

# **NUTRITION AND MENTAL HEALTH**

## **Historical and Public Health Context**

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# **Disclosure for all speakers today**

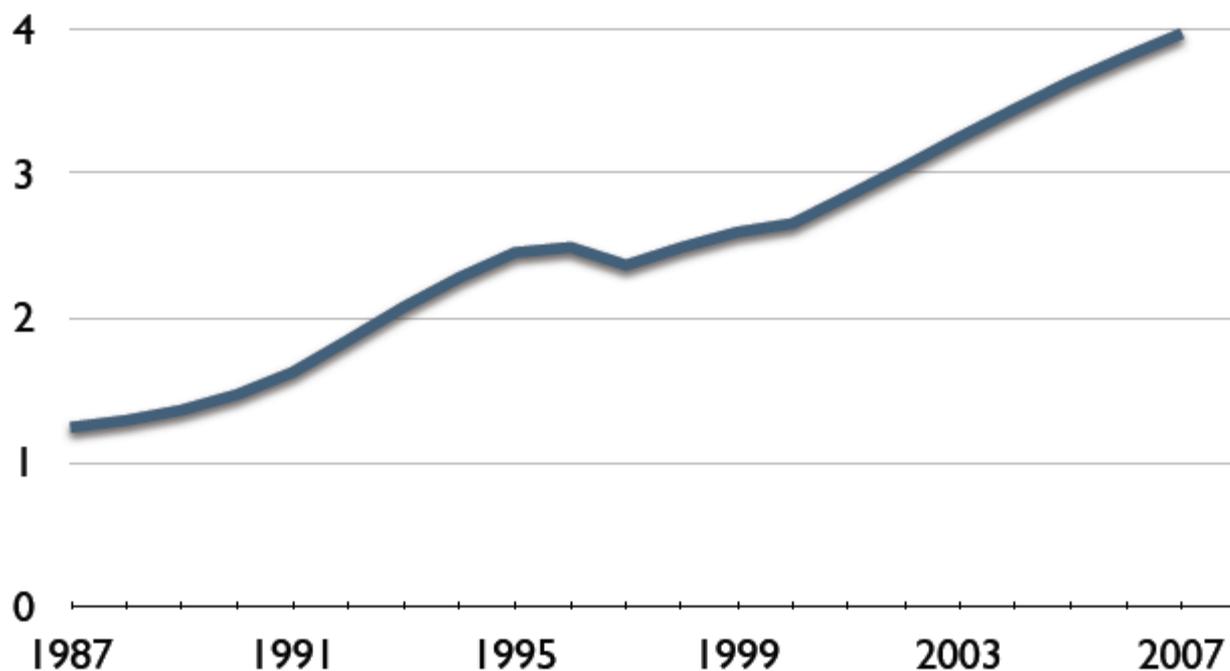
- 1. No commercial interest in any company or sale of any product**
- 2. And this symposium has no commercial sponsors or affiliations**

# **The broader context for why most of us are here today**

- 1. Increasing prevalence of mental  
problems**

# U.S. Disability in the Prozac Era

Millions of adults, 18 to 66 years old



Source: U.S. Social Security Administration Reports, 1987-2007

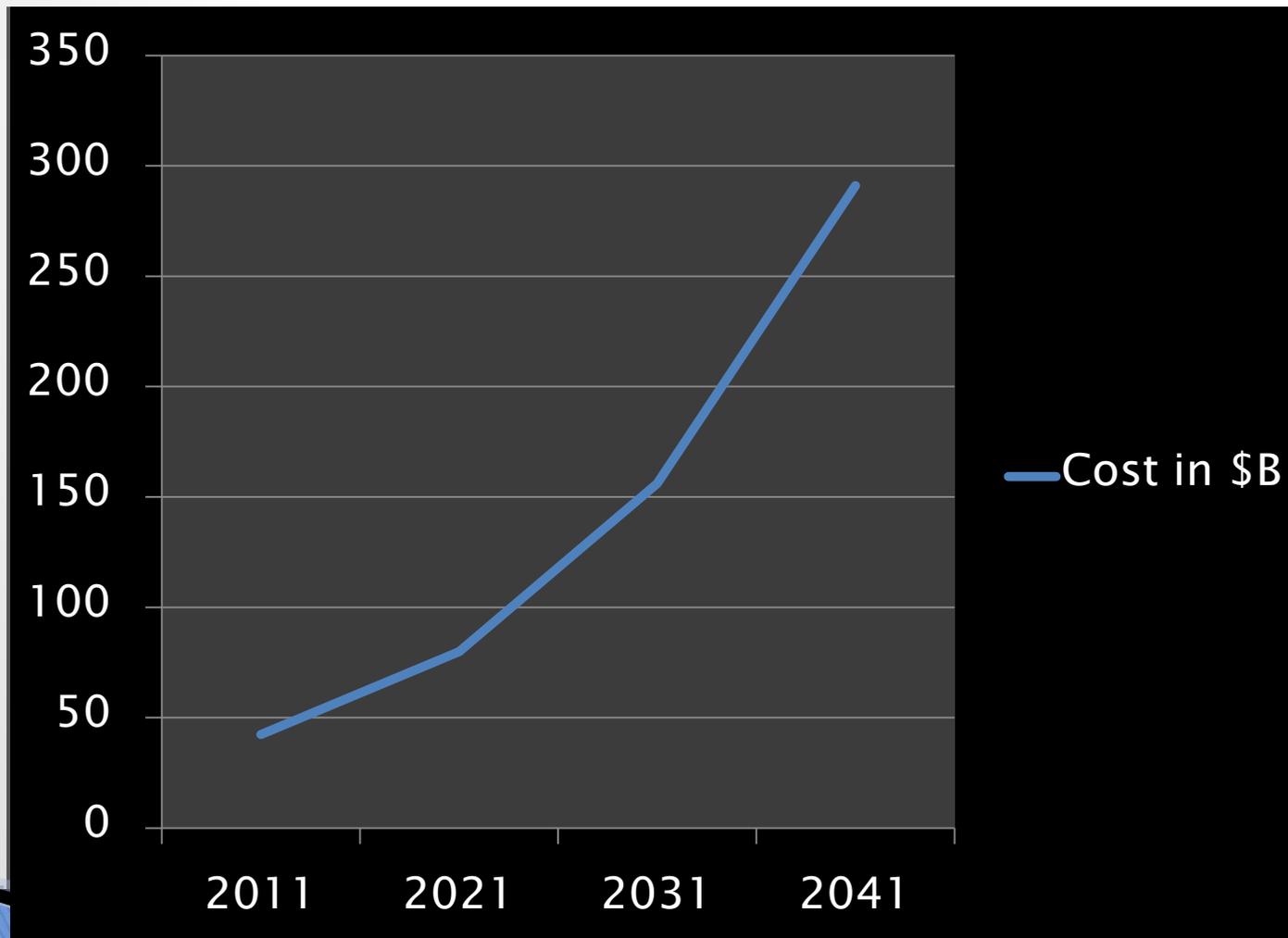
# **Mental Health Commission of Canada – 2013 report: *Making the case for investing in mental Health in Canada***

