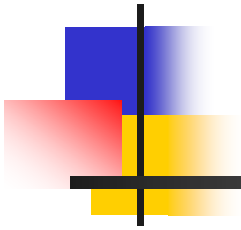
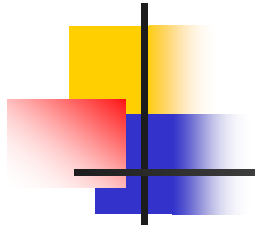


# MTHFR and Autism



Help from the  
Human Genome project.

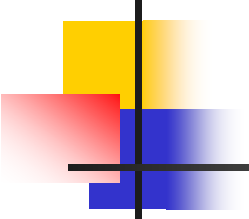
Neil Rawlins, MD



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# **What is Autism, Autism Spectrum disorder, Asperger's, etc ?**

# Autism

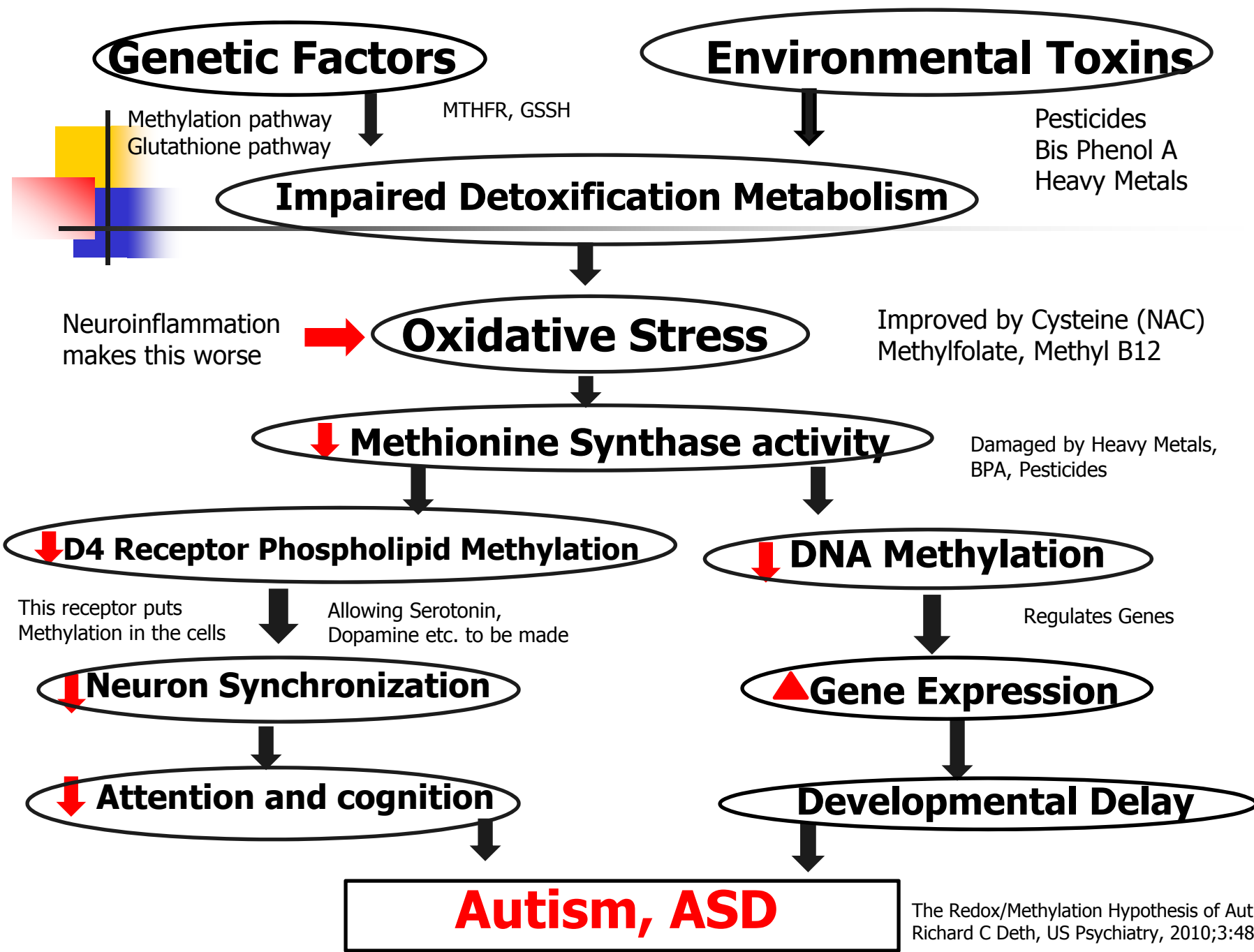
- 
- 
- Not a single disease
  - No definitive test available
  - Many treatments
  - Some treatments work for one person but not for others
  - Nutritional supplementation have worked well for many with Autism



