Dr Jessica Peatross, MD

ILADS 2021

Cellcore Biosciences

Mold & Biotoxin Illness: the hidden health hazard

What is mold/mycotoxins and what determines disease?

Mold is a multicellular fungus that forms thread like structures called hyphae and produces mycotoxins.

-forms spores or hyphal elements which are easily inhaled and stick in the lungs

Ex aspergillus, penicillum, etc. Yeast is unicellular and behaves similar to mold on a much smaller scale.

200 different types of mycotoxins have been discovered.

Type of mycotoxin

Duration and amount of exposure

Age, sex, and health status of the person exposed

Combined effects including genetics, dietary status, and interactions with other toxic assaults

Bennett, J. W., and M. Klich. "Mycotoxins." *Clinical Microbiology Reviews*, Vol. 16, No. 3 July 2003.

Types Of Mycotoxin Produced by Mold Spores

Mold / Mycotoxin	Aspergillus	Bipolaris	Candida albicans	Chaetomium globosum	Fusarium	Monascus	Penicillium	Stachybotrys
Aflatoxin B1	X							
Chaetoglobosin				X				
Citrinin	X					X	X	
Enniatin B					X			
Gliotoxin	X		X					
Mycophenolic Acid							X	
Ochratoxin	X						X	
Riordin E					X			X
Sterigmatocystin	X	X					X	
Trichothecenes					X			X
Verrucarin					X			X

- Hope J. A review of the mechanism of injury and treatment approaches for illness resulting from exposure to water-damaged buildings, mold, and mycotoxins. *ScientificWorldJournal*. 2013;2013:767482. Published 2013 Apr 18. doi:10.1155/2013/767482
- https://www.betterhealthguy.com/episode122: Neil Nathan, MD

Mycotoxin Illness/CIRS/Biotoxin illness Pearls of Knowledge

- Mycotoxicosis=CIRS. Mold is an exacerbating factor for lyme.
- Mold toxicity is a risk in water damaged buildings and food. Remediation is often not enough.
  - According **Implementing Health-Protective Features and Practices in Buildings** **43%** of buildings they examined had current water damage and **85%** had past water damage. When water damage occurs, mold can grow in as little as 24 to 48 hours.
- 25% of the population has a HLA genotype (HLA DR haplotypes)=predisposes them to CIRS/biotoxin illness--requires "priming event."
- That's one in four people!

Laurent, Jose & Williams, Augusta & Macnaughton, Piers & Cao, Xiaodong & Eitland, E. & Spengler, J. & Allen, Joseph. (2018). Building Evidence for Health: Green Buildings, Current Science, and Future Challenges. Annual Review of Public Health. 39. 10.1146/annurev-publhealth-031816-044420.

How Does Mold Start the Process of Lowered Immunity or Autoimmunity?

Mold can cause allergies, sinusitis, wheezing, asthma and itchy eyes in people who are not predisposed. In others, it is an immune reaction.

For the 25% susceptible, it can lower immunity by wiping out communication from the mitochondria and brain down to the other organs. This is an all system attack. 92% will fail visual contrast test on www.survivingmold.com

Mold against TH1/TH2 Immunity

- T lymphocytes expressing CD4 are also known as helper T cells--produce cytokines. Further subdivided into Th1 and Th2 and the specific cytokines each produces.
- Th1 cells generally secrete interferon-gamma, tumor necrosis factor-beta (TNFß), IL-2.
- Th2 cells secrete IL-4 and IL-5; and IL-3, IL-10, IL-13 (protects against allergens and parasites)
- Transforming growth factor-beta (TGFß) is secreted by both cell types. Naïve CD4+ cells, are differentiated into Th1 and Th2 cells by various cytokines.
- In susceptible people, the innate immune system "sees" the biotoxins and keeps signaling to the humoral immune system. However, the humoral immune system cannot "see" the biotoxins and does not make proper antibodies against them. Specifically in animal models, mycotoxins seem to enhance TH1/TH17.

BMJ 2000;321:424

Mosmann TR, Cherwinski H, Bond MW, et al. Two types of murine helper T cell clone. I. Definition according to profiles of lymphokine activities and secreted proteins. *J Immunol*. 1986;136(7):2348-2357.

Yoshimura A, Suzuki M, Sakaguchi R, et al. SOCS, Inflammation, and Autoimmunity. *Front Immunol*. 2012;3:20.

Nakamura T, Kamogawa Y, Bottomly K, Flavell RA. Polarization of IL-4- and IFN-gamma-producing CD4+ T cells following activation of naive CD4+ T cells. *J Immunol*. 1997;158(3):1085-1094.

TH1 overdominance in animal studies

- Studies analyzing the individual effects of Ochratoxin (OTA) and DON exposure in mice demonstrated increased production of IL-1ß, IL-6, and IL-17, and increased gene expression of STAT-1, 3, and 4, roughly equating to a promotion of Th1 and Th17 cellular differentiation.
- One study demonstrated upregulation of gene expression for IL-6, IL-1ß, and STAT-1, 2, and 3 in murine macrophages exposed to DON and T-2 toxin individually.
- A mouse study exemplified this scenario, wherein OTA and DON exposure caused a spike in IFNγ and IL-17 levels, well before clinical symptomology was noted; both cytokines are implicated in association with Th1/Th17 differentiation.

Jahreis S, Kuhn S, Madaj AM, et al. Mold metabolites drive rheumatoid arthritis in mice via promotion of IFN-gamma- and IL-17-producing T cells. *Food Chem Toxicol*. 2017;109(1):405-413.

