

# GFCF and the Immune System

The role of gluten, casein, and  
impaired immunity in ASD

# Gluten—Definition

Gluten is a protein found in many cereal grains, particularly wheat, rye, and barley. It is used extensively in baking because it makes dough sticky (glue like protein) and traps the carbon dioxide bubbles from yeast fermentation that allows dough to rise. It also is pleasing to the palate.

# Casein—Definition

Casein is a group of proteins found in milk. Like gluten, they are not water soluble but are held in suspension in the milk. Also like gluten, it is a big, sticky protein. Casein is coagulated by enzymes and acid to form cheese (the curds of Little Miss Muffet's curds and whey).

# Why are they grouped together?

Gluten and casein are digested in a similar manner using the same enzyme: DPP-IV

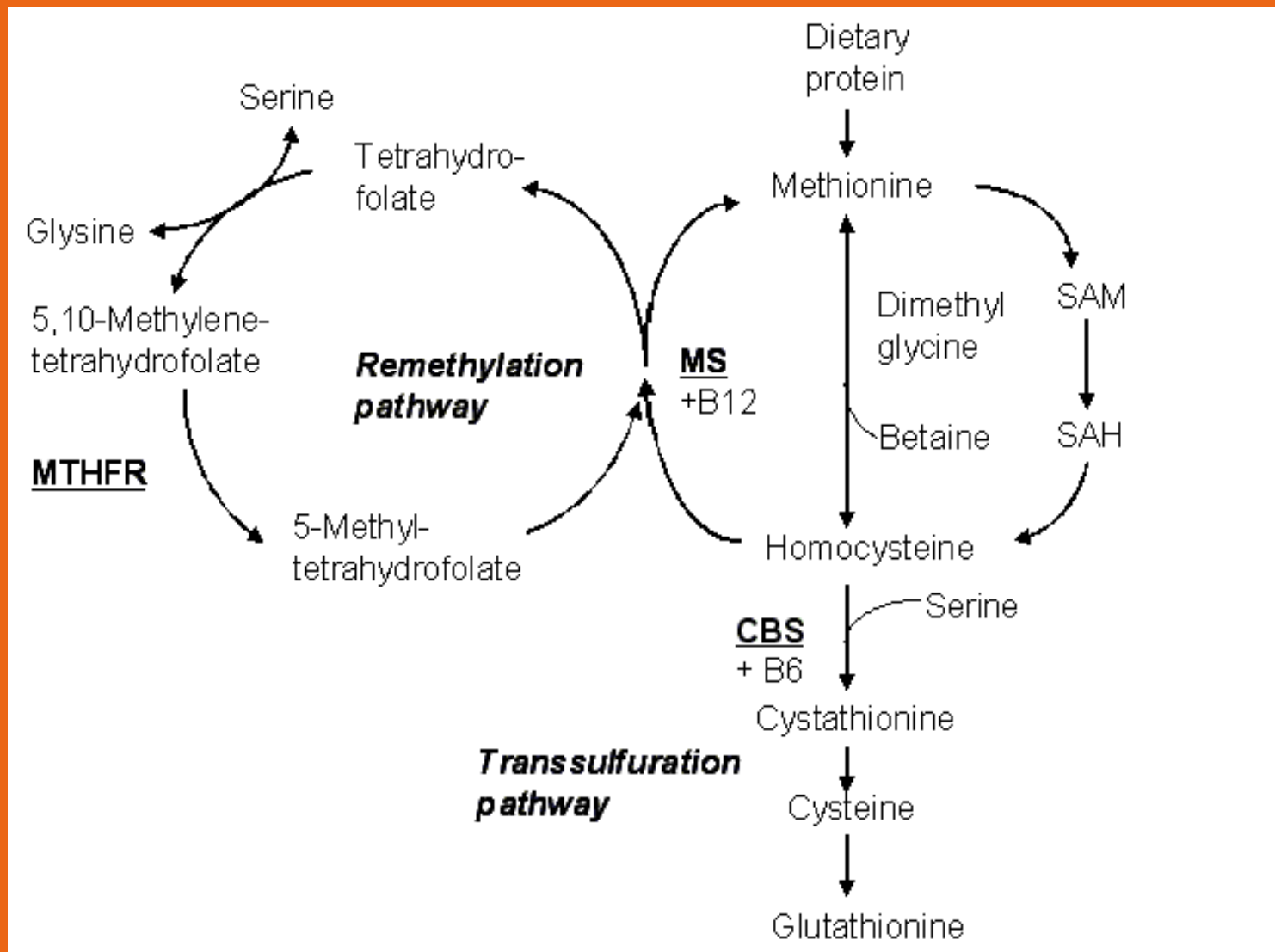
Individuals that lack DPP-IV have problems with both of these proteins and the foods that contain them

Both have been linked with various disorders of digestion, immune function, and brain function

# Theory of GFCF Diet: Oxidative Stress

- Both gluten and casein have been demonstrated to increase homocysteine and cystathione levels (suggests less reduced glutathione and methionine in cells)
- Both interfere with cysteine uptake in the GI tract
- Casein has been shown to directly reduce cysteine, methionine, and glutathione levels in neuronal cells
- Consumption of A1 beta casein is directly correlated with incidence of heart disease (inflammatory disorder)