# AUTISM and current models for disease

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- Two hit model, Genetic Predisposition and environmental toxins
  - American Journal of Biochemistry and Biotechnology, 2008
- Many Gene defects have been associated with Autism including MTHFR
- Many of these gene defects function in the Detox pathway



The Redox/Methylation Hypothesis of Autism  
 Richard C Deth, US Psychiatry, 2010;3:48-52

# Some Genes associated with Autism



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- MTHFR
- Transcobalamin II
- COMT
- GST-M1
- PON1
- GLOX
- GSH
- SLC40A1
- MTF1
- ALAD
- CPOX
- SNN
- GSSG
- GST



# Autism

## Associated Toxins

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- Bis-Phenol A
- Mercury
- Lead
- Highway exhaust
- Pesticides PCB's
- Arsenic/Cadmium
- Fluoride
- Dry Cleaning PERC
- Flame Retardants
- Paint thinner
- Radiation
- Soy Formula
- Mold
- Etc....



# Nutritional Things to Avoid

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- Food dyes
- Artificial colors
- High Fructose Corn Syrup
- Artificial Flavorings
- Artificial Preservatives
- Artificial Sweeteners





# Treatments for Autism Spectrum Disorders

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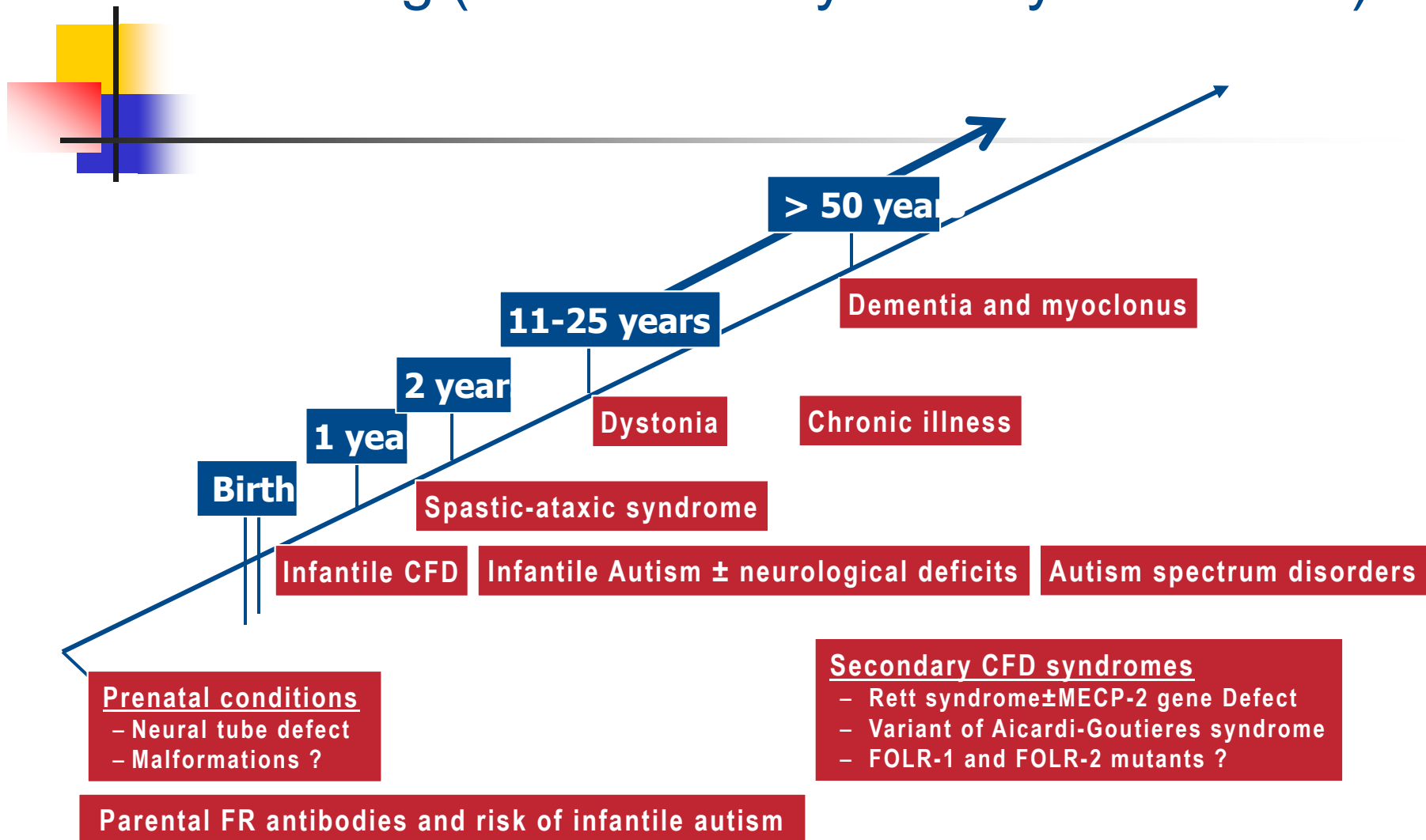
Not covered in Talk

- Healthy Diet
- Food sensitivities
- GFCF Diet
- Gut Treatments
- Thyroid
- Immune regulation
- Hyperbaric Oxygen

