FM: Dermatological Applications

A Biogenetix Clinical Presentation

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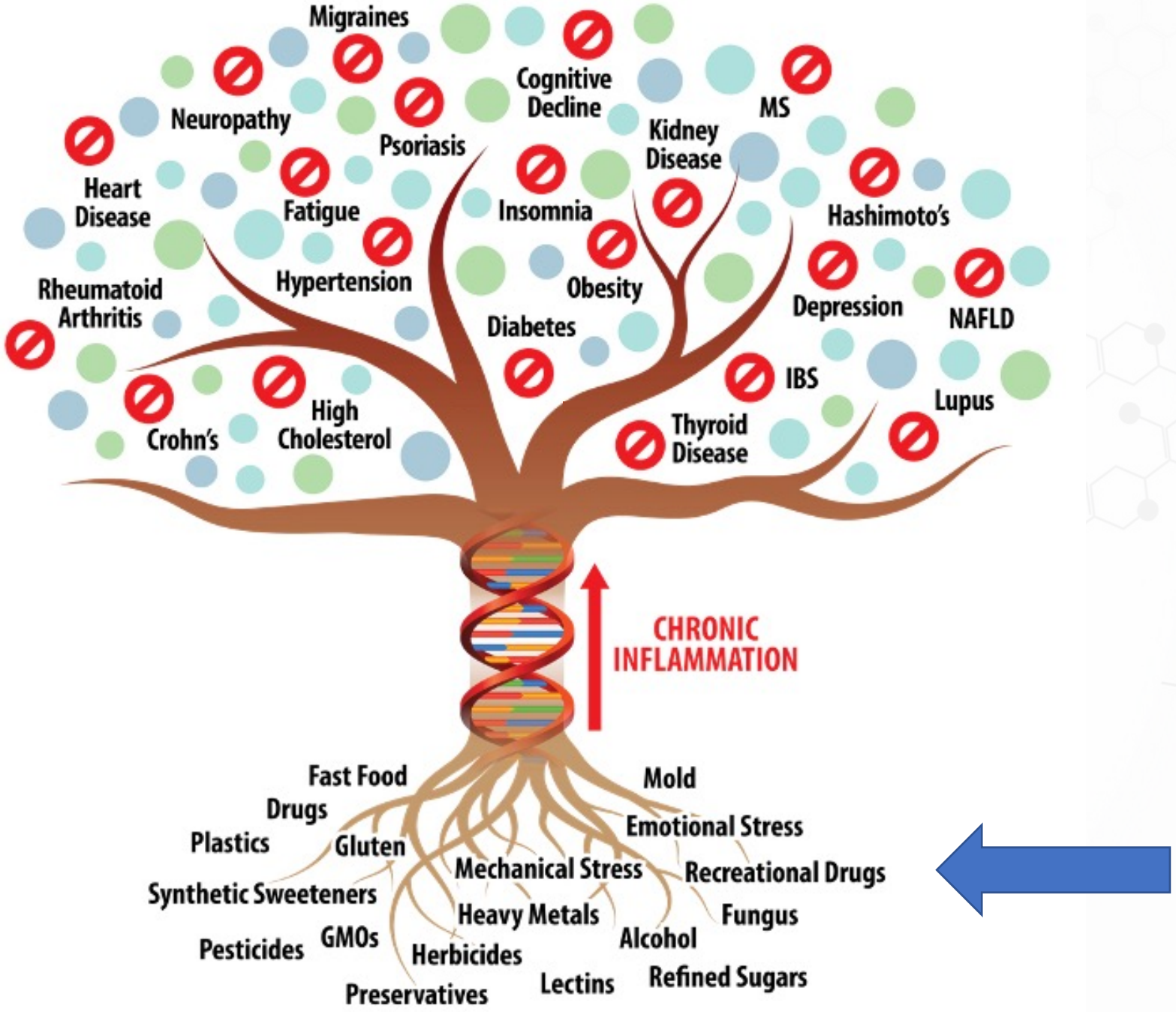
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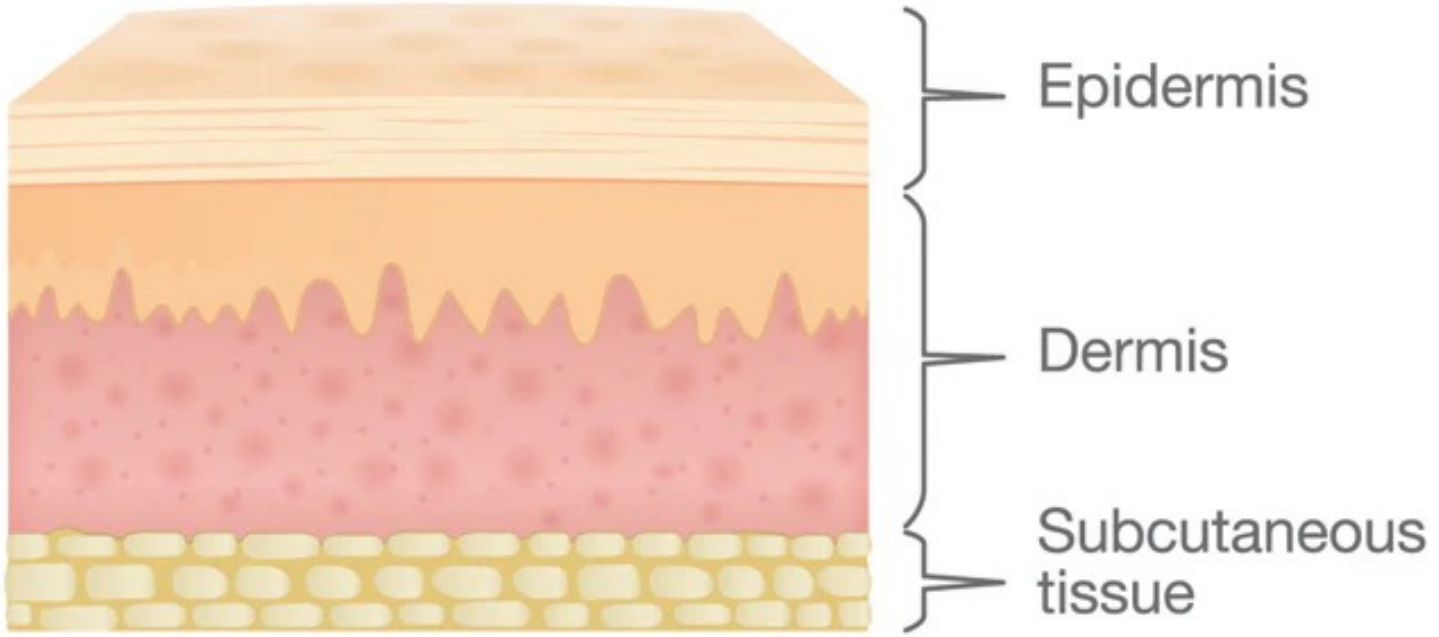
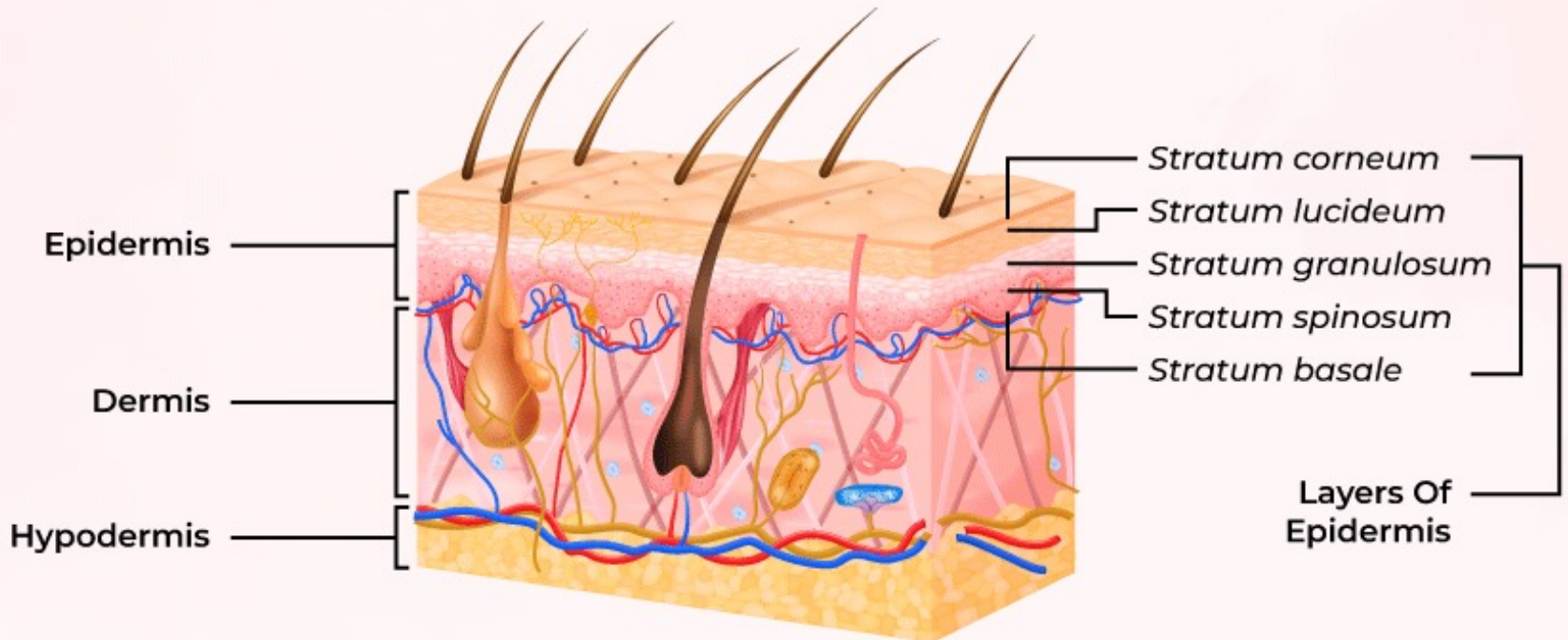
Neuropathy
Psoriasis
Cognitive Decline
MS
Kidney Disease
Heart Disease
Fatigue
Insomnia
Hashimoto's
Rheumatoid Arthritis
Hypertension
Obesity
Depression
NAFLD
Diabetes
IBS
Crohn's
High Cholesterol
Lupus
Thyroid Disease
CHRONIC INFLAMMATION
Fast Food
Mold
Drugs
Emotional Stress
Plastics
Gluten
Mechanical Stress
Recreational Drugs
Synthetic Sweeteners
Heavy Metals
Fungus
Pesticides
GMOs
Alcohol
Herbicides
Refined Sugars
Lectins
Preservatives