# Theory of GFCF Diet: Oxidative Stress



# Theory of GFCF Diet: Morphin Theory

- Both gluten and casein are known to break down into morphine like compounds—gluteomorphin and caseomorphin.
- This process is accelerated in a system that lacks adequate DPP-IV activity
- Eating these foods has an opiate like effect on both bowel and brain function
- May explain food seeking behaviors and withdrawal symptoms when starting GFCF diet
- Factoid: morphine also inhibits uptake of cysteine into neuronal cells

# Theory of GFCF Diet: Gut Permeability

- The intestinal tract, particularly the small intestine, is a semi-permeable membrane
- The cells lining the intestine are tightly bound to one another with junctions
- This allows only very small chunks of protein to be absorbed
- Both gluten and casein break these tight junctions and allow an increase in permeability



# Theory of GFCF Diet: Gut Permeability

- Impaired permeability means larger than normal proteins will be absorbed
- This creates the possibility of forming immune reactions to foods
- It also increases the likelihood of an overactive immune system
- At its extreme, this can result in “leaky gut syndrome” and the development of multiple food and environmental allergies



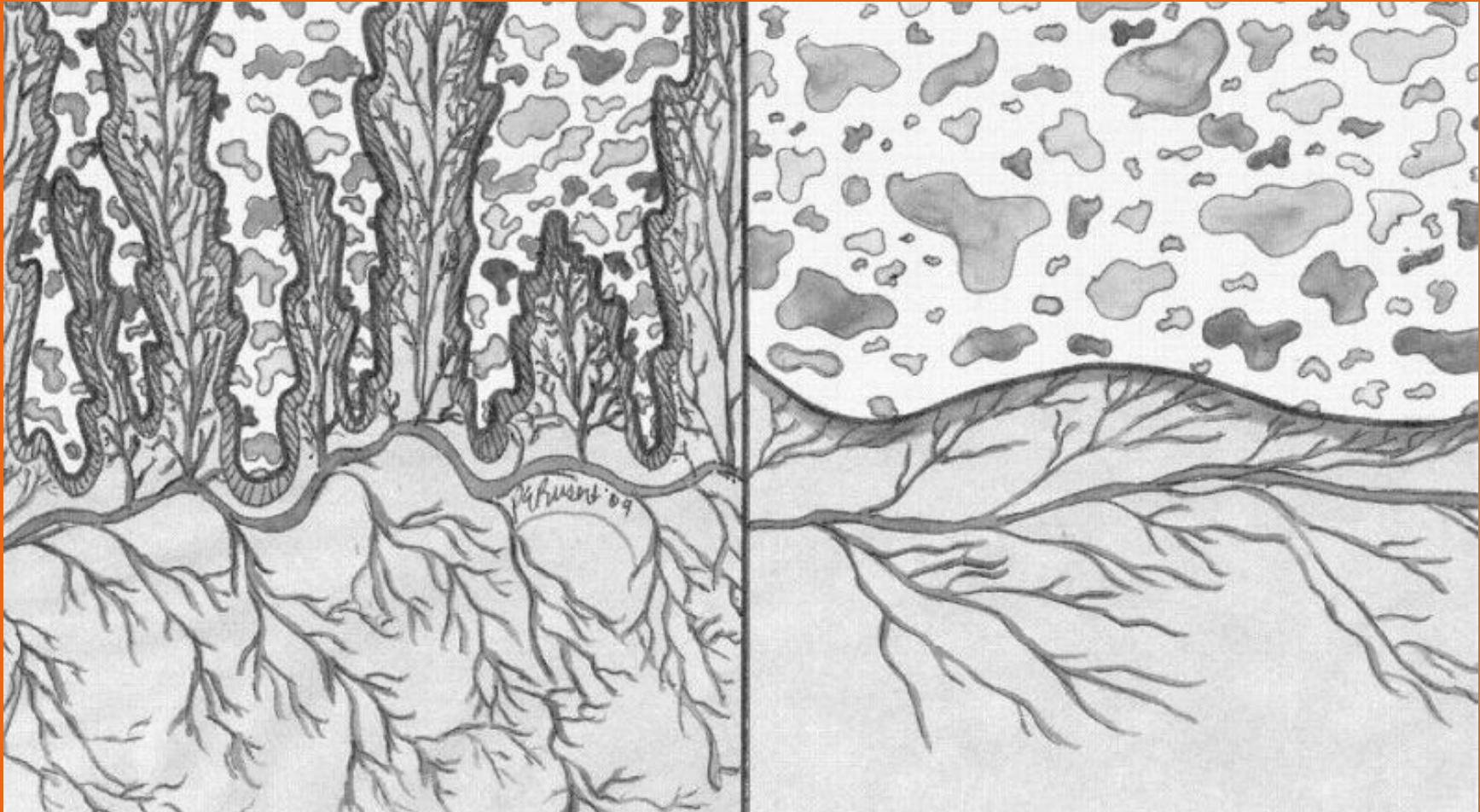
# Theory of GFCF Diet: Food Allergy

- As an extension of the permeability theory: are results of diet simply from allergy elimination?
- High incidence of positive ELISA (IgG) testing for gluten and casein in spectrum kids
- If long term antibodies (IgG) are present, the immune system will be activated with each intake of gluten or casein
- The resulting inflammation gives symptoms throughout the body

