palatable ready-to-eat or to-heat food products liable to be consumed as snacks or desserts or to replace home-prepared dishes	Breads, biscuits (cookies), cakes and pastries; ice cream; jams (preserves); fruits canned in syrup; chocolates, confectionery (candies), cereal bars, breakfast cereals with added sugar; chips, crisps; sauces; savoury and sweet snack products; cheeses; sugared fruit and milk drinks and sugared and "no-cal" cola, and other soft drinks; frozen pasta and pizza dishes; pre-prepared meat, poultry, fish, vegetable and other "recipe" dishes; processed meat including chicken nuggets, hot dogs, sausages, burgers, fish sticks; canned or dehydrated soups, stews and pot noodle, salted, pickled, smoked or cured meat and fish; vegetables bottled or canned in brine, fish canned in oil; infant formulas, follow-on milks, baby food

\* These listings do not include alcoholic drinks. The examples given are not meant to be complete. Many others can be added, especially to group 3, using the general principles specified in the text and as indicated in the second column.

### Food classification based on the extent and purpose of industrial processing

Monteiro, C. A., Levy, R. B., Claro, R. M., Castro, I. R., & Cannon, G. (2010). A new classification of foods based on the extent and purpose of their processing. *Cad Saude Publica*, 26(11), 2039-2049.

## **FAO - Food and Agriculture Organization of the United Nations**

### **Food-based dietary guide - Brazil**

Brazil does NOT use a food guide.

### **Ten Steps to Healthy Diets:**

#### **1. Make natural or minimally processed foods the basis of your diet**

Natural or minimally processed foods, in great variety, and mainly of plant origin, are the basis for diets that are nutritionally balanced, delicious, culturally appropriate, and supportive of socially and environmentally sustainable food systems. Variety means foods of all types – cereals, legumes, roots, tubers, vegetables, fruits, nuts, milk, eggs, meat – and diversity within each type – such as beans and lentils, rice and corn, potato and cassava, tomatoes and squash, orange and banana, chicken and fish.

#### **2. Use oils, fats, salt, and sugar in small amounts when seasoning and cooking natural or minimally processed foods and to create culinary preparations**

As long as they are used in moderation in dishes and meals based on natural or minimally processed foods, oils, fats, salt, and sugar contribute to diverse and delicious diets without making them nutritionally unbalanced.

#### **3. Limit consumption of processed foods**

The ingredients and methods used in the manufacture of processed foods – such as vegetables in brine, fruits in syrup, cheeses and breads – unfavourably alter the nutritional composition of the foods from which they are derived. In small amounts, processed foods can be used as ingredients in dishes and meals based on natural or minimally processed foods.

#### **4. Avoid consumption of ultra-processed foods**

Because of their ingredients, ultra-processed foods such as salty fatty packaged snacks, soft drinks, sweetened breakfast cereals, and instant noodles, are nutritionally unbalanced. As a result of their formulation and presentation, they tend to be consumed in excess, and displace natural or minimally processed foods. Their means of production, distribution, marketing, and consumption damage culture, social life, and the environment.

#### **5. Eat regularly and carefully in appropriate environments and, whenever possible, in company**

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Make your daily meals at regular times. Avoid snacking between meals. Eat slowly and enjoy what you are eating, without engaging in another activity. Eat in clean, comfortable and quiet places, where there is no pressure to consume unlimited amounts of food. Whenever possible, eat in company, with family, friends, or colleagues: this increases the enjoyment of food and encourages eating regularly, attentively, and in appropriate environments. Share household activities that precede or succeed the consumption of meals.

#### **6. Shop in places that offer a variety of natural or minimally processed foods**

Shop in supermarkets and municipal and farmers markets, or buy directly from producers or other places, that sell varieties of natural or minimally processed foods. Prefer vegetables and fruits that are locally grown in season. Whenever possible, buy organic and agro-ecological based foods, preferably directly from the producers.