The Layers of Skin



https://skinkraft.com/cdn/shop/articles/Layers-Of-Skin_1024x1024.jpg?v=1582612390

Layers of the Skin



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MAYO CLINIC

Atopic dermatitis (eczema) is a condition that causes dry, itchy and inflamed skin. It's common in young children but can occur at any age. Atopic dermatitis is long lasting (chronic) and tends to flare sometimes. It can be irritating but it's not contagious.

People with atopic dermatitis are at risk of developing food allergies, hay fever and asthma.

Moisturizing regularly and following other skin care habits can relieve itching and prevent new outbreaks (flares). Treatment may also include medicated ointments or creams.

https://www.mayoclinic.org/diseases-conditions/atopic-dermatitis-eczema/symptoms-causes/syc-20353273

MAYO CLINIC

Atopic dermatitis (eczema) symptoms can appear anywhere on the body and vary widely from person to person. They may include:

- Dry, cracked skin
- Itchiness (pruritus)
- Rash on swollen skin that varies in color depending on your skin color
- Small, raised bumps, on brown or Black skin
- Oozing and crusting
- Thickened skin
- Darkening of the skin around the eyes
- Raw, sensitive skin from scratching

Atopic dermatitis often begins before age 5 and may continue into the teen and adult years. For some people, it flares and then clears up for a time, even for several years.

https://www.mayoclinic.org/diseases-conditions/atopic-dermatitis-eczema/symptoms-causes/syc-20353273

MAYO CLINIC

In some people, atopic dermatitis is related to a gene variation that affects the skin's ability to provide protection. With a weak barrier function, the skin is less able to retain moisture and protect against bacteria, irritants, allergens and environmental factors — such as tobacco smoke.