# Gluten Sensitivity vs Celiac Disease

Celiac disease is a very special form of gluten sensitivity. This is a genetically programmed disorder in which the sensitivity to even traces of gluten is so severe that it results in destruction of the microvilli of the small intestine causing loss of absorptive capacity and severe diarrhea. Diagnosis is usually made with either an intestinal biopsy or a blood test for two antibodies. Unfortunately, there are ten different markers involved in celiac; and many people that have severe gluten sensitivity do not have those two markers.

# Gluten Sensitivity vs Celiac Disease



# GFCF Diet: The Evidence

- One of the top interventions based on parent ratings
- Gluten free—55% improved
- Casein free—55% improved
- GFCF diet—69% improved

Sounds like a winner, BUT . . .

# GFCF Diet: The Evidence

Two double blind cross over studies beg to differ

- Elder, et al, in 2006. 15 autistic children showed no benefit from the diet in a 12 week study. Interestingly, blinded parents did report benefits when their children were on GFCF—did not show up in the testing.
- Hyman, 2010 IMFAR abstract. 14 children in 18 week study. On GFCF for at least 4 weeks. No difference.

# GFCF Diet: My Experience

The vast majority of children on the spectrum experience an improvement in their symptoms with this diet. This is particularly true of spectrum kids with GI symptoms (constipation, diarrhea, bloating, pain, etc.). I usually recommend a trial—low tech (although not inexpensive) and definitive.



# GFCF Diet: Testing

- Testing for celiac antibodies. Two issues—some people with celiac won't be positive for the antibodies and the testing gives an all or nothing answer: less than 20 is negative, over 25 is positive. What if your child is at 19?
- ELISA testing. This tests for long term (IgG) antibody levels against gluten and casein. Usually will test positive for other grains and foods.

# GFCF Diet: Why Now?

- There has been a huge increase in the number of people who have gluten and casein sensitivities.
- Probably was always an issue with ASD
- The amount of gluten in foods has dramatically increased as have the number of gluten containing foods we eat
- There has been a shift in the type of casein that is in milk—much more likely to increase oxidative stress markers

# GFCF Diet: Why Now?

A1 versus A2 casein.

- A2 casein was the “original” casein
- A1 casein is the protein related to intolerance and inflammation
- Milk is a mix of A1 and A2 caseins
- Most modern dairy cattle make milk that is much higher in A1 casein than in the past

# GFCF Diet: Implementation

- Be prepared before you start. Read labels.
- Begin by replacing a food with a GFCF counterpart. Snacks are a good place to start—Glutino makes some killer pretzels.
- If you can't find a GFCF counterpart, try something different (rolls vs bread)
- Keep trying different brands or recipes until you find something your child likes
- Talk to someone who has been there
- Full benefits are not seen until your child is 100% GFCF
- Don't give up—it is usually worth it

# GFCF Diet: What's Missing?

Both gluten grains and dairy products do contain beneficial nutrients that need to be replaced.

## Gluten

- Soluble fiber and B vitamins
- Can replace with soluble fiber from fruit (apples and pears) or from supplements (fruit pectin, guar gum)
- B vitamins from green veggies or from multi

# GFCF Diet: What's Missing?

## Casein

- Milk is primarily a protein source
- Also contains more calcium than any other food— an essential nutrient, but much of the calcium in milk is used by the body to buffer the acids in milk
- Protein from any other animal protein, also abundant in nuts and seeds
- Calcium is readily available in orange juice, green veggies (broccoli), dark leafy greens (spinach)

# Food and The Immune System

- New research suggests that certain foods (like gluten) play a huge role in the development of immune system disorders
- Gluten has been implicated in autoimmune disorders such as rheumatoid arthritis
- Food sensitivities contribute to the expression of environmental allergies
- Certain foods have been implicated in chronic inflammation

# Immune Dysfunction in ASD

- Specific immune abnormalities have been found in up to 70% of ASD kids\*
- Studies are small, so they are hard to characterize; but ALL studies showed abnormalities
- Abnormalities run the spectrum of immune dysfunction—overactive, underactive, dysfunctional, autoimmune, etc.