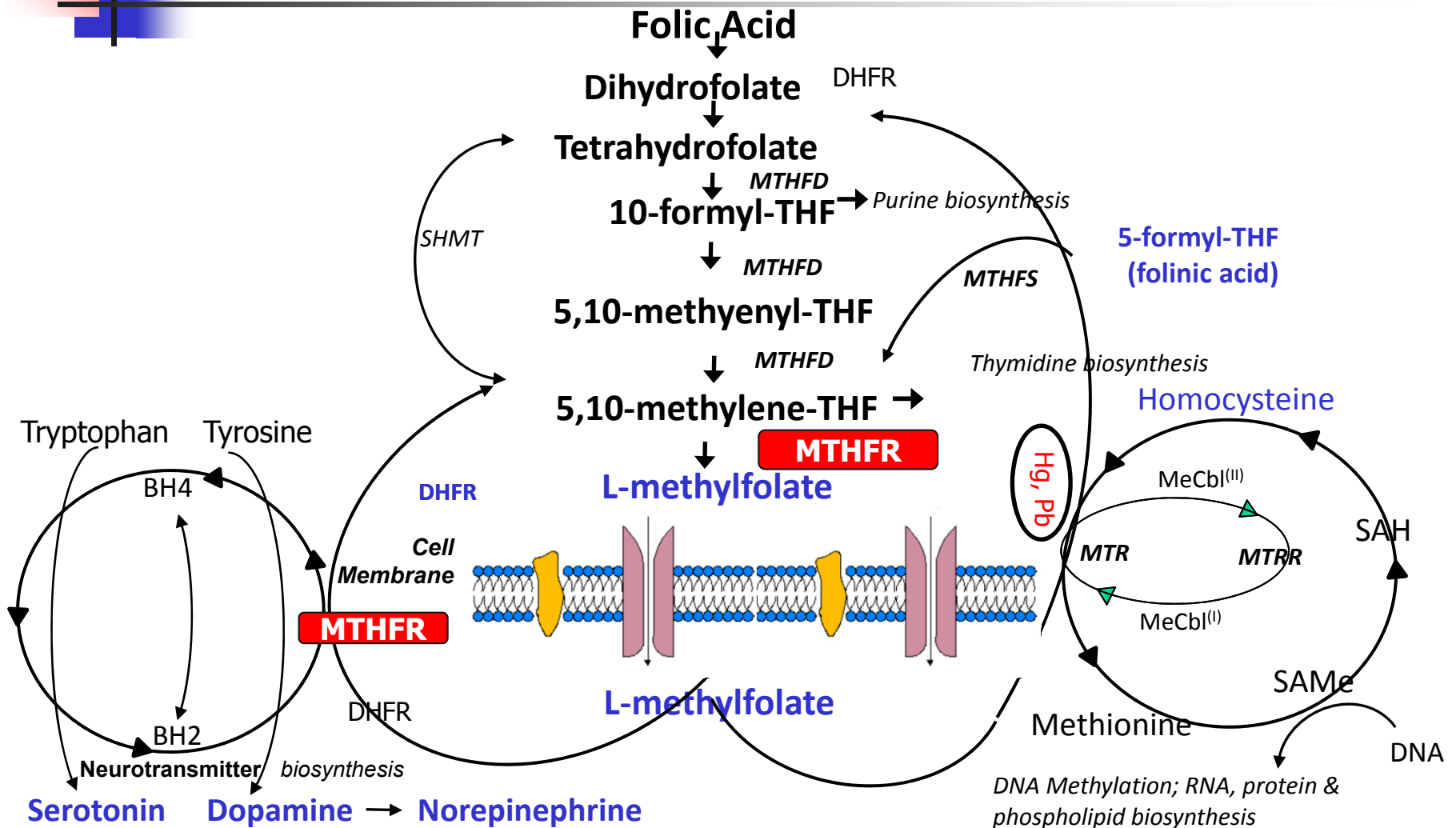
Covered in talk

- Vitamin/Mineral
- High dose B6/Mg
- Essential Fatty acid
- Amino Acids
- Chelation
- Methylation
- Sulfation
- Microbiome