In other people, atopic dermatitis is caused by too much of the bacteria Staphylococcus aureus on the skin. This displaces helpful bacteria and disrupts the skin's barrier function.

A weak skin barrier function might also trigger an immune system response that causes the inflamed skin and other symptoms.

Atopic dermatitis (eczema) is one of several types of dermatitis. Other common types are contact dermatitis and seborrheic dermatitis (dandruff). Dermatitis isn't contagious.

https://www.mayoclinic.org/diseases-conditions/atopic-dermatitis-eczema/symptoms-causes/syc-20353273

Complications

Complications of atopic dermatitis (eczema) may include:

•**Asthma and hay fever.** Many people with atopic dermatitis develop asthma and hay fever. This can happen before or after developing atopic dermatitis.

•**Food allergies.** People with atopic dermatitis often develop food allergies. One of the main symptoms of this condition is hives (urticaria).

•**Chronic itchy, scaly skin.** A skin condition called neurodermatitis (lichen simplex chronicus) starts with a patch of itchy skin. You scratch the area, which provides only temporary relief. Scratching actually makes the skin itchier because it activates the nerve fibers in your skin. Over time, you may scratch out of habit. This condition can cause the affected skin to become discolored, thick and leathery.

•**Patches of skin that's darker or lighter than the surrounding area.** This complication after the rash has healed is called post-inflammatory hyperpigmentation or hypopigmentation. It's more common in people with brown or Black skin. It might take several months for the discoloration to fade.

•**Skin infections.** Repeated scratching that breaks the skin can cause open sores and cracks. These increase the risk of infection from bacteria and viruses. These skin infections can spread and become life-threatening.

•**Irritant hand dermatitis.** This especially affects people whose hands are often wet and exposed to harsh soaps, detergents and disinfectant at work.

•**Allergic contact dermatitis.** This condition is common in people with atopic dermatitis. Allergic contact dermatitis is an itchy rash caused by touching substances you're allergic to. The color of the rash varies depending on your skin color.

•**Sleep problems.** The itchiness of atopic dermatitis can interfere with sleep.

•**Mental health conditions.** Atopic dermatitis is associated with depression and anxiety. This may be related to the constant itching and sleep problems common among people with atopic dermatitis.

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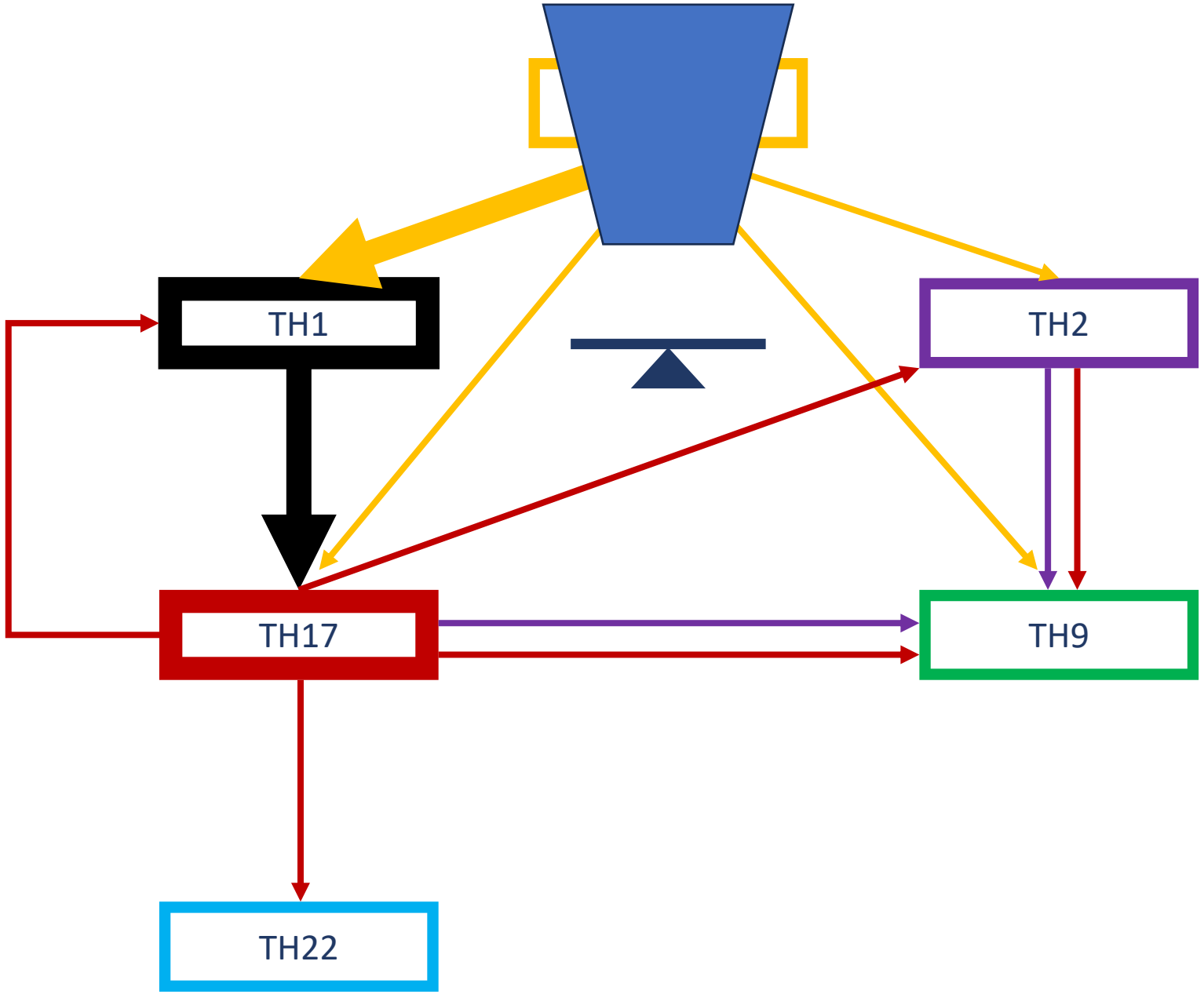
PMID: 30819278