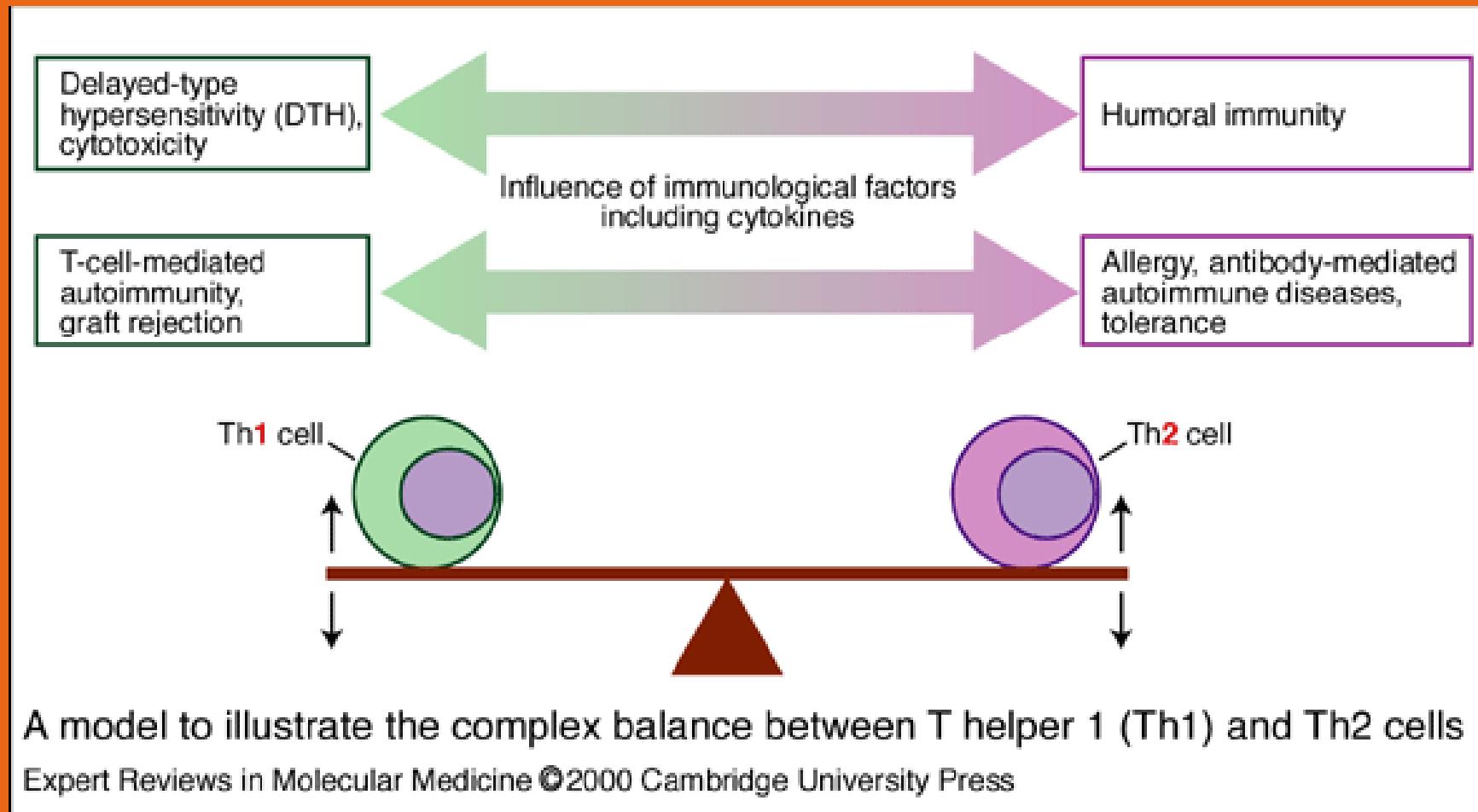
\*Ashwood, et al, IMFAR, May, 2005; Goines, et al, Autism Soc. Am. Env. Health, 2006