- ▶ **1 in 5 people in Canada lives with a mental illness each year**

# The broader context

1. Increasing prevalence of mental problems
- 2. There is a danger of (mental) health care bankrupting our society**

# Canadian Cost of Mental Disorders



# The broader context

1. Increasing prevalence of mental problems
2. There is a danger of (mental) health care bankrupting our society
- 3. Our current 'gold standards' are turning out to be less effective than hoped (*addressed by Dr. Rodway*)**

# Then what are we to do?



# History provides some answers.....

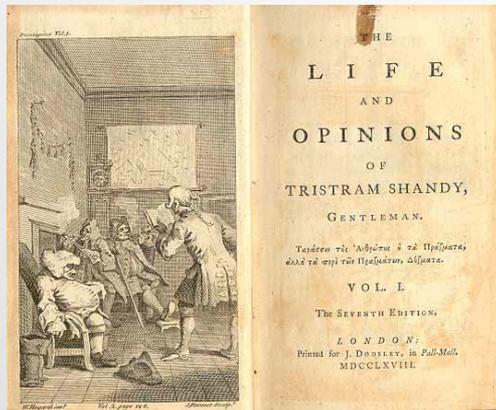


# Early 20<sup>th</sup> century

- ▶ **1910 People's Home Library: source of in-depth practical knowledge for North Americans; 500 pages**
- ▶ **guided families; health care providers not easily accessed; treatments for everything from minor burns up to TB and heart disease**
- ▶ ***The number one cause of acquired insanity was:  
“imperfect nutrition”***

# Importance of a healthy gut: 1759

**“A man’s body and his mind, with the utmost reverence to both I speak it, are exactly like a jerkin, and a jerkin’s lining; - rumple the one, - you rumple the other.”**



Steme L. The Life and Opinions of Tristram Shandy. Philadelphia: The Franklin Library. Franklin Center, 1980 (Book III, Chap. 4)

# What do these characteristics sound like?

- ✓ Depression
- ✓ Hysteria
- ✓ Irritability
- ✓ Self-mutilation
- ✓ Apathy, lethargy
- ✓ Social withdrawal
- ✓ Inability to concentrate

# Minnesota Starvation Experiments

Ancel Keys, 1950

**24 wks of nutrient deprivation in normal healthy students:**

- ✓ Depression
- ✓ Hysteria
- ✓ Irritability
- ✓ Self-mutilation
- ✓ Apathy, lethargy
- ✓ Social withdrawal
- ✓ Inability to concentrate

# Population health data on MH and nutrition



- ▶ **Primarily the study of dietary *patterns*, not nutrient intake**

# Studies from Australia, Spain, and UK

## In a nutshell.....

- ❑ People who eat 'traditional' 'unprocessed' 'Mediterranean' 'prudent' diets have *lower rate of mood and anxiety symptoms*
- ❑ People who eat 'Western' 'processed' diets have *higher rate of mood and anxiety symptoms*



- ❑ 1,046 women, diagnoses of depression/anxiety confirmed with structured interviews, FFQ for dietary patterns
- ❑ “**Traditional**” dietary pattern (vegetables, fruit, meat, fish, and whole grains) associated with lower odds for major depression, dysthymia, anxiety disorders.
- ❑ “**Western**” diet (processed or fried foods, refined grains, sugary products, and beer) associated with a higher mental health symptom scores.

Jacka et al, *Am J Psychiatry*, 2010

# Children (N=3040), ages 11-18, followed over 2 school years

- ❑ Overall diet score measured 'healthiness' of dietary pattern
- ❑ Mental health measured with Pediatric Quality of Life Inventory
- ❑ Result: change in diet quality was associated with *change in mental health*.