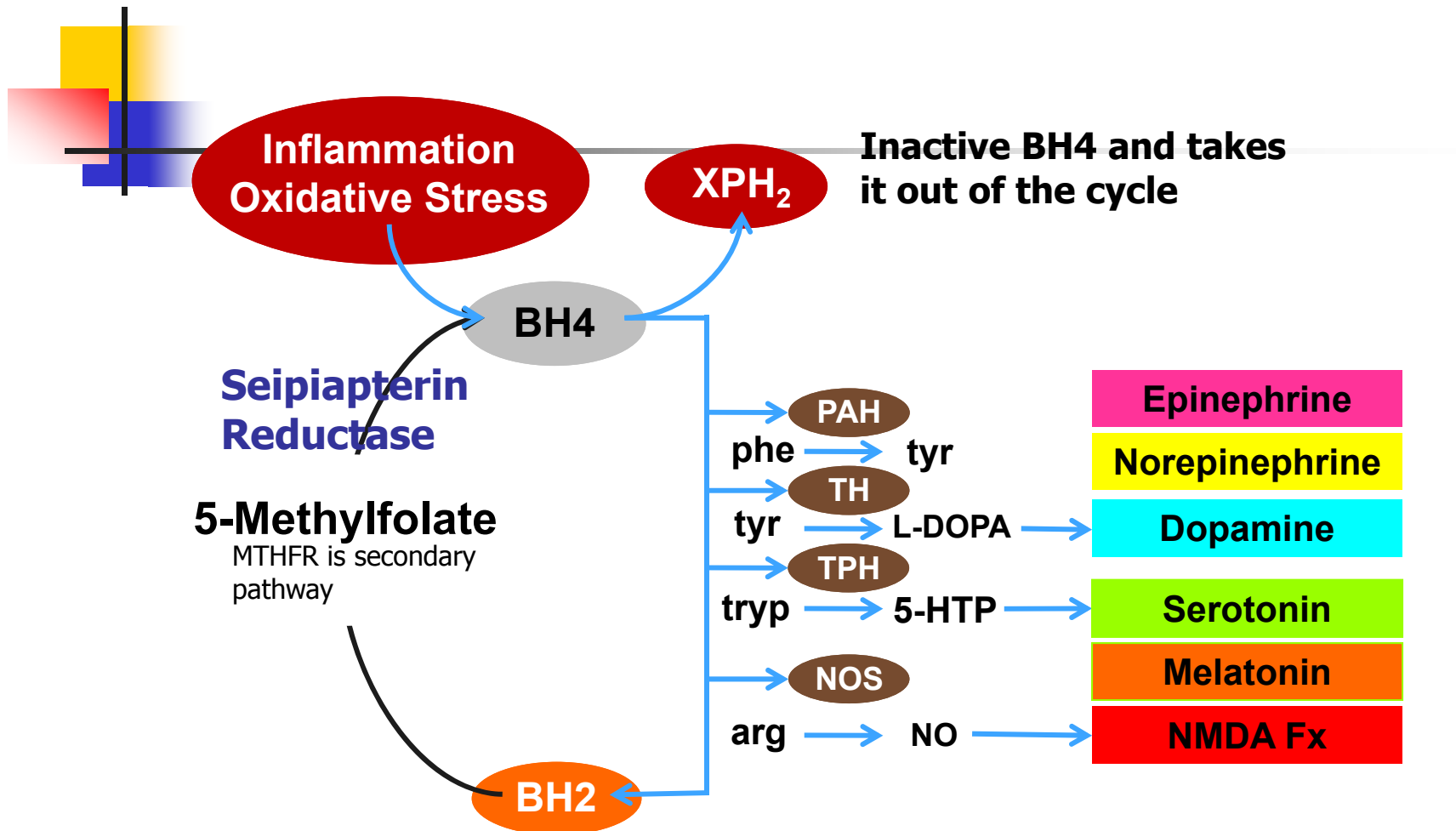
# Onset Cerebral MethylFolate Deficiency (CFD) Is Devastating (But Potentially Entirely Reversible)



# Genetic Variants of Folate Metabolism



# L-methyfolate—Is Critical in Monoamine Synthesis





# MTHFR and Autism Link Folate Study

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- Women not taking prenatal vitamins immediately before and during a pregnancy were **2X** as likely to have a child with autism,
- If the women didn't take folate and also had MTHFR deficiency, they were **7X** as likely to have a child with Autism

- Epidemiology: July 2011 - Volume 22 - Issue 4 - pp 476-485



# Autism and MTHFR subtypes

Example of how multiple defects makes things worse

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■ Subtype	Autism Rate
■ 677CT	50% increase
■ 677TT	300% increase
■ 1298CC	Increased
■ 677CT/1298AC	811%

Studies on Psychiatric Disorders, Oxidative Stress in Applied Basic Research and Clinical Practice  
A. Dietrich-Muszalska et al. Springer Science + Business Media NewYork 2015 pp 417-433  
(Genetic Polymorphism Related to Oxidative Stress in Autism, Hee Jeong You)



# Autism and environment

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- Living within 1000' of freeway had a 4 times higher incidence of Autism compared to those living further away
- Environ Health Perspect. Mar 2013;121(3) 380-386
- JAMA Psychiatry 2013;70(1):71-77