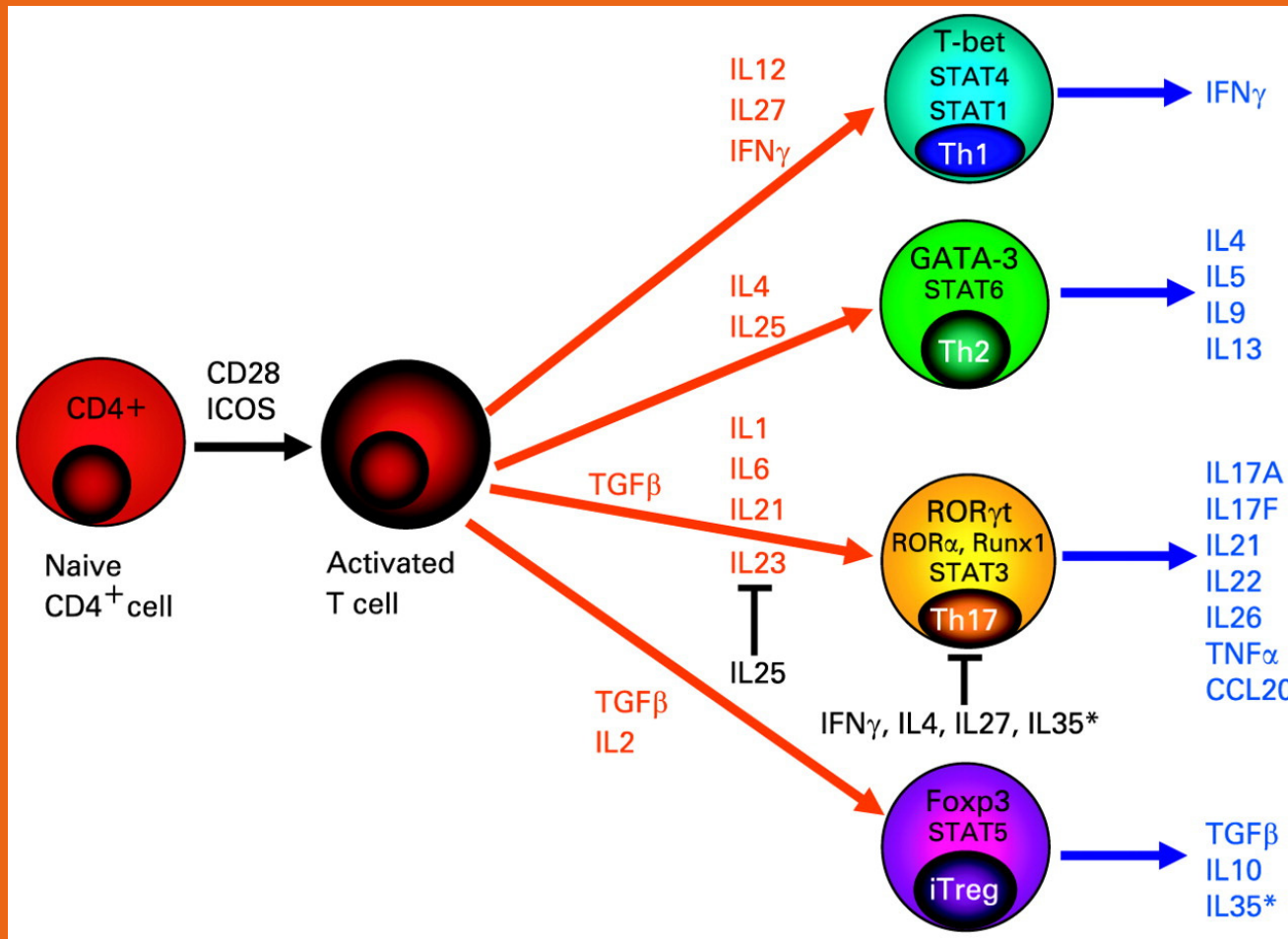
# Immune Dysfunction in ASD

- Children with ASD have increased activation of TH1 and TH2 arms of immune system without the compensatory increase of Treg arm
- Evidence of chronic inflammation markers in blood and spinal fluid (brain) of kids with ASD
- High levels of antibodies to certain vaccines (low levels to others)
- Low levels of IgG and IgA
- Low NK cell numbers and function