# Is nutrient intake as opposed to dietary pattern associated with mental health?

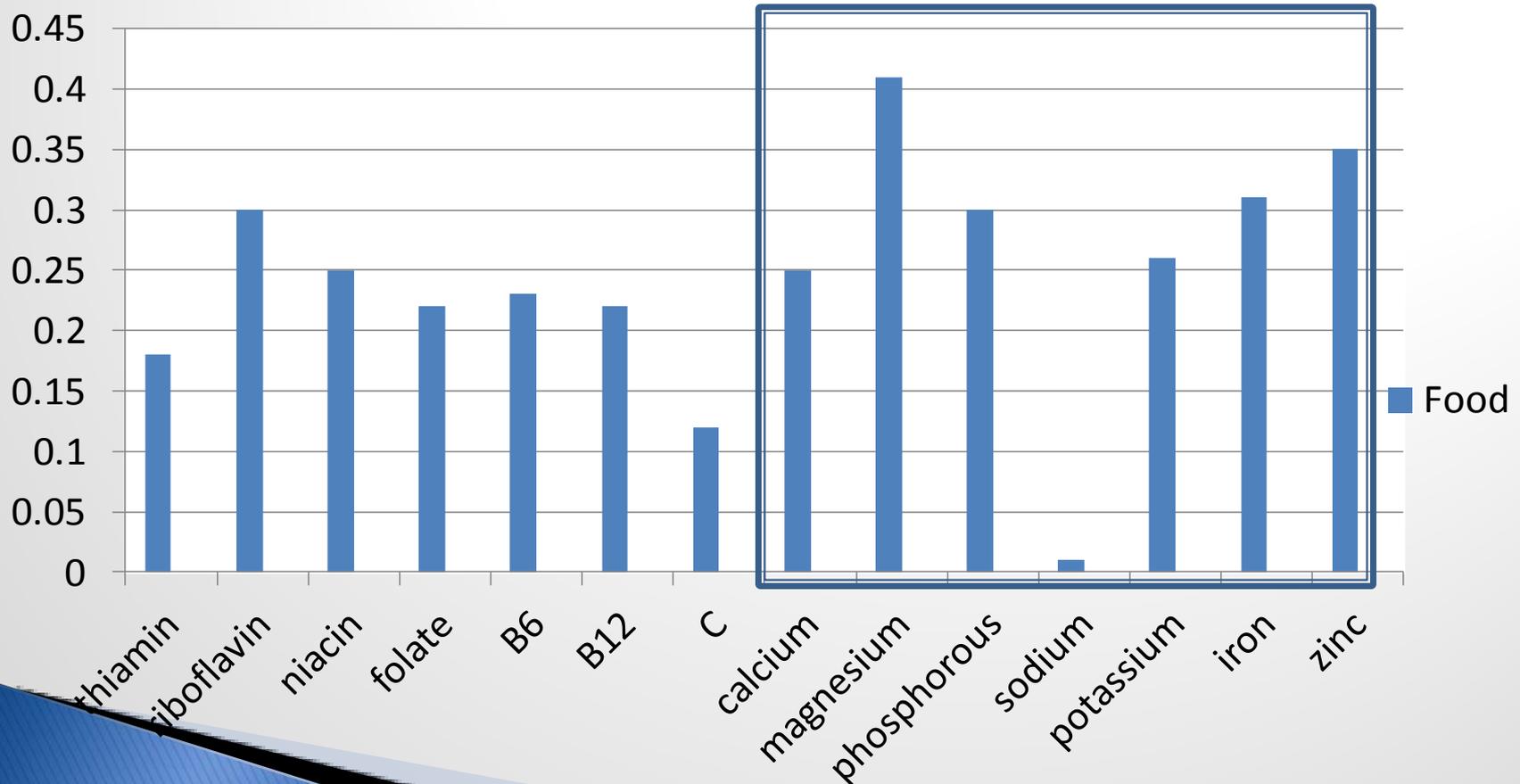
In people already diagnosed with a mood disorder

- ❑ 97 community-living adults, diagnoses confirmed with structured interviews
- ❑ 3-day food records
- ❑ Obviously, only mildly and moderately symptomatic people volunteer

Davison & Kaplan, “Nutrient intakes are correlated with overall psychiatric functioning in adults with mood disorders,” *Cdn J Psychiatry*, 2012.

# Correlations with Global Assessment of Functioning

(all correlations sig except sodium,  $p < .05$ )



# What's good about 'Mediterranean, prudent' diets?

## More vitamins and minerals

(Associated with *lower* inflammatory cytokines)

Chrysohoou et al (the ATTICA study in healthy adults),  
*J Am Coll Cardiol*, 2004.