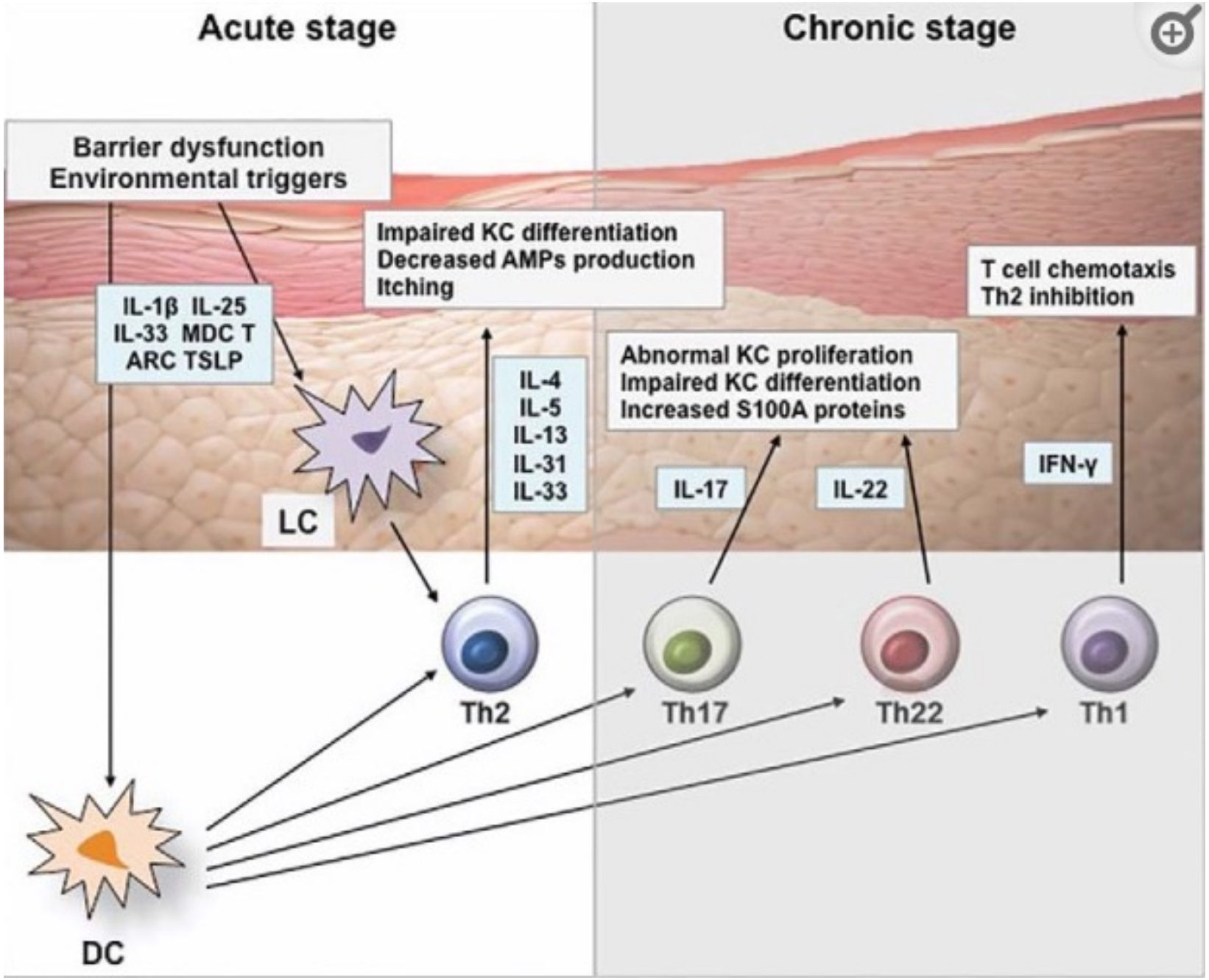
Pathophysiology of atopic dermatitis: Clinical implications

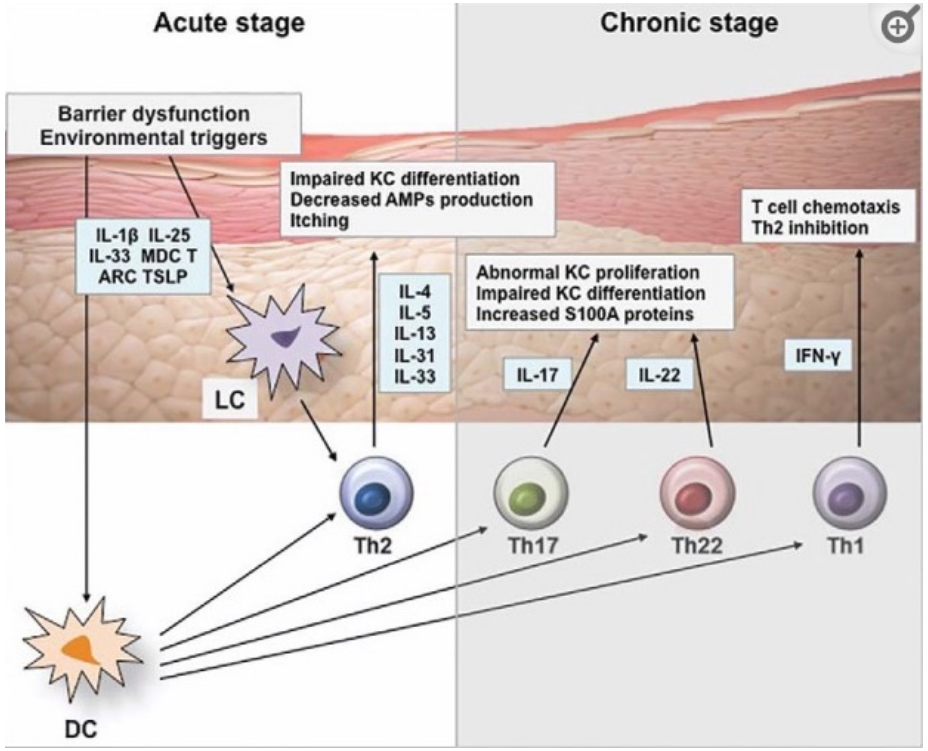
Jihyun Kim, M.D., Ph.D.,[1,–,3] Byung Eui Kim, M.D., Ph.D.,[2] and Donald Y. M. Leung, M.D., Ph.D.[✉2]