# Methylfolate and Environment



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- Heavy metals build up without MTHF
- Medications such as Glucophage, Birth control pills decrease MTHF utilization
- Other gene defects compound the problem
- BPA, Heavy Metals and other organic toxins build up because of lack of Glutathione





# Heavy Metal Symptoms

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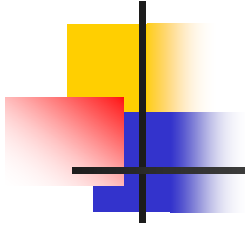
- Social Deficits, Withdrawal
- OCD, Depression, Bipolar, Suicide
- Schizophrenia, Aggression, tantrums
- Chronic Fatigue, Fibromyalgia
- Poor concentration, Memory
- Hearing loss, seizure, Stroke
- Peripheral neuropathy, Paresthesia
- Autism, ASD, Etc.....



# Conditions that treating methylation has helped

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- Fibromyalgia
- Chronic Fatigue
- Irritable Bowel
- Migraines
- Bipolar, Schizophrenia
- Autism, Autism spectrum disorders
- Prevention of Birth Defects



Where do we go  
from Here?



# General Recommendations

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1. Decrease exposure to toxins
  - Water filters, locally grown foods
2. Improve the body's Metabolism
  - Improve diet, supplements
3. Clear heavy metals if symptomatic
  - Urine challenge test
  - Check Multiple Heavy Metals



# President's Cancer Panel Recommendations 2009

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- Remove shoes when entering home
- Filter water, Stainless steel, Glass, BPA free
- Avoid Drinking from bottled water
- Microwave in glass or ceramic
- Use non-toxic cleaners
- Wash Fruits and vegetables
- Avoid pesticides
  - President's Cancer Panel annual report 2009.
    - Reducing environmental cancer risk, What we can do now
  - [www.ourstolenfuture.org/basics/chemlist.htm](http://www.ourstolenfuture.org/basics/chemlist.htm)



# Non supplement Measures that improve symptoms

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- Dietary: More vegetables, berries, fruits
  - Better if grown locally, organic
- Mathematics, Accounting
  - Engineers, creative people
- Piano, Classical music
- Exercise
- Band (not rock band) participation (structured music)



# Improve metabolism

## General guidelines

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- Only add one supplement at a time
- Drink/Cook with filtered Water
- If mod/severe symptoms consider Heavy Metal testing (Urine is more accurate)
- Supplements will be discussed in order of importance.
- For doses use [autism.com](http://autism.com)



# Autism Treatment Reference

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- Review of treatments
- Summary of Dietary, Nutritional and Medical treatments
- Survey of treatment effectiveness by parents/caregivers
- Best reference for pediatric doses





# Methylfolate Options

(Older form was Folinic acid)

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- Metafolin from Merck (Best Studied)
  - Deplin, 7.5 or 15 mg
  - Solgar Metafolin 400mcg, 800 mcg
- Extrafolate, Extrafolate-S, Quatrefolate
  - Thorne, Methyl-life, etc

Data is for Folic Acid

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
5%	50%	44%	10:1	2505



# Methyl B 12 (Methylcobalamin)

- Oral Dissolving tablets
  - Jarrow Brand has best results
- Oral drops available(Malley's Pharmacy)
- Compounded Shots are the best studied but harder to do
  - Local Pharmacies are Malley's and Moses Lake. National Pharmacy Hopewell.