# What's wrong with 'western, processed' diets?

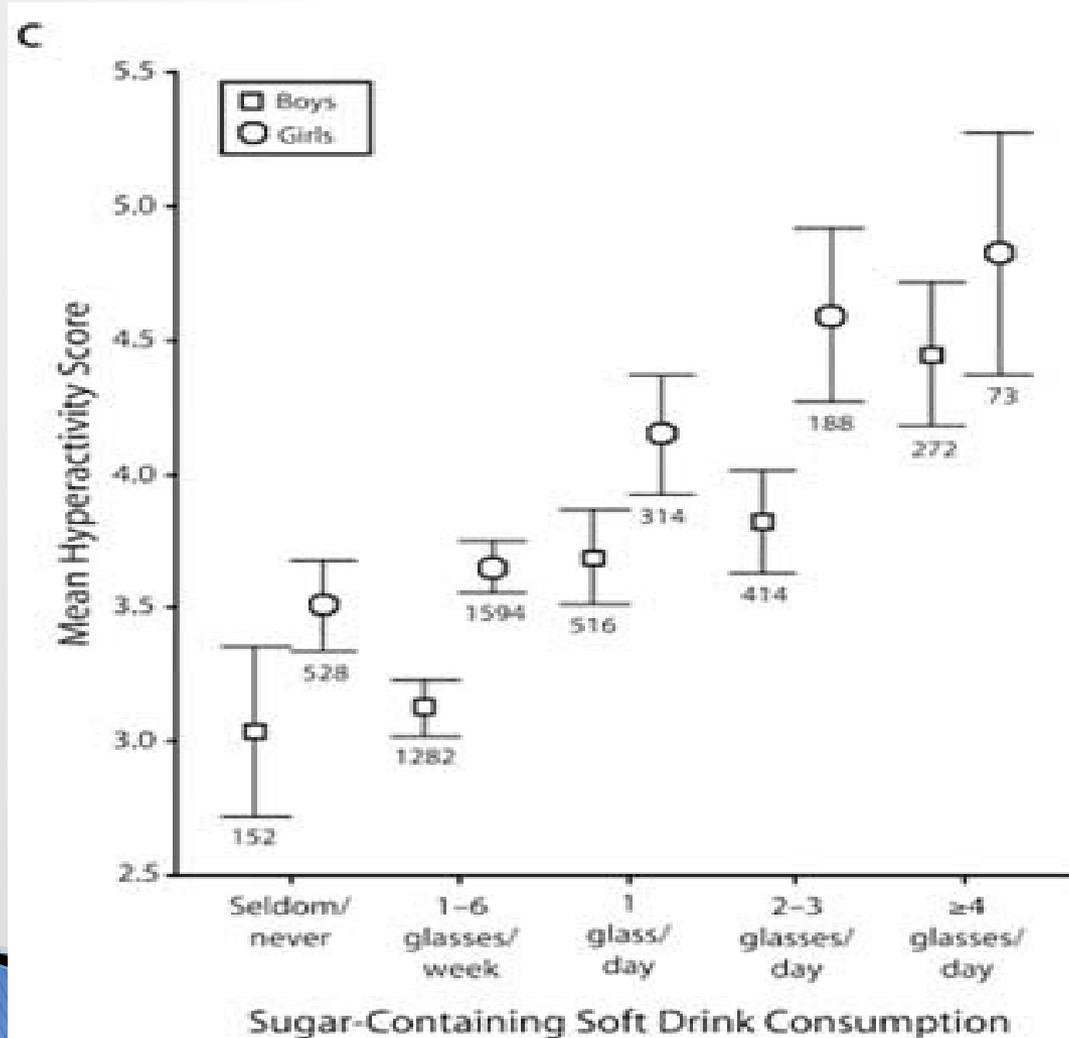
## Fewer vitamins and minerals

(Western diets are associated with *higher* levels of inflammatory markers such as C-reactive protein)

Liu et al., *Am J Clin Nutr*, 2002

*6 wks on 'prudent diet' does decrease CRP  
(e.g., Watzl, Am J Clin Nutr, 2005)*

# High consumption levels of sugar-containing soft drinks were associated with mental health problems among adolescents



Lien et al, Am J Public Health. 2006 96:1815-20.

# Fast food and commercial baked goods increase the risk of depression, irritability, anxiety

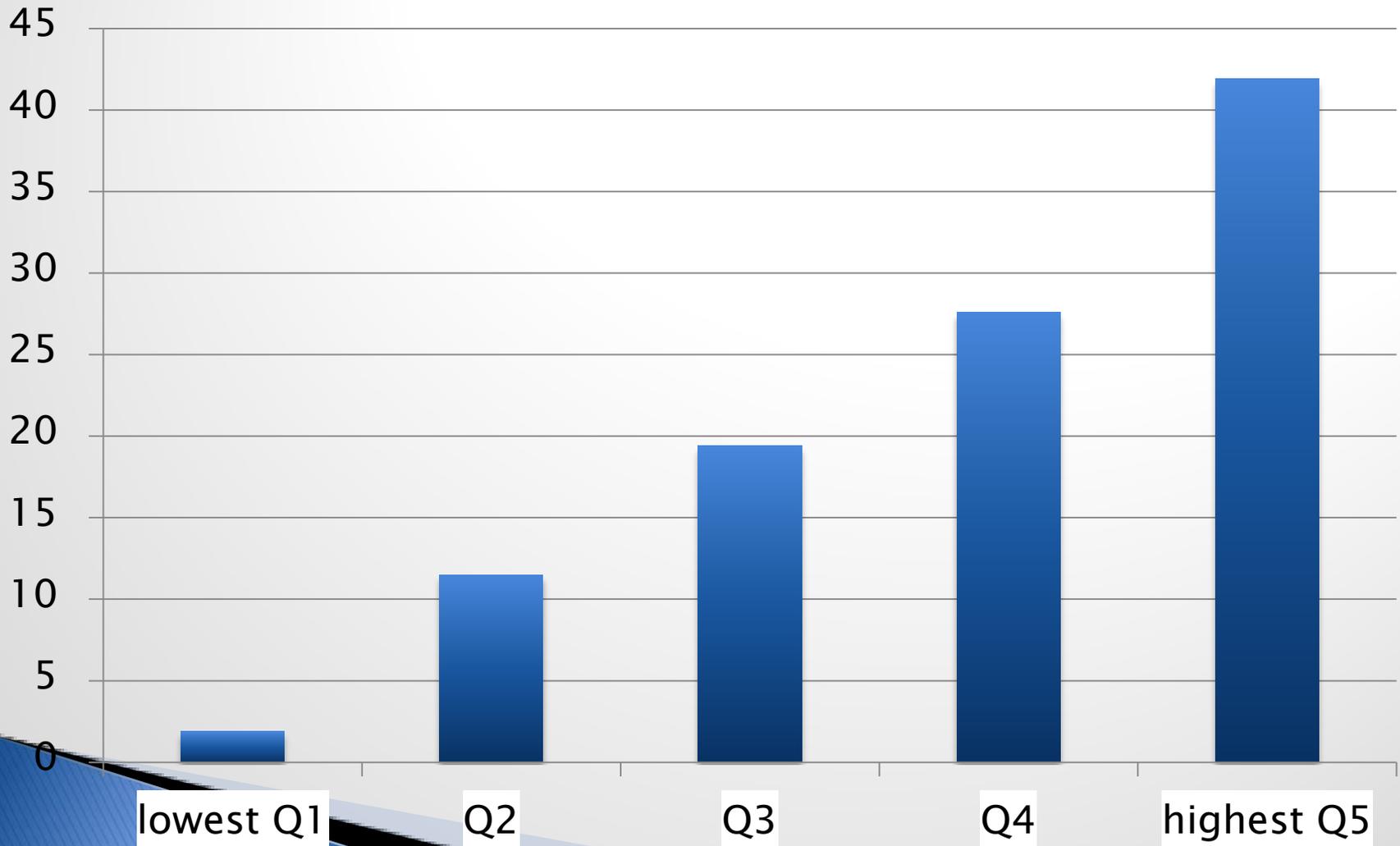
Sequimiento Universidad de Navarra (SUN) Project in Spain, >16,000 former students and professors from Univ of Navarra, begun in 1999.