Although the pathophysiology of AD is not completely understood, numerous studies demonstrated that skin barrier dysfunction and immune dysregulation contribute to the pathobiology of AD.[6–8] The epidermis plays a crucial role as a physical and functional barrier, and skin barrier defects are the most significant pathologic findings in AD skin.[1,9,10] Filaggrin (FLG), transglutaminases, keratins, and intercellular proteins are key proteins responsible for epidermal function. Defects in these proteins facilitate allergen and microbial penetration into the skin.[9–11]

Skin barrier dysfunction has been considered to be the first step in the development of atopic march as well as AD.[7,12] However, it is also now evident that immune dysregulation, including the activation of type 2 immune responses, results in impairment of the epidermal barrier.[13–16] Recently, new insights into the pathophysiology of the development of AD focused on an important role of abnormalities in epidermal lipid layer as well as neuroimmune interactions and microbial dysbiosis.[17–20] These factors have been used to develop novel therapeutic and preventative strategies of AD. This review addressed recent insights into the pathophysiologic mechanism of AD and the clinical application of these factors for improved treatment and prevention of AD. This work was supported by National Institutes of Health (grant AR41256). J. Kim and B. Eui Kim contributed equally to the article.


TH1
TH2
TH17
TH9
TH22
(Dermatologic)


Acute stage
Chronic stage
Barrier dysfunction
Environmental triggers
IL-1β IL-25
IL-33 MDC T
ARC TSLP
Impaired KC differentiation
Decreased AMPs production
Itching
IL-4
IL-5
IL-13
IL-31
IL-33
Abnormal KC proliferation
Impaired KC differentiation
Increased S100A proteins
T cell chemotaxis
Th2 inhibition
IL-17
IL-22
IFN-γ
LC
Th2
Th17
Th22
Th1
DC



Effects of cytokines on epidermis in AD. Disrupted epidermal barrier and environmental triggers stimulate keratinocytes to release IL-1β, IL-25, IL-33, MDC, TARC, and TSLP, which activate dendritic cells and Langerhans cells. Activated dendritic cells stimulate Th2 cells to produce IL-4, IL-5, IL-13, IL-31, and IL-33, which leads to barrier dysfunction, decreased AMP production, impaired keratinocyte differentiation, and itch symptoms. Chronic AD is characterized by recruitment of Th1, Th22, and Th17 subsets, which results in epidermal thickening and abnormal keratinocyte proliferation. AD = atopic dermatitis; AMP = antimicrobial peptide; DC = dendric cell; IFN = interferon; IL = interleukin; KC = keratinocyte; LC = Langerhans cell; MDC = macrophage-derived chemokine; S100A = S100 calcium-binding protein A; Th = T-helper type; TARC = thymus and activation-regulated chemokine; TSLP = thymic stromal lymphopoietin.

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MICROBIOME

Go to:

AD skin has decreased bacterial diversity associated with increased *Staphylococcus, Corynebacterium,* and with reduced *Streptococcus, Propionibacterium, Acinetobacter, Corynebacterium, and Propionibacterium* during AD flares.[81,82] Greater bacterial diversity with increased abundance of *Staphylococcus epidermidis* and *Streptococcus, Corynebacterium,* and *Propionibacterium* species was observed after AD treatment and reduced eczema.[82] Species-level investigation of AD has shown a higher predominance of *S. aureus* in patients with more-severe disease and an abundance of *S. epidermidis* in patients with less-severe disease.[83] *S. aureus* colonizes AD skin and has pivotal roles in the development and exacerbation of AD.[84] *S. aureus* can induce T-cell–independent B-cell expansion; upregulate proinflammatory cytokines, such as TSLP, IL-4, IL-12, and IL-22; and stimulate mast cell degranulation, which results in Th2 skewing and skin inflammation.[85–88]

A recent study demonstrated that epidermal thickening and expansion of cutaneous Th2 and Th17 cells were induced when mice were exposed to *S. aureus* isolates from patients with AD.[83] Of note, methicillin-resistant *S. aureus* colonization on AD skin is associated with lower microbial diversity and a more profound reduction in the composition of commensal bacteria, such as *Streptococcus* and *Propionibacterium,* than methicillin-sensitive *S. aureus* colonization.[89] It is presumed that the differences and shifts in skin microbiome according to AD status are associated with the production of bacteriocins and AMPs from commensal bacteria.[90,91] In addition, a recent study showed a positive correlation between the abundance of propionibacteria and corynebacteria on epidermis and long-chain unsaturated FFAs, such as FA20:1, FA20:2, FA22:1, and FA24:1.[92] These findings highlight the importance of the balance between *S. aureus* and commensal bacteria.