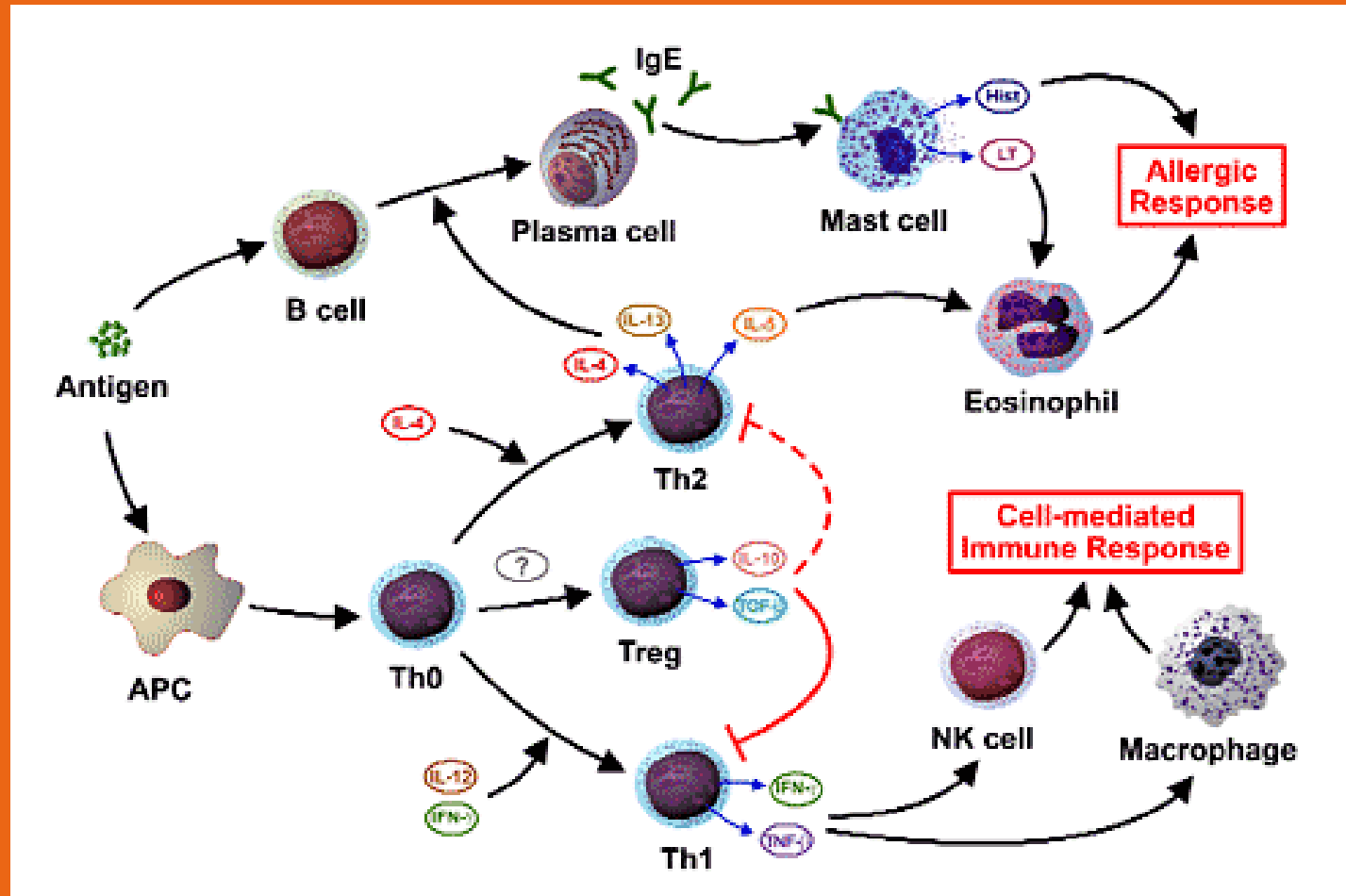
# Immune Dysfunction—TMI



# Immune Dysfunction—TMI-2



# Immune Dysfunction—TMI-3



# Immune Dysfunction—Paleo Theory

- When we were hunters and gatherers, our diet was primarily meat supplemented with nuts, seeds, fruits, and vegetables.
- Things changed about 10,000 years ago with the advent of farming.
- Crops were chosen for their ability to resist pests.
- They are resistant to pests because they have proteins that are toxic to the digestive tract of those pests.