- Semi-quantitative FFQ

Sanchez-Villegas et al., *Public Health and Nutrition*, 2012, 15(3):424-32.

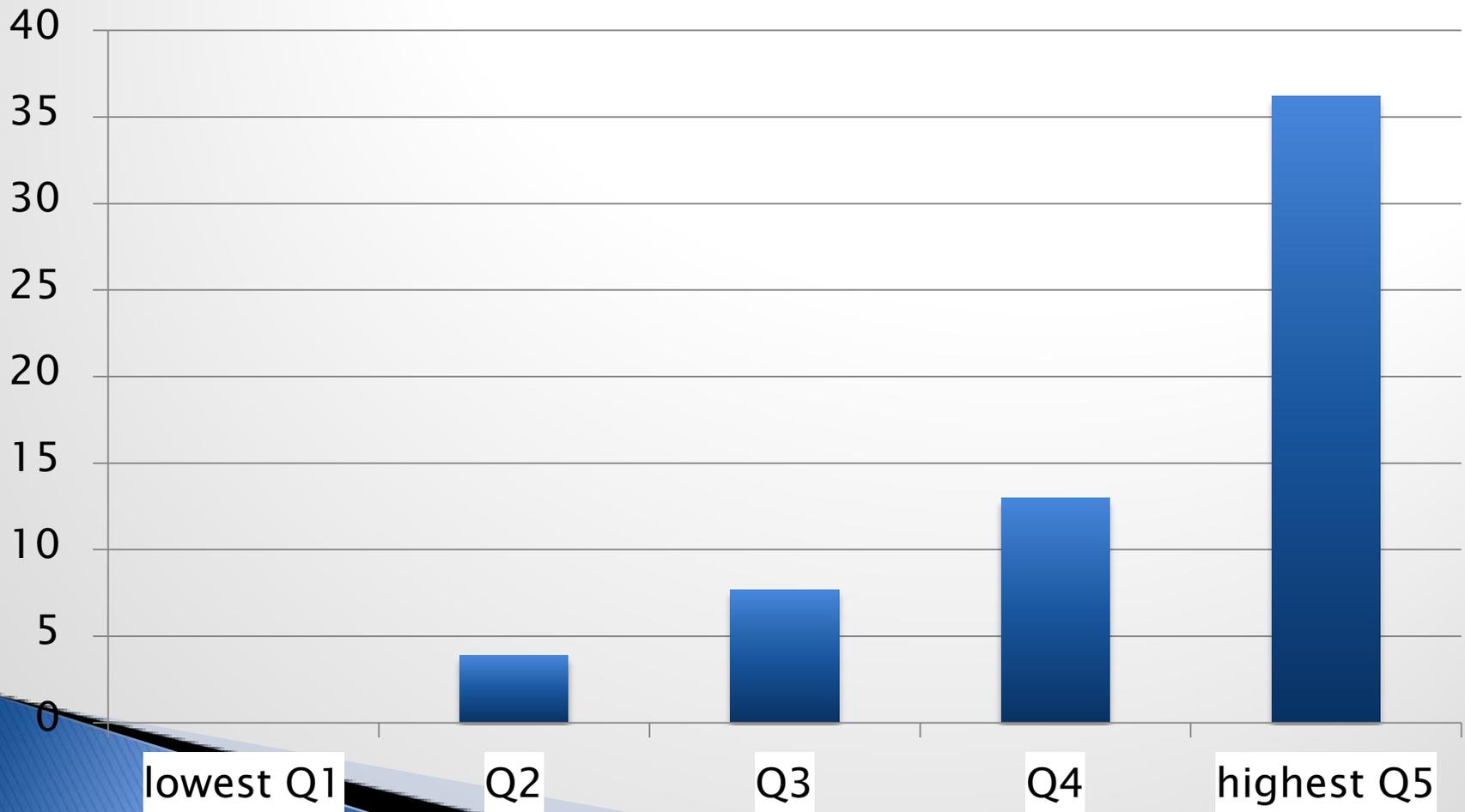
# Risk of Depression within 6.2 years in ~9,000 people

Based on fast food (hamburgers, pizza)



# Risk of Depression within 6.2 years in ~9,000 people

Based on processed pastries (muffins,  
doughnuts)



**The obvious solution?**

**Tell  
everyone to  
eat better**

*“It is easier to change a man's religion than to change his diet.”*

**Margaret Mead**

**And there are other worries.....**

# Eating better is a good thing.... **BUT**

- ▶ **Nutrient content of food has decreased**
- ▶ **Rapidly growing crops may be nutrient-poor**
- ▶ **Glyphosate exposure, and plants bred to be resistant to glyphosate: result in poor capture of minerals from the soil, and nutrient-poor crops**