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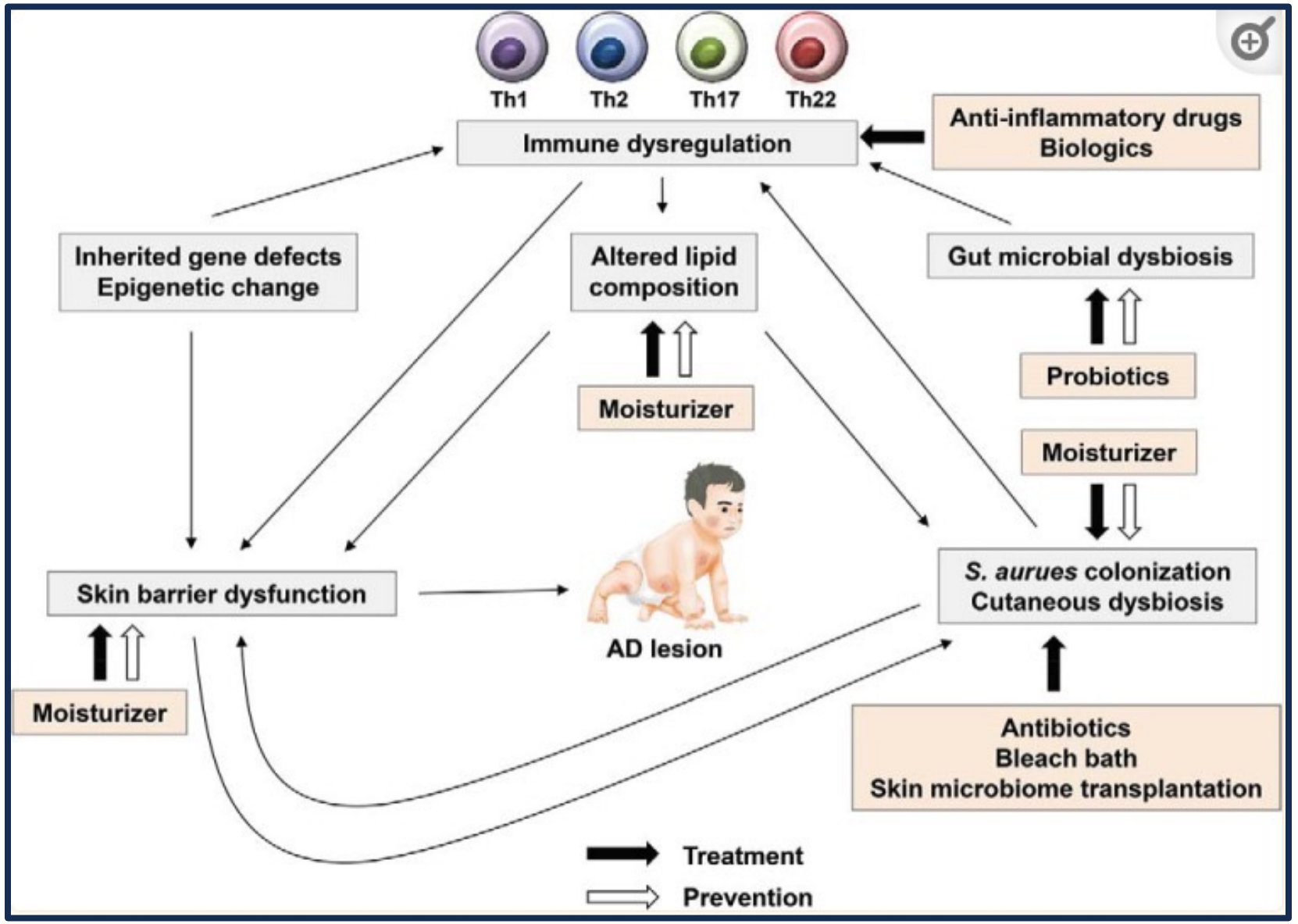
Author information

Patients with AD have significantly lower numbers of intestinal commensal *Bifidobacterium* and higher numbers of *Staphylococcus* than healthy control subjects.[93] Overgrowth of pathogenic bacteria, such as *Escherichia coli* and *Clostridium difficile,* is postulated as being associated with a decrease in beneficial bacteria, reduced induction of regulatory T (Treg) cells, loss of immune tolerance, and increased intestinal permeability.[94,95] These observations support the hypothesis that specific microbial composition in the gut prevented Th2-shifted immunity and stimulated regulatory immunity, producing regulatory dendritic cells and Treg cells.[96,97] However, further studies are necessary to elucidate how dysbiosis affects epidermal barrier function and the development of AD.



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6399565/

65-year-old female
DM2
Atopic Dermatitis
- Steroids not helping

High (>95th percentile) — Mycotoxins, Heavy Metals, Environmental Toxins

TEST NAME	CURRENT RESULT	PREVIOUS RESULT	CURRENT RESULT / PREVIOUS RESULT	REFERENCE
Aflatoxin G2	13.31		0 6.08 10.8	≤10.8 ng/g
Dihydrocitrinone	32.51		0 9.3 16.5	≤16.53 ng/g
Fumonisins B1	7.2		0 3.45 6.13	≤6.13 ng/g
Ochratoxin A (OTA)	19.21		0 3.83 6.8	≤6.8 ng/g
Gadolinium	1.21		0 0.17 0.45	≤0.45 ug/g
Tungsten*	1.33		0 0.12 0.33	≤0.33 ug/g
Bisphenol A (BPA)*	14.81		0 2.12 5.09	≤5.09 ug/g
Dimethyl phosphate (DMP)*	45.01		0 9.1 33.6	≤33.6 ug/g
Glyphosate	10.82		0 1.65 7.6	≤7.6 ug/g