#### **7. Develop, exercise and share cooking skills**

If you have cooking skills, develop them and share them, especially with boys and girls. If you do not have these skills – men as well as women – acquire them. Learn from and talk with people who know how to cook. Ask family, friends, and colleagues for recipes, read books, check the internet, and eventually take courses. Start cooking!

#### **8. Plan your time to make food and eating important in your life**

Plan the food shopping, organise your domestic stores, and decide on meals in advance. Share with family members the responsibility for all activities related to meals. Make the preparation and eating of meals privileged times of conviviality and pleasure. Assess how you live so as to give proper time for food and eating

#### **9. Out of home, prefer places that serve freshly made meals**

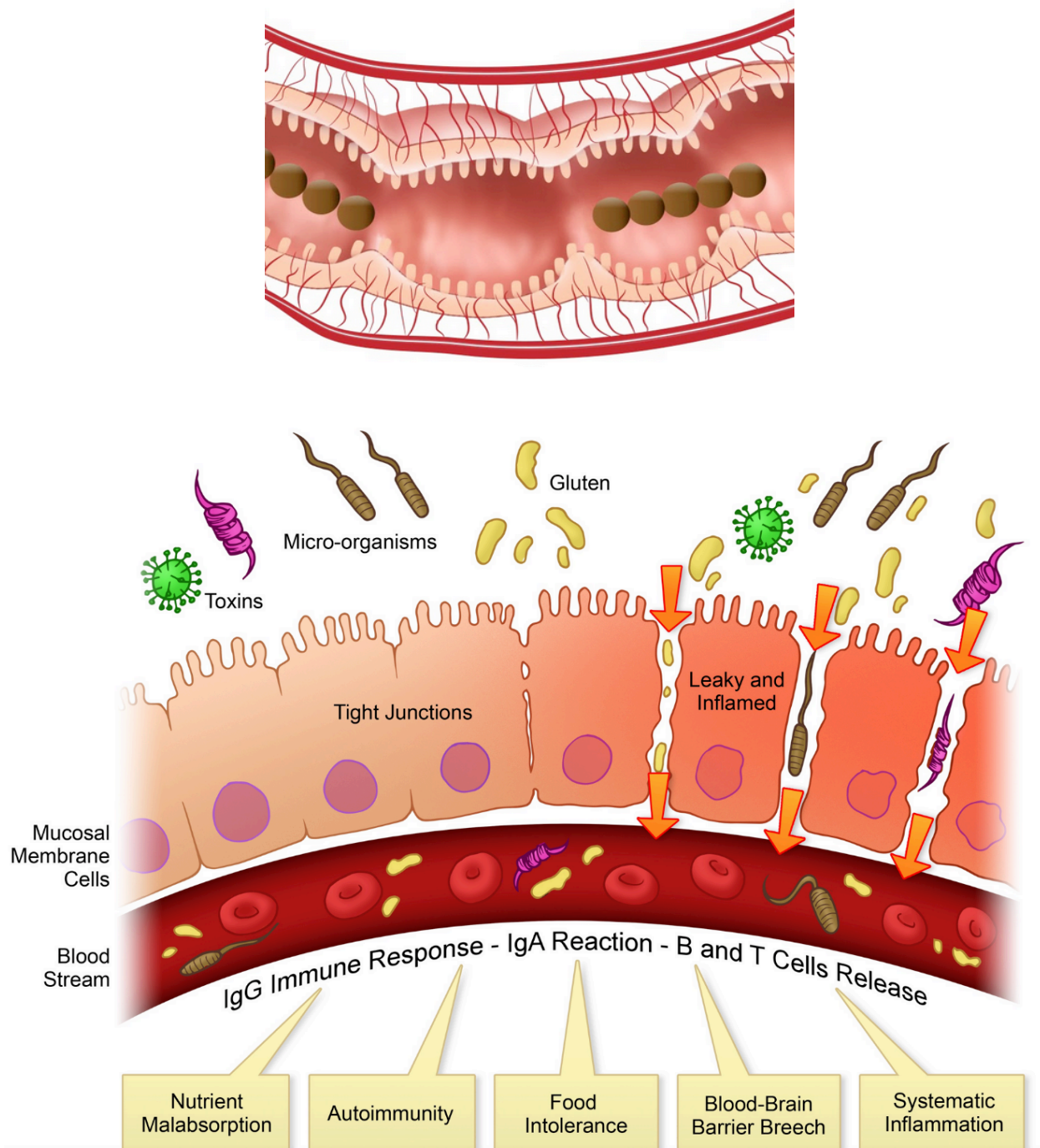
Eat in places that serve fresh meals at good prices. Self-service restaurants and canteens that serve food buffet-style charged by weight are good choices. Avoid fast food chains.