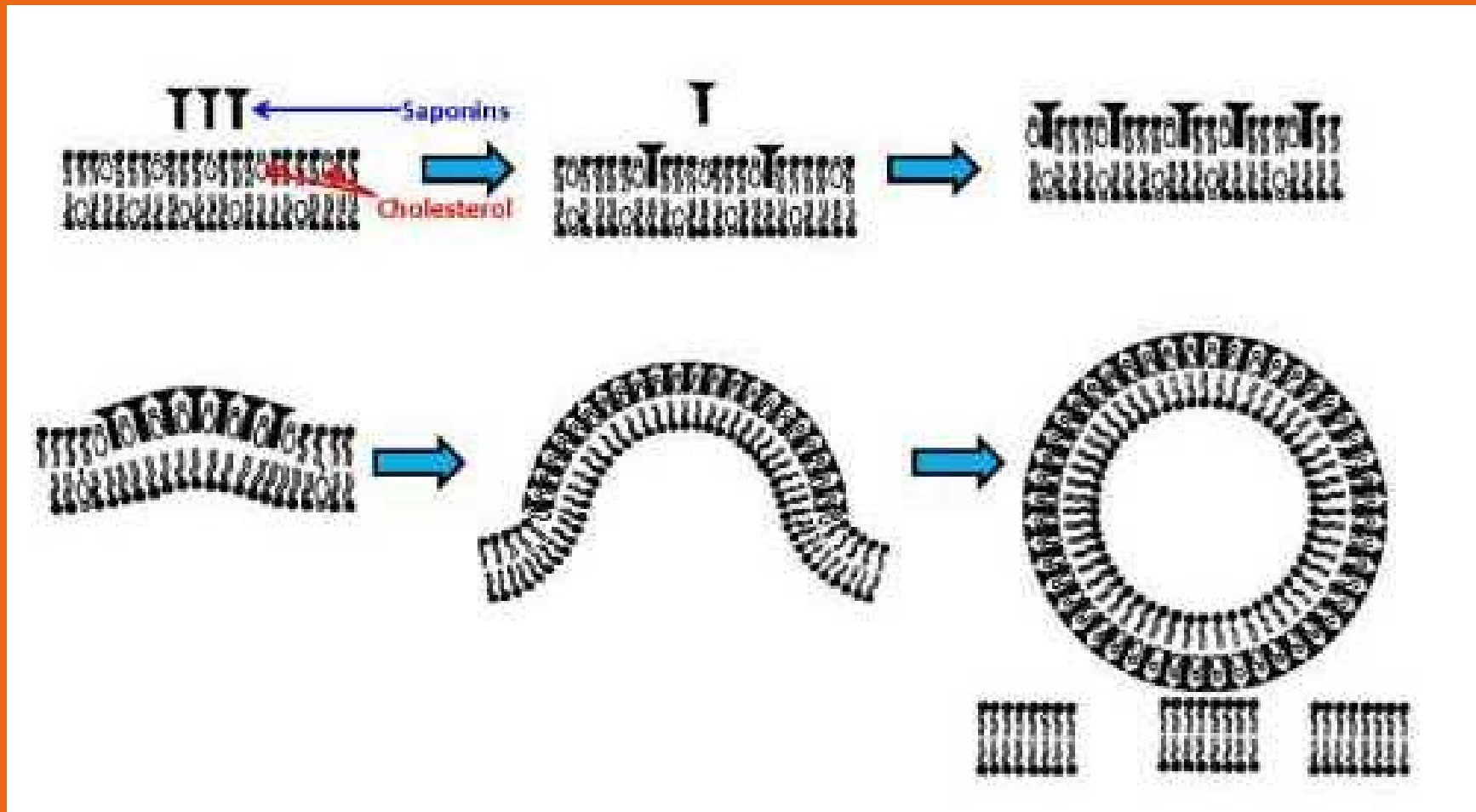
# Immune Dysfunction—Paleo Theory

- These proteins are called lectins and saponins
- Grains contain lectins—gluten is a lectin-like protein
- Potatoes and certain other produce (tomatoes) contain saponins
- Legumes (soy, peanuts, dried beans) contain both lectins and saponins
- Over the centuries, we have selected crops that are more resistant, inadvertently concentrating the saponins and lectins in those foods.

# Immune Dysfunction—Paleo Theory

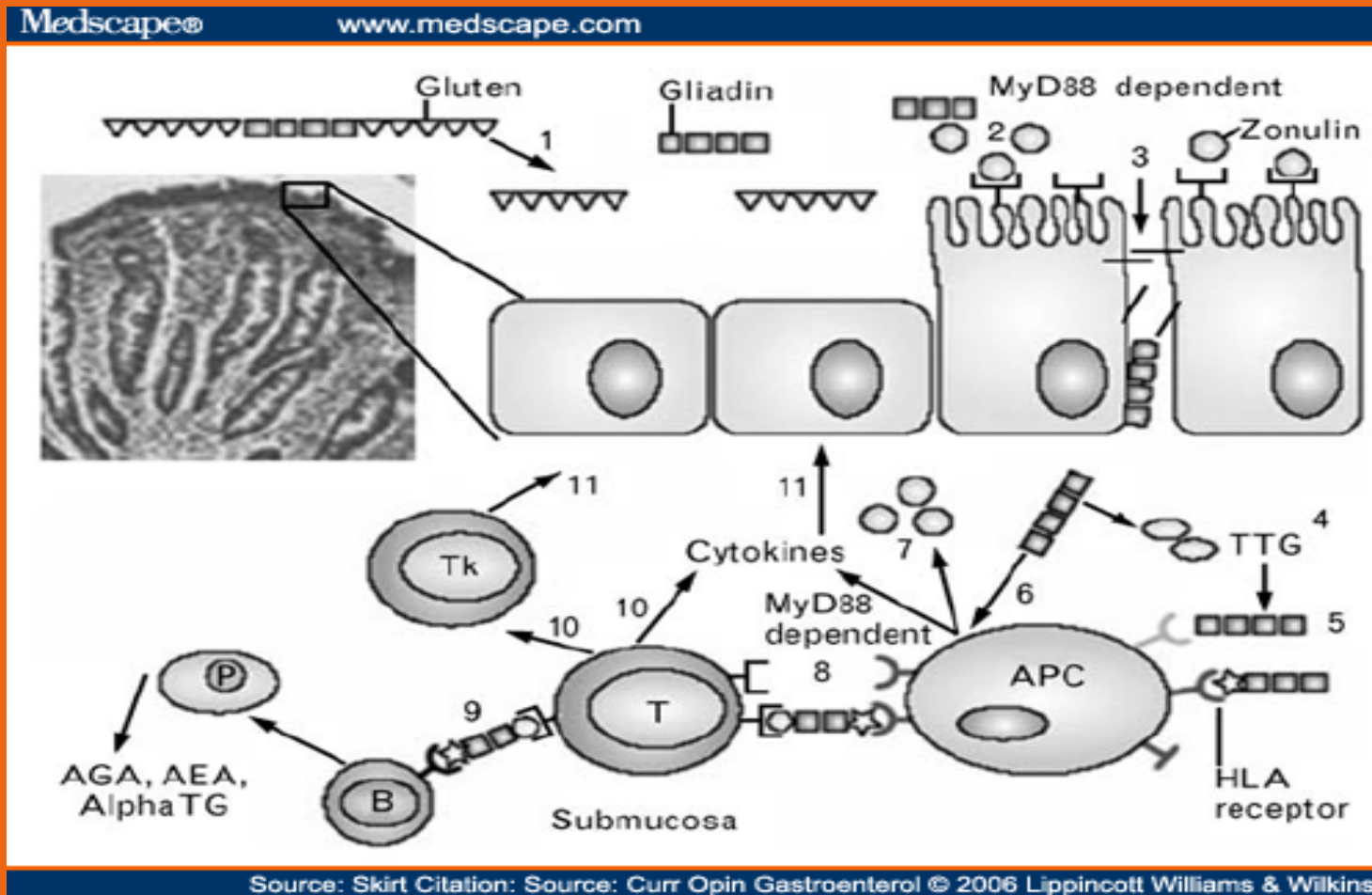
- All grains have lectins—gluten containing grains (especially wheat) are the worst.
- All legumes have both lectins and saponins—soy beans and peanuts are the worst
- Different parts of the vegetable have different amounts of the offending item (potato peels have the bulk of a potato's saponin level)
- Different subspecies have differing amounts (small tomatoes have much higher levels than traditional tomatoes)

# Immune Dysfunction—Paleo Theory





# Immune Dysfunction—Paleo Theory



# Immune Dysfunction—Paleo Theory

What do our kids eat?