Moderate (75th-95th percentile) — Heavy Metals, Environmental Toxins

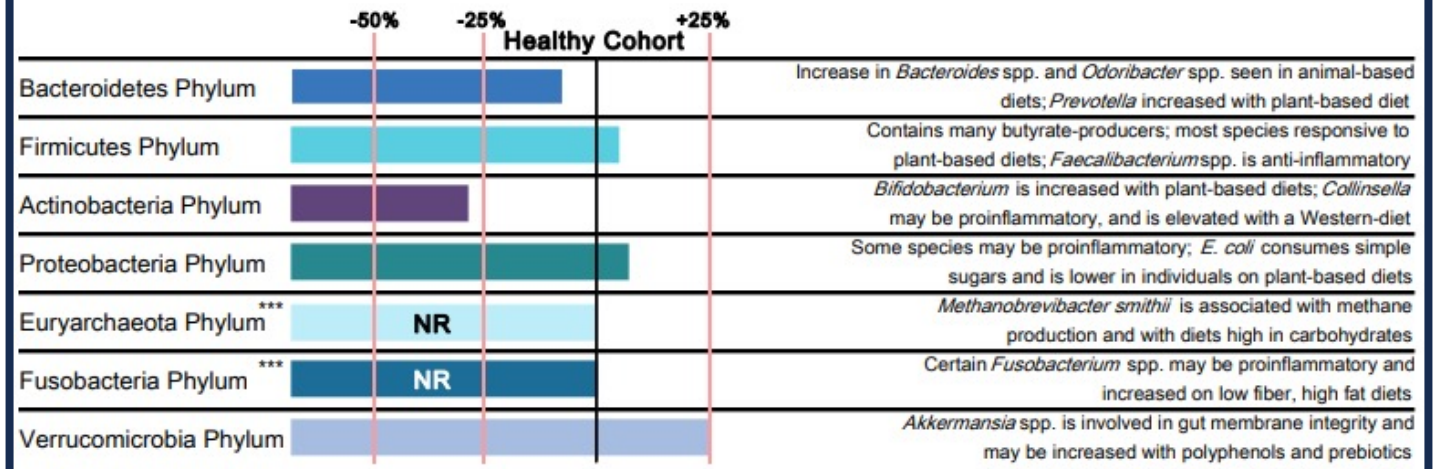
TEST NAME	CURRENT RESULT	PREVIOUS RESULT	CURRENT RESULT / PREVIOUS RESULT	REFERENCE
Thallium*	0.33		0 0.24 0.43	≤0.43 ug/g
Thorium	0.07		0 0.02 0.07	≤0.07 ug/g
Butylparaben*	0.68		0 0.25 4.39	≤4.39 ug/g
Propylparaben*	37.69		0 36.7 222	≤222 ug/g
Triclosan (TCS)*	46.52		0 29.9 358	≤358 ug/g

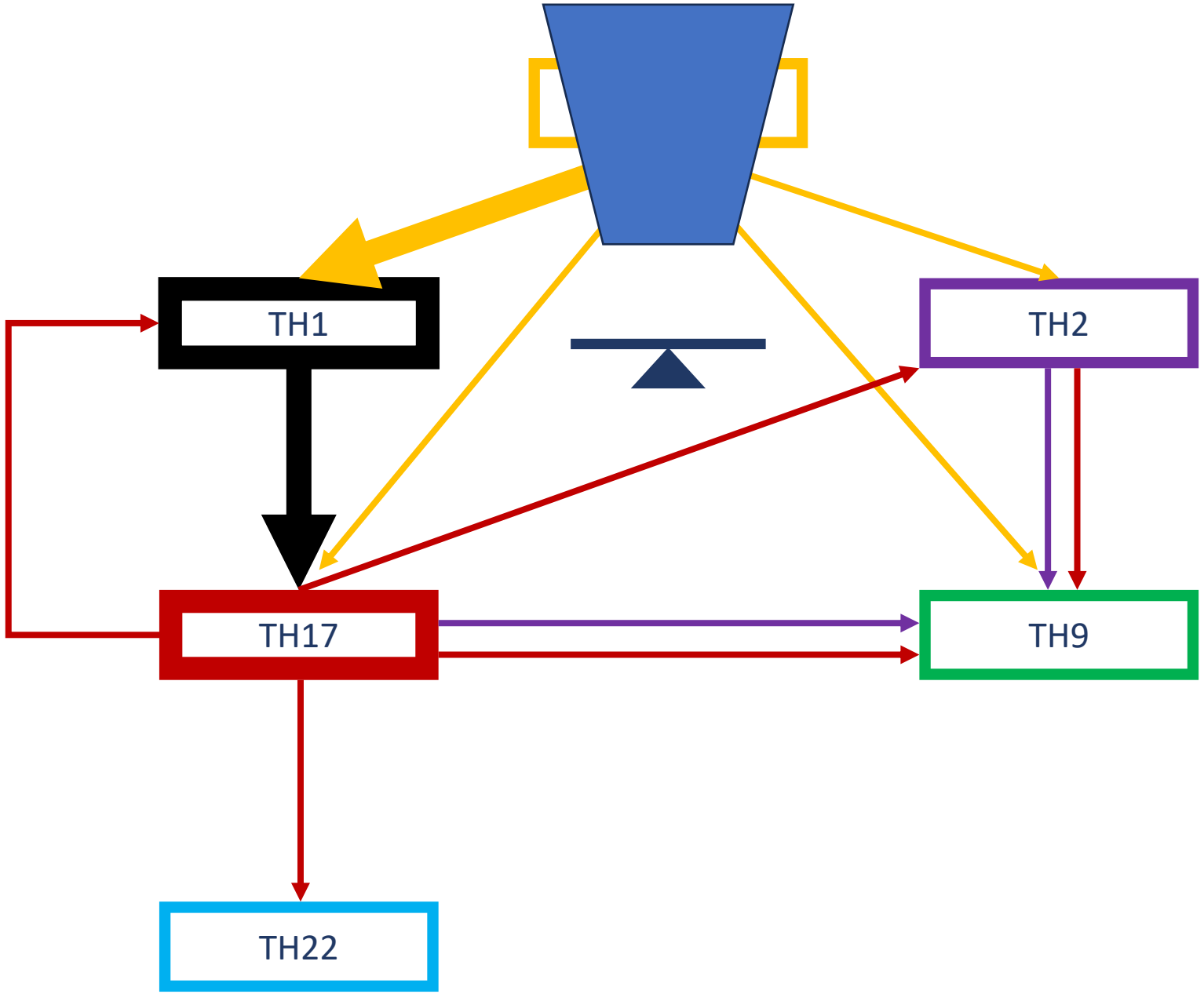
Functional Imbalance Scores

Key (< 2): Low Need for Support (2-3): Optional Need for Support (4-6): Moderate Need for Support (7-10): High Need for Support