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
6%	22%	72%	12:1	899

# Pyridoxyl 5 Phosphate Vit B6 (P5P)

- Best studied of any nutritional supplement.
- Used in conjunction with Magnesium
- Only B vitamin that has been associated with toxicity in a small percentage.
- Stop for numbness/significant headache

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
13%/4%	37%/46%	51%/49%	4:1/11:1	213/7256

First numbers are for P5P alone. Second are for P5P and Magnesium

# N-Acetyl Cysteine

- Shows improvement in behavior in randomize trial
- Critical component in Glutathione production
- Use to treat obsessions, skin picking, bipolar, schizophrenia and addictions

[Biol Psychiatry](#). 2012 Jun 1;71(11):956-61, J Psychiatry Neurosci 2011;36(2)

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
No Data				

Newer supplement, Added to help glutathione



# Tetrahydrobiopterin

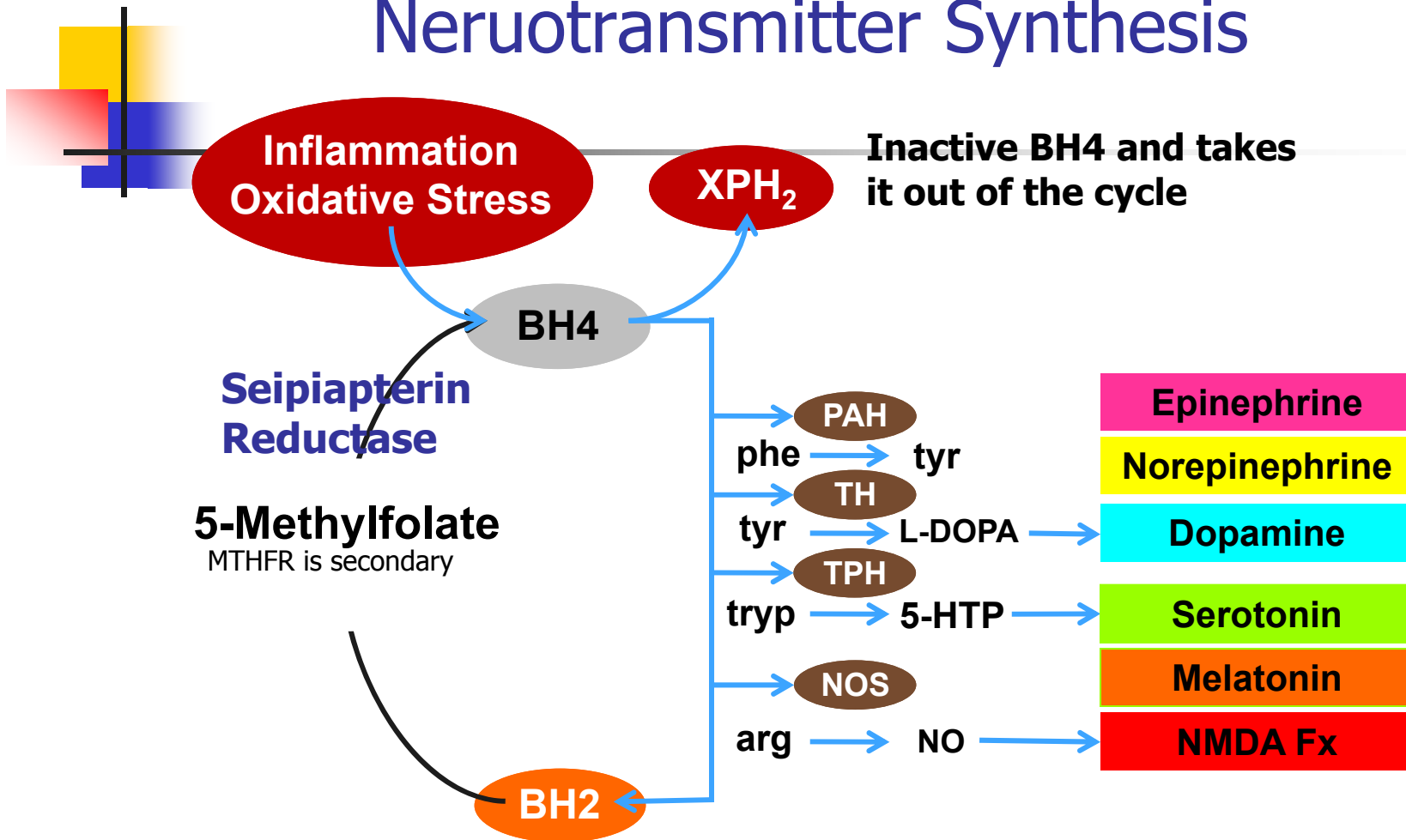
## Intermediary for neurotransmitters

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- **BH4 (Tetrahydrobiopterin)**
  - Used for ADD/ADHD
  - Difficult to treat Depression
  - Improves behavior problems
  - Compounded version at Malley's Pharmacy
    - Two compounded doses 0.5mg, 0.025mg
  - Homeopathic version was available at Nutrimedical

Worse	No change	Better	Better/worse	Reports
No data				

# L-methyfolate/ BH4—Is Critical in Neurotransmitter Synthesis

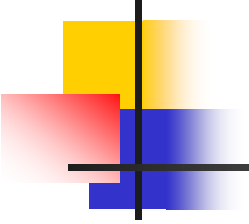


# Sulfation

- **Epsom Salt bath** Soak feet or body with 1-2 cup of salts 2/3 times/week
  - – The magnesium absorbs directly. It helps with improving the mineral balance. It also adds the sulfate that is critical in clearing toxins.
  - Molybdenum 50mcg improved results

Worse	No change	Better	Better/worse	Reports
6%	65%	29%	4.6:1	301

# Vitamin C

- 
- **Vitamin C** 1,000 mg, 1-3 times a day
    - Regenerates Glutathione
    - Helps regulate bowel movements
    - Powerful antioxidant

Worse	No change	Better	Better/worse	Reports
2%	52%	46%	20:1	3077



# TMG or DMG

- Critical in Protein building
- TMG can sometimes interfere with B12 absorption
- Important in step to clear homocysteine

Worse	No change	Better	Better/worse	Reports