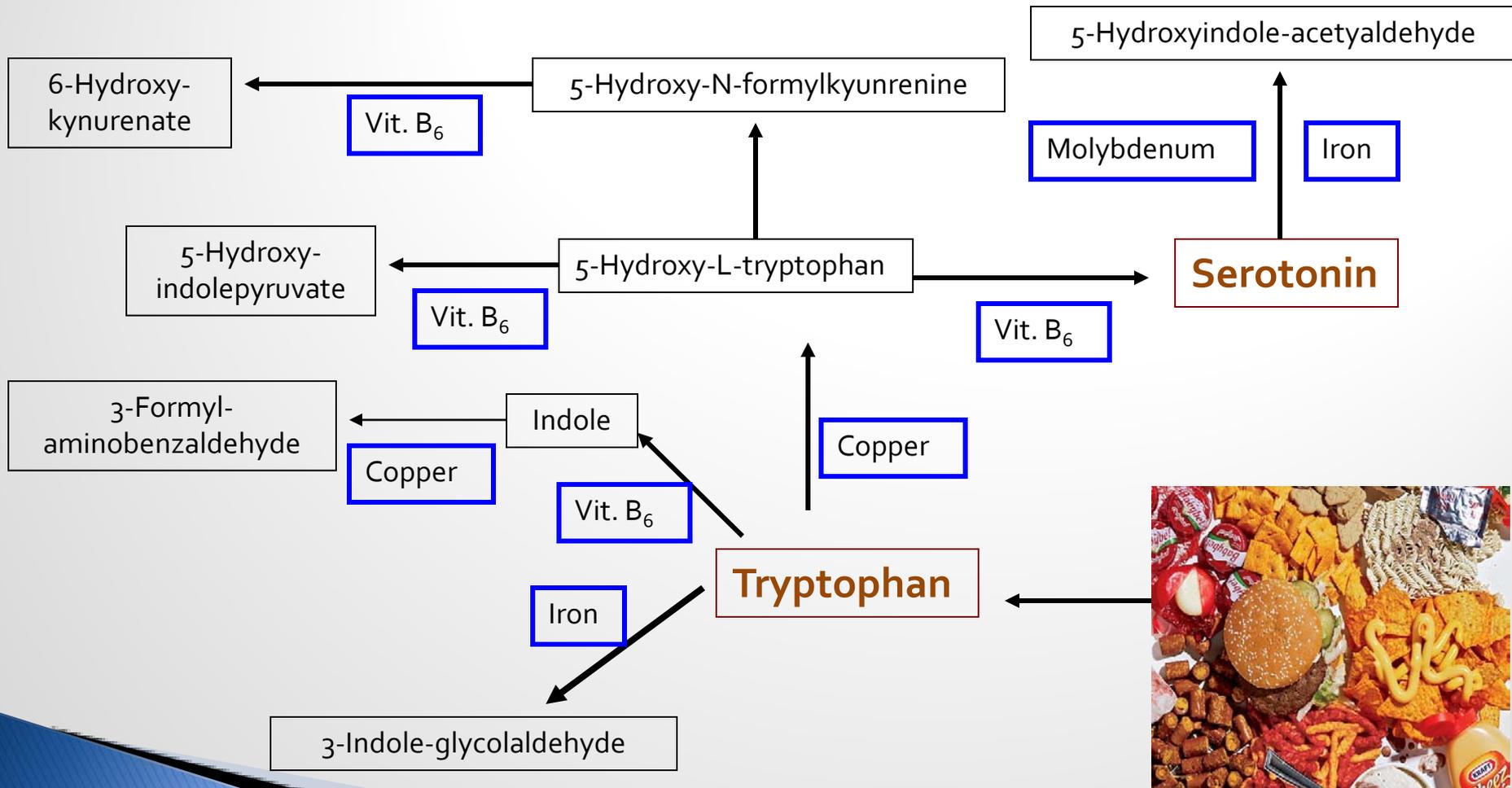
# Is glyphosate a big deal?

▶ **Glyphosate = Roundup**

# My final topic: mechanisms

- ▶ Efficiency of neurotransmitter synthesis and function
- ▶ Poor intestinal health leads to inflammation
- ▶ Mitochondria function

# One small portion of serotonin pathways



# Makes no sense to look for a 1-2 nutrients to be magic bullets

- ▶ Nutrients work most effectively together
- ▶ So supplementing with only ONE doesn't *usually* make physiological sense...

**“So depression is an inflammatory disease, but where does the inflammation come from?”** Berk et al., *BMC Medicine*, 2013



**Based on the really extensive data now linking depression with *inflammatory response*, especially well-documented for TNF-alpha and IL-6**

- ❑ **Relevant beyond depression to the ‘common mental disorders’**

# Where *does* the inflammation come from?

- ❑ **Stress and trauma**
- ❑ **Suboptimal diet (cf nutritional epidemiology studies)**
- ❑ **Sedentary behaviour (stand up!)**
- ❑ **Obesity ('an inflammatory state')**
- ❑ **Gut health!!!**
- ❑ **Etc.**