#### **10. Be wary of food advertising and marketing**

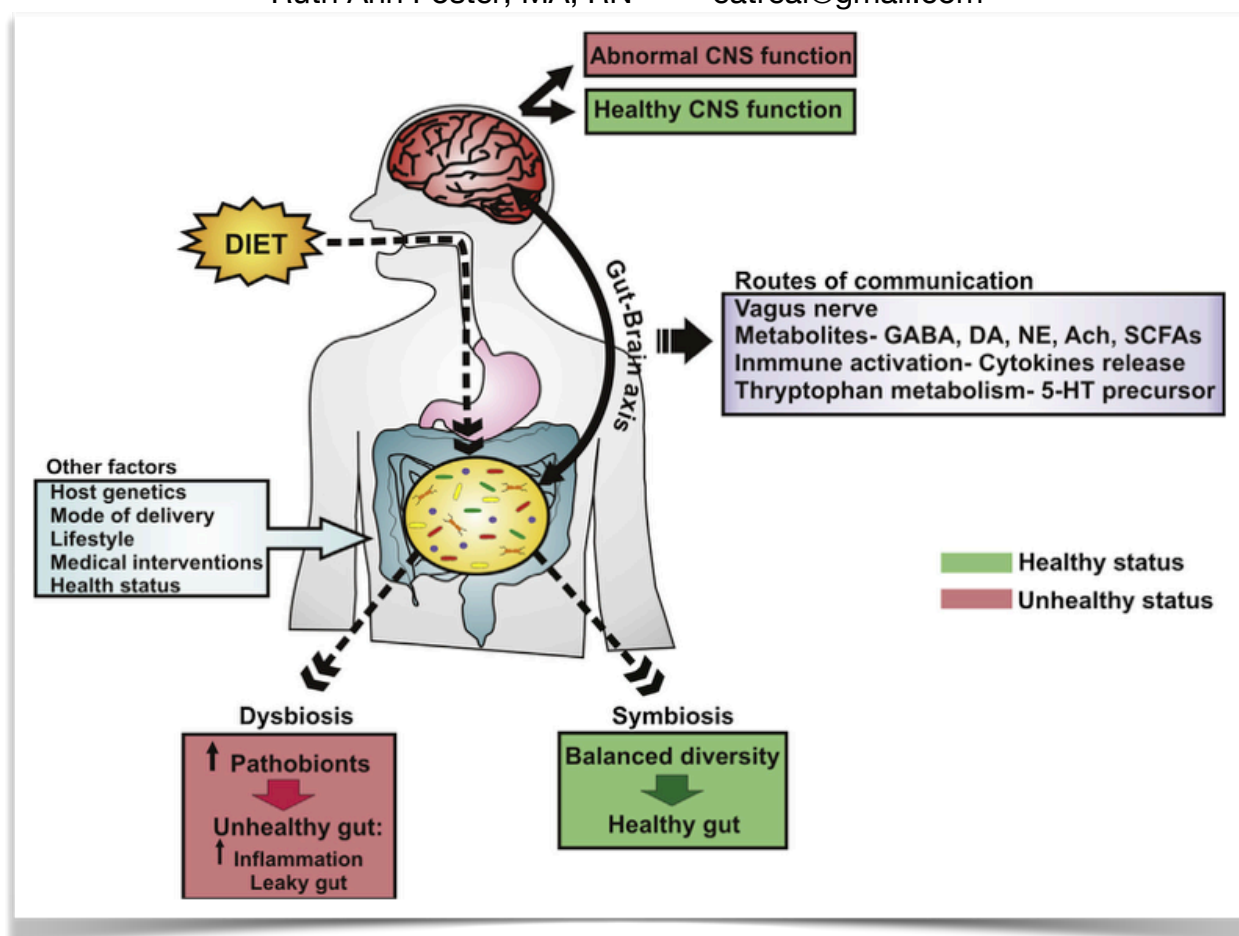
The purpose of advertising is to increase product sales, and not to inform or educate people. Be critical and teach children to be critical of all forms of food advertising and marketing.