TMG 14%	43%	43%	2.6:1	1132
<b>DMG 8%</b>	<b>50%</b>	<b>42%</b>	<b>5.3:1</b>	<b>6363</b>

# Essential Fatty Acids

- **Omega 3 (Flax seed or Fish oil that has mercury removed)** 1-2 tablets per day. Helpful with Brain/Nerve Healing (Chia or Flax seeds)
  - *Some of the fish oil tablets don't have the mercury removed.*
  - Important in brain development

Worse	No change	Better	Better/worse	Reports
2%	39%	59%	31:1	1680

# Glutathione

## Sustained release will absorb

- Glutathione SR by Thorne. Twice a day
  - Can be given orally in sustained release
  - May precipitate increased symptoms if removes toxins
  - Usually start with pulse therapy. (3days on and 4-11 days off)
  - Most glutathione is destroyed by the stomach. Glutathione SR by Thorne has good absorption

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
No Data				

# Zinc

**Zinc** 20-40 mg/ day

- Especially important in eye sensitivity
- Critical to replace when chelating
- Seems to help with COMT genetic deficiency

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
2%	44%	54%	24:1	2738

# Vitamin D

- Essential for development
- Very Low levels are common in Autism
- Usually supplement at 1000-2000 IU D3

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
No Data				

# Mineral supplement

- Helps replace trace minerals
  - Molybdenum, Manganese, Selenium etc
- Essential to take after chelating.

<b>Worse</b>	<b>No change</b>	<b>Better</b>	<b>Better/worse</b>	<b>Reports</b>
No Data				



# Microbiome treatment for Autism

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- Gut Bacteria in children with autism is different than normal controls
- Treating with Probiotics has shown improvement in autistic symptoms
- Microbiota transplant is now being studied but is showing promise



# Summary

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- Supplements are a trial and error
- Most are water soluble (Low Risk)
- For Children's doses check [Autism.com](http://Autism.com)
- Need for removal of toxins depends on symptoms
- Future: tests for genetic and environmental factors are coming but limited benefit today





MTHFR

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Questions?