# **‘My son’s behaviour is in his intestines’**

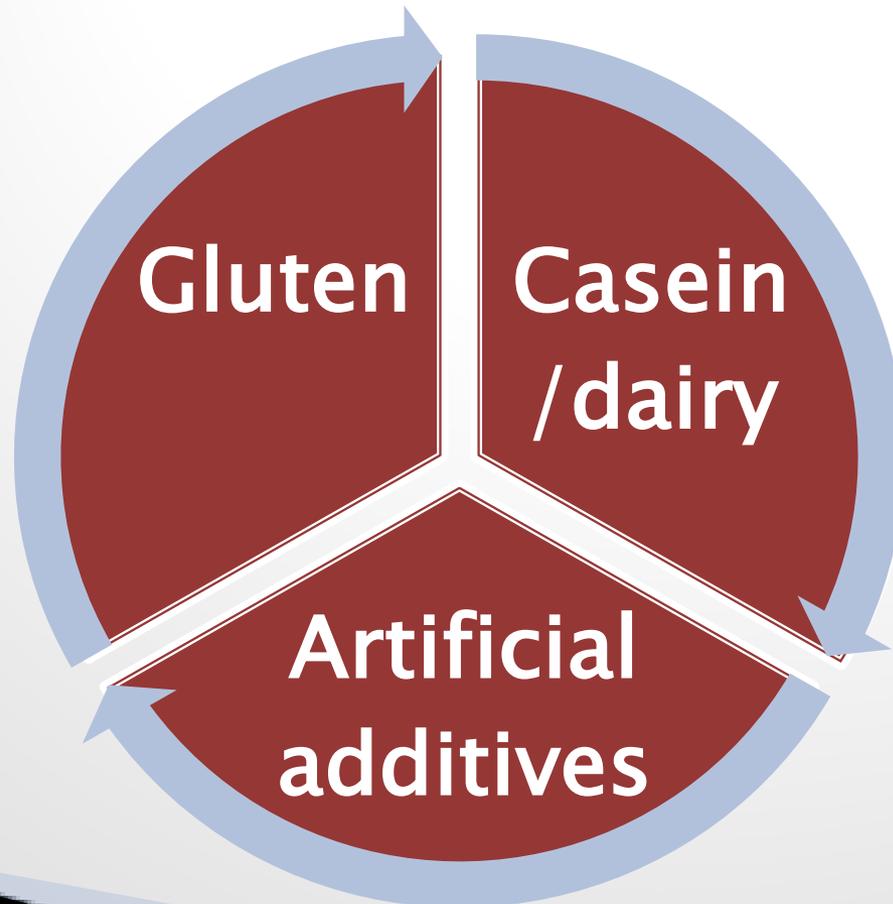
- ▶ **Derrick MacFabe, Univ Western Ont**
  - **Gut Inflammation research ---impaired propionic acid metab (short chain FA) released and affects brain, mitochondria function, and causes *reversible* autistic behaviour in lab animals**
- ▶ **Several studies now show dysbiosis (microbial imbalance) in the gut, especially in subsets of people on the autism spectrum.**
- ▶ **Basis of GFCF diet, GAPS diet, eating fermented foods, etc.**

**If you doubt the importance of  
intestinal health.....**

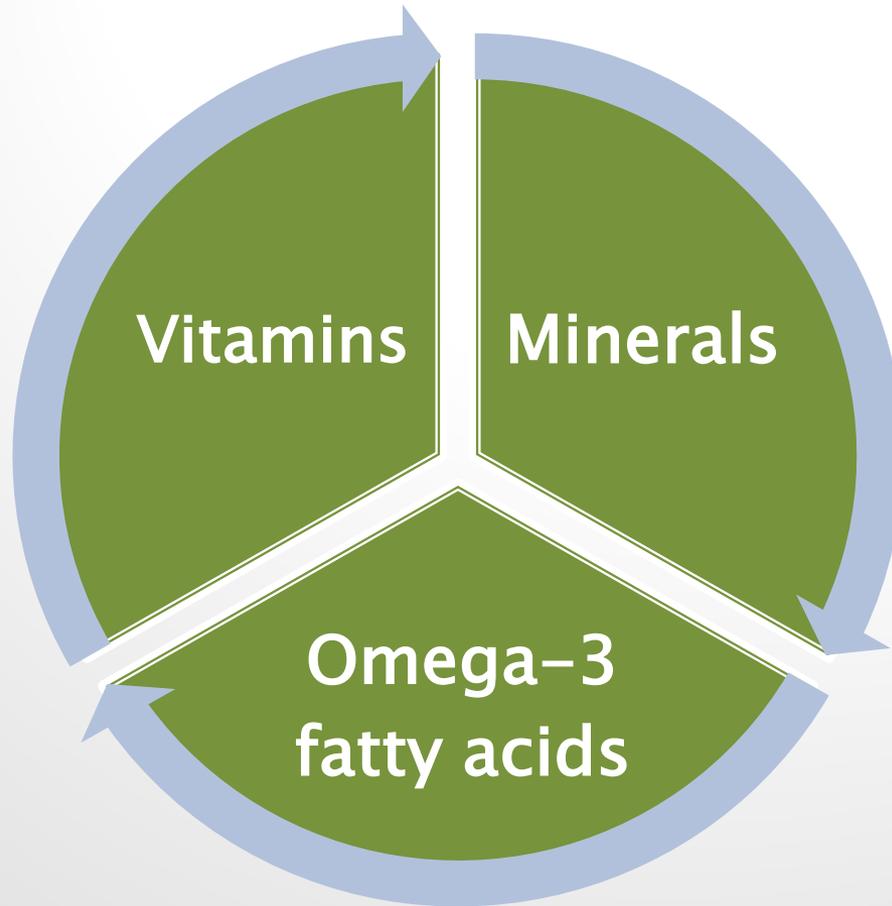
- ▶ **Remember, you are only 10% human**

# Nutrition: there are 2 sides to this coin

What we eat that maybe  
we should *not* eat



# What are we NOT eating enough of



# **Autism community --- the real vanguards, demanding that scientists figure out how digestion of food affects the brain**

- ▶ **GFCF diets, artificial food ingredients, the gut-brain connection etc.**
- ▶ **Inflammatory biomarkers in autism, importance of mitochondrial function *and a healthy digestive system***
- ▶ **This is not a specifically autism-focused symposium, but there will be some interesting research on *ASD (presented by Dr. Rucklidge)***