- Chicken nuggets=lectins
- Peanut butter=lectins and saponins
- French Fries/chips=saponins
- Ketchup=saponins (potential lectins from corn syrup)
- Grilled Cheese/burgers/sandwiches=lectins
- Breakfast cereals=lectins

# Paleo and GFCF

Full Paleo diet (no grains, no legumes, no dairy, no potatoes or tomatoes) is difficult for adults and nearly impossible for kids.

We modify the Paleo diet by eliminating the most important foods in each group—instead of no grains, we eliminate gluten grains; instead of no legumes, we eliminate soy and peanuts, and we still eliminate dairy

# Paleo and GFCF

The modified Paleo diet is basically GFCF along with soy free and peanut free.

This diet becomes critically important if your child has signs of digestive issues or immune system issues.

# Immune Dysfunction—The Signs

- Recurrent ear infections (a healthy child should not have any)
- Recurrent strep
- Environmental allergies
- Asthma
- Eczema and other skin rashes
- Intestinal Candidiasis

# Immune Dysfunction—The Signs

- Extreme reaction to vaccines
- Recurrent colds/flu's (always sick)
- Difficulty in healing simple wounds
- Failure to thrive
- Chronic diarrhea
- Pallor/dark circles

# Immune Dysfunction—Workup

- Any lab: CBC with diff, lymphocyte subsets including a helper/suppressor ratio and NK cell count, antibody levels (including IgG subsets), basic inflammation markers, complement. Levels that are too high or too low both indicate a problem. Significant abnormalities justify evaluation by immunologist.
- More in depth workup: cytokine profile, NK cell function, immune reactivity (MELISA) testing.

# Immune Dysfunction--PANDAS



Pediatric

Autoimmune

Neuropsychiatric

Disorders

Associated with

Streptococcal infections



# Immune Dysfunction—PANDAS

- Special type of autoimmune reaction
- The brain equivalent to rheumatic fever
- This is the neurotypical child who suddenly develops symptoms
- Twitches, tics, extreme anxiety, fear of germs, motor hyperactivity, can't be separated from parent
- Can happen to spectrum kids

# Immune Dysfunction--PANDAS

- Thought to be caused by autoimmune antibodies crossing over into the brain and creating inflammation
- If suspected—check for signs of chronic strep infection (ASO titer and anti-Dnase are available in any lab—other, more specialized tests are available)
- Treatment involves both antibiotics as well as immune system modulation (IVIg)

# Immune Dysfunction—Dysbiosis

- Dysbiosis=imbalanced organisms in the intestinal tract. Can either be outright pathogens or organisms that simply don't belong there.
- Certain organisms are directly associated with immune system dysfunction—klebsiella has been associated with rheumatoid arthritis, ankylosing spondylitis, and possibly multiple sclerosis.

# Immune Dysfunction—Dysbiosis

- Other organisms create issues because they are similar to pathogens—“normal” strep species in the intestine can perpetuate reactions from abnormal strep in the throat.
- Replacement with good bacteria frequently improves immune dysfunction

# Immune Dysfunction—Why?

- The clean theory of disease
- Let 'em eat dirt
- Possible role of over vaccination
- Over use of antibiotics
- Lack of breast feeding
- Possible role of childhood viruses in proper maturation of immune system
- Role of parasites in immune tolerance

# GFCF Diet: Resources

- Celiac Sprue Association: [www.csaceliacs.org](http://www.csaceliacs.org)
- Gluten Intolerance Group of N. America: [www.gluten.net](http://www.gluten.net)
- Celiac Disease Foundation: [www.celiac.org](http://www.celiac.org)
- Gluten Free Grocery Shopping Guide: [www.ceceliasMarketplace.com](http://www.ceceliasMarketplace.com)
- GFCF diet: [www.gfcfdiet.com](http://www.gfcfdiet.com)
- Gluten free links: [www.gflinks.com](http://www.gflinks.com)

# GFCF Diet: Resources

- Kinnikinnick foods: [www.kinnikinnick.com](http://www.kinnikinnick.com)
- Pamela's Products: [www.pamelasproducts.com](http://www.pamelasproducts.com)
- The Allergy Grocer: [www.allergygrocer.com](http://www.allergygrocer.com)
- Gluten free mall: [www.glutenfreemail.com](http://www.glutenfreemail.com)
- Gluten free pantry: [www.glutenfree.com](http://www.glutenfree.com)
- Shelley Case, author: [www.glutenfreediet.ca](http://www.glutenfreediet.ca)
- Quick start diet guide: [www.enjoylifefoods.com](http://www.enjoylifefoods.com)

# GFCF Diet: Resources

- [www.glutenfreeliving.com](http://www.glutenfreeliving.com) (magazine)
- [www.livingwithout.com](http://www.livingwithout.com) (magazine)
- [www.glutenfreecookingclub.com](http://www.glutenfreecookingclub.com)
- [www.glutenfreedrugs.com](http://www.glutenfreedrugs.com) (for prescription and OTC drugs)