Need for Digestive Support	Need for Inflammation Modulation	Need for Microbiome Support	Need for Prebiotic Support	Need for Antimicrobial Support
MALDIGESTION	**INFLAMMATION**	**DYSBIOSIS**	**METABOLIC IMBALANCE**	**INFECTION**
8	0	4	10	0
Pancreatic Elastase ▽	Calprotectin ●	Reference Variance ▲	SCFA (%) ▲	Parasitic Infection ●
Products of Protein Breakdown ▽	Eosinophil Protein X ●	IAD/Methane Score ●	Total SCFA's ▼	Pathogenic Bacteria ●
Fecal Fats ●	Secretory IgA ●	PP Bacteria/Yeast ●	n-Butyrate Conc. ▼	PP Bacteria/Yeast ●
	Occult Blood ●	Total Abundance ●	Beta-glucuronidase ●	Total Abundance ●
• Digestive Enzymes • Betaine HCl • Bile Salts • Apple Cider Vinegar • Mindful Eating Habits • Digestive Bitters	• Elimination Diet/ Food Sensitivity Testing • Mucosa Support: Slippery Elm, Althea, Aloe, DGL, etc. • Zinc Carnosine • L-Glutamine • Quercetin • Turmeric • Omega-3's • GI Referral (If Calpro is Elevated)	• Pre-/Probiotics • Increase Dietary Fiber Intake • Consider SIBO Testing • Increase Resistant Starches • Increase Fermented Foods • Meal Timing	• Pre-/Probiotics • Increased Dietary Fiber Intake • Increase Resistant Starches • Increase Fermented Foods • Calcium D-Glucarate (for high beta-glucuronidase)	• Antibiotics (if warranted) • Antimicrobial Herbal Therapy • Antiparasitic Herbal Therapy (if warranted) • *Saccharomyces boulardii*

Relative Commensal Abundance

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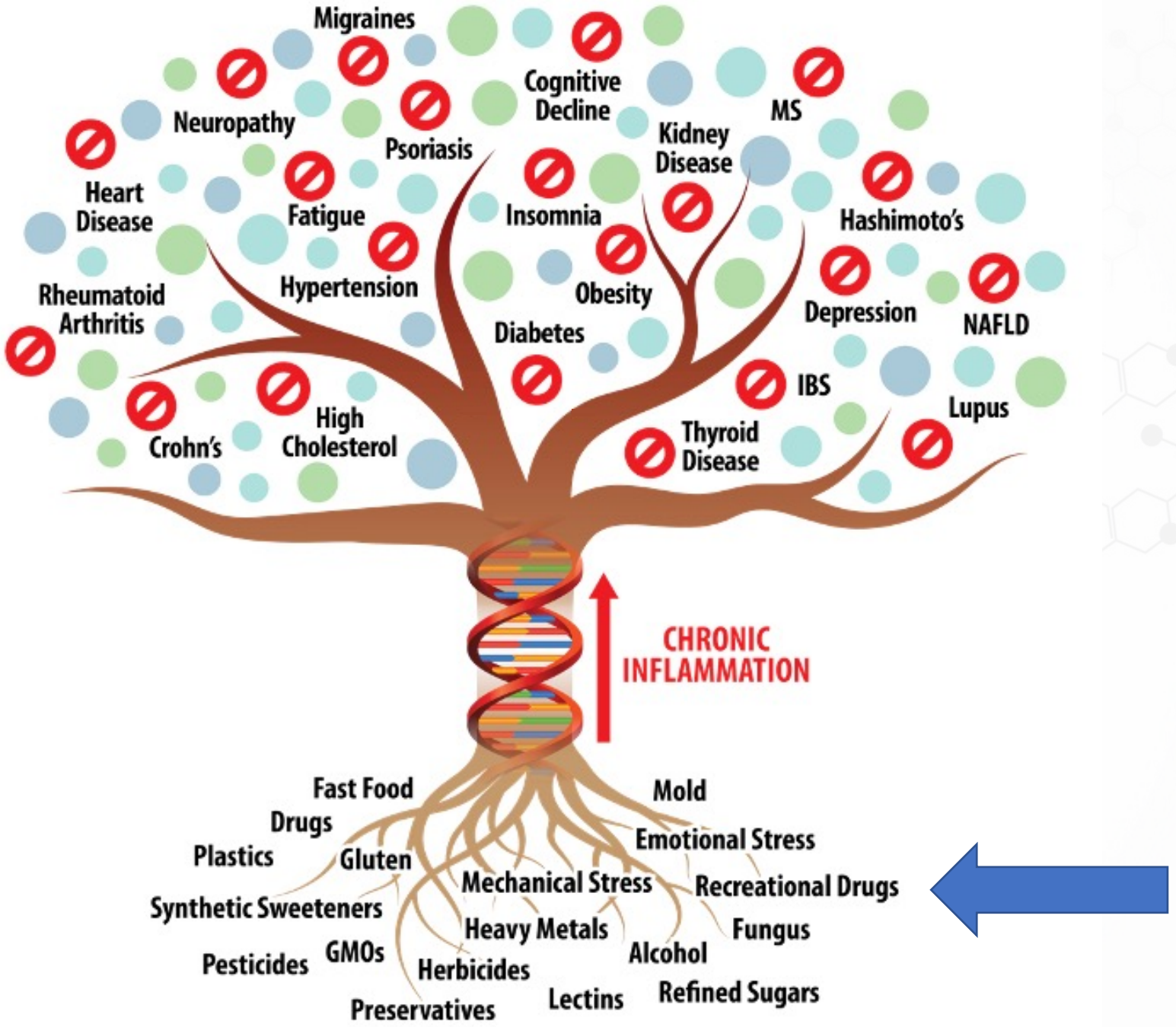
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