# What does our body do to combat inflammation, oxidative stress?

## Mitochondria Inner Structure

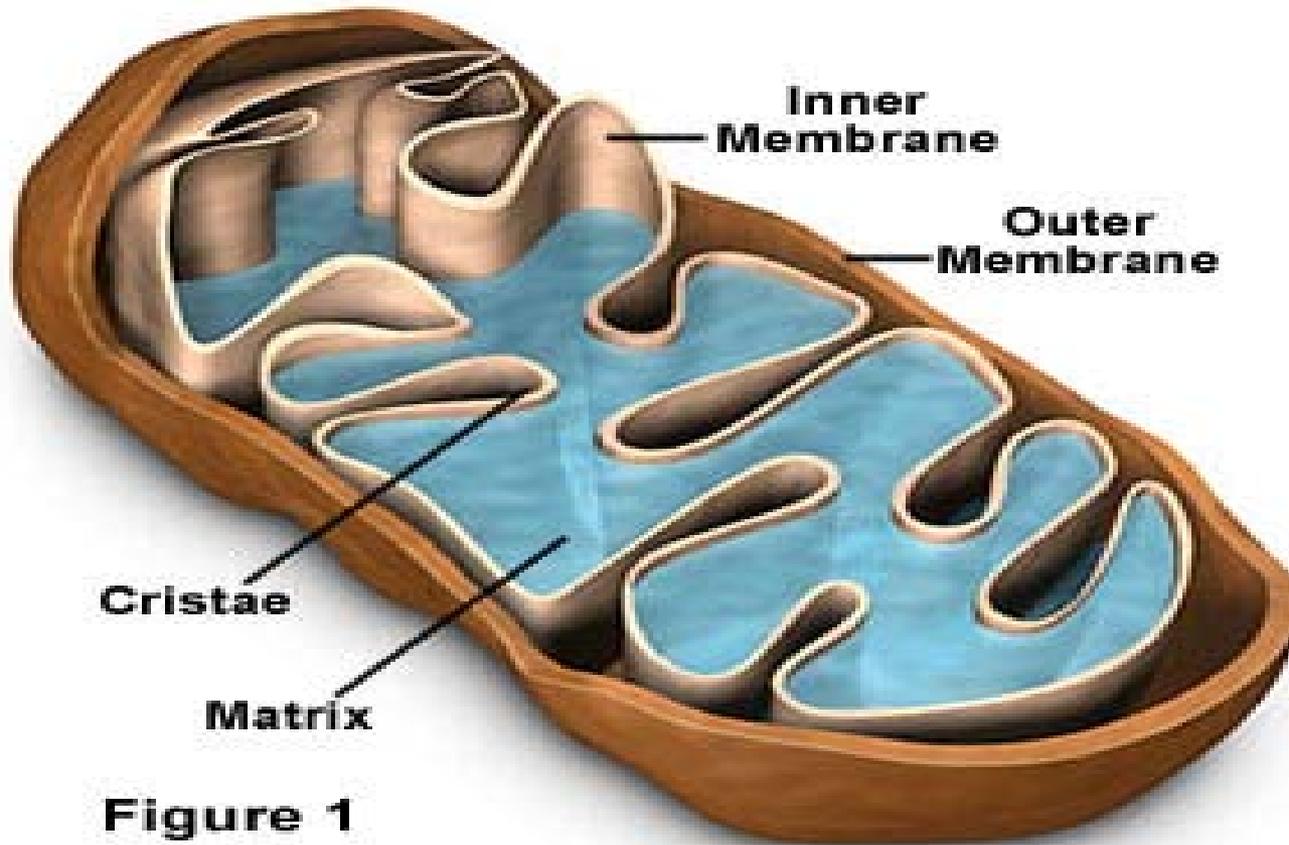


Figure 1

# Mitochondria: What *are* they?

- ▶ Mitochondria are organelles in every cell, with their own DNA (maternal)
- ▶ Our **natural defense against inflammation**



# What do they *do*?

- ▶ The 'powerhouse' of every cell, for their ability to **form energy** in the form of adenosine triphosphate (**ATP**)

**ALL mito function is  
dependent on nutrients....**

**Possibly ALL nutrients**

# Mitochondrial Dysfunction and Mental Health?

- ▶ Growing evidence from molecular research that some individuals **with mental illness have mitochondrial dysfunction** (Konradi et al., 2004; Iwamoto et al., 2005)
- ▶ *A very hot topic in the autism world*

# The new model of mental disorders

Nutritional Psychiatry

Inflammation

Oxidative stress

Mitochondrial function



All roads point to the importance of various **nutrients** for brain and mental function

*In conclusion:*  
*We are what we eat.....*  
*And are able to absorb*

**(How could it be otherwise?)**

**Especially important for our  
brain.....**

**only ~2% of our  
weight**



**account for  
20-50%  
of our metabolic  
demands**

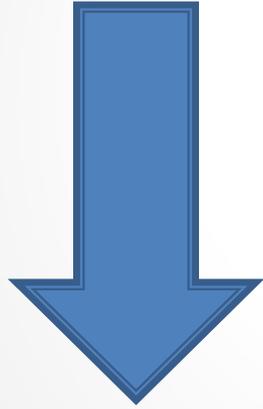
# Blood carries nutrients to brain

- ▶ **Adult body has ~6 liters of blood**
- ▶ **~1 liter passes through the brain every minute**
- ▶ **WHY??**

**Mostly, the blood's job is to carry **oxygen** and **nutrients** to the brain**

**What's in *your*  
brain's 'bathwater'?**

# It is our choice....



# ?