<http://www.fao.org/nutrition/education/food-based-dietary-guidelines/regions/countries/brazil/en/>

## Intestinal Epithelial Cells







**Fig. 2. Impact of diet on the gut microbiota and routes of communication involved in the gut-brain axis.** (Oriach, Robertson, Stanton, Cryan, & Dinan, 2016)

Diet is one of the most crucial factors in the development of the human gut microbiota. Different dietary patterns can change the gut microbiota composition by keeping a balanced diversity of the gut microbiota (symbiosis) or causing a state of dysbiosis which is characterized by an overgrowth of potentially pathological organisms (pathobionts). A state of dysbiosis leads to an increased inflammation and leaky gut. Many mechanisms have shown to be involved in this bidirectional pathway between the gut microbiota and brain including vagus nerve signalling, immune activation, tryptophan metabolism and production of microbial metabolites and neurometabolites. Many of these bacterial metabolites significantly impact neurological function, therefore there is potential for dietary interventions that increase bacterial metabolism and promote growth of beneficial bacteria, to beneficially modulate the gut-brain axis and modulate CNS function.

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Abbreviations: GABA, gamma-aminobutyric acid; DA, dopamine; NE, norepinephrine; Ach,acetylcholine; SCFAs, short-chain fatty acids; 5-HT,serotonine; CNS, central nervous system.

Oriach, C. S., Robertson, R. C., Stanton, C., Cryan, J. F., & Dinan, T. G. (2016). Food for thought: The role of nutrition in the microbiota-gutebrain axis. *Clinical Nutrition Experimental*, 6. doi:<http://dx.doi.org/10.1016/j.ycline.2016.01.003>

**Table 4.** A summary of brain-affecting disorders, where gastrointestinal manifestation exists and the intestinal microbiome and enteric nervous networks are actively involved. (Lerner, Neidhofer, & Matthias, 2017)

**Diseases:**

Parkinson's disease	<a href="#">[84,113–128]</a>
Autism spectrum disorder	<a href="#">[84,129–133]</a>
Amyotrophic lateral sclerosis	<a href="#">[84,134–136]</a>
Alzheimer diseases	<a href="#">[84,137–139]</a>
Prion diseases	<a href="#">[81,84,94,139–147]</a>
Creutzfeldt-Jakob disease	<a href="#">[81,143,145]</a>
Transmissible spongiform encephalopathies	<a href="#">[84,139,143,145,146]</a>

**Additional conditions:**

Depression	<a href="#">[148–152]</a>
Anxiety	<a href="#">[150,151,153]</a>
Behavior	<a href="#">[154–156]</a>
Cognition	<a href="#">[157–159]</a>
Mood	<a href="#">[67,160,161]</a>
Stress	<a href="#">[151,162–164]</a>
Fatigue	<a href="#">[165–168]</a>
Aging	<a href="#">[108,138,169]</a>

Lerner, A., Neidhofer, S., & Matthias, T. (2017). The Gut Microbiome Feelings of the Brain: A Perspective for Non-Microbiologists. *Microorganisms*, 5(4). doi:10.3390/microorganisms5040066