Wang X, Liu Q, Ihsan A, et al. JAK/STAT pathway plays a critical role in the proinflammatory gene expression and apoptosis of RAW264.7 cells induced by trichothecenes as DON and T-2 toxin. *Toxicol Sci*. 2012;127(2):412-424.

Symptoms of Biotoxin Illness

Fatigue, weakness	Post-exertional malaise	Memory problems, difficulties with concentration and executive function, seizures	Difficulty holding urine
Headaches	Vertigo, lightheadedness	Muscle aches, cramping, joint pains without inflammatory arthritis	Hypersensitivity to bright light, blurred vision, burning or red eyes, tearing
Cough, asthma-like illness, shortness of breath, chronic sinus congestion	Air hunger or unusual shortness of breath at rest	Chronic abdominal problems including nausea, cramping, secretory diarrhea	A propensity to experience static shocks

Difficulty regulating body temperature/dysautonomia

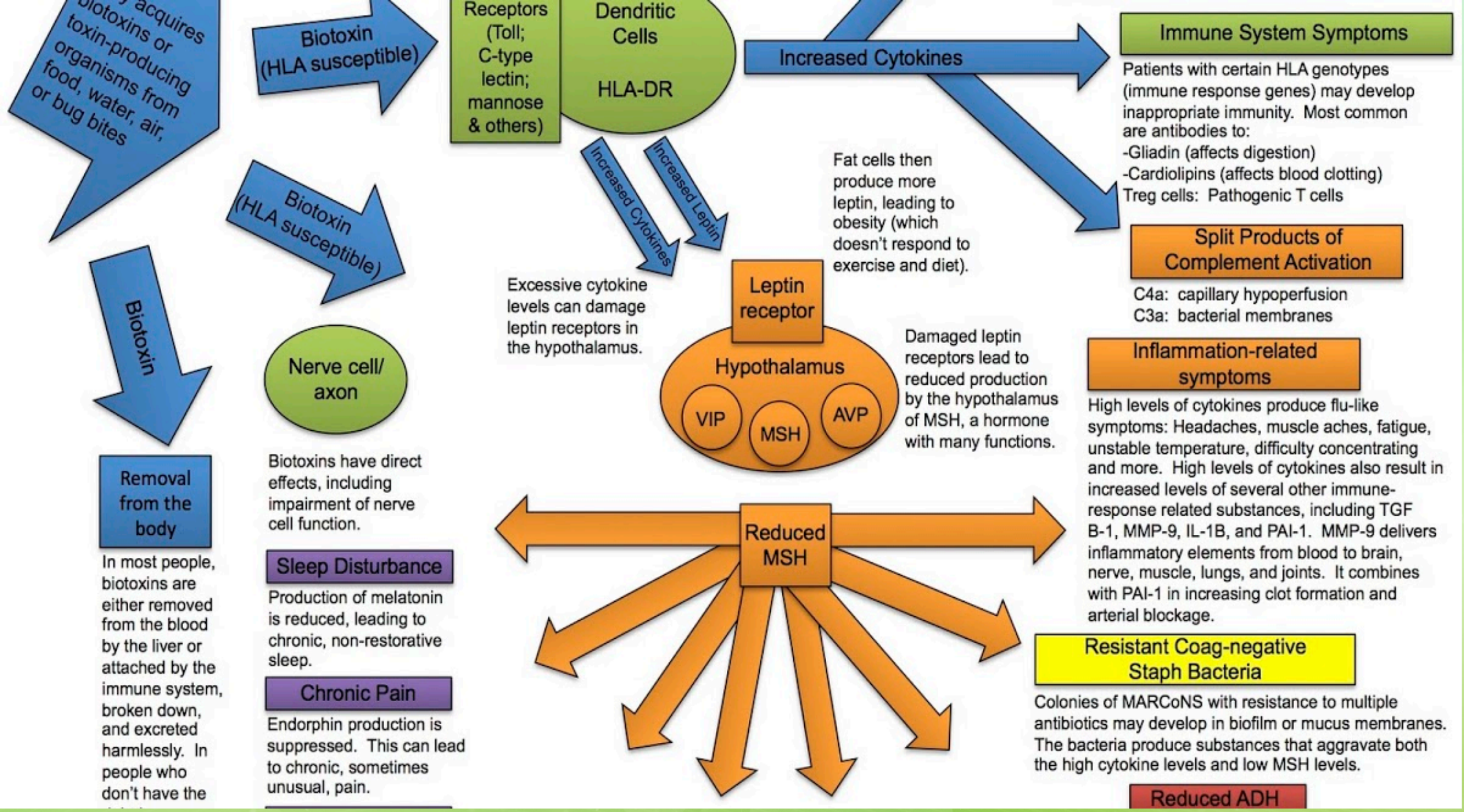

Chart by survivingmold.com

Mold and Disrupting Immunity and Hormone Production

- Disrupted melatonin (sleep disturbances)
- Gut inflammation (food sensitivities, irritable bowel, immune deregulation)
- Compromised Hypothalamic-Pituitary-Adrenal (HPA) axis communication (severe fatigue)
- Disrupted Vitamin D metabolism (increased viral activity)
- Low testosterone (fatigue, low libido)
- Caudate atrophy (diminished motivation)
- Swelling and enlargement of the forebrain and cortical gray matter (brain fog)
- Dysfunction in cellular metabolism and energy via mitochondrial damage

Diseases Linked to Mold/CIRS

1. Sarcoidosis
2. Hashimoto's thyroiditis
3. Grave's Disease (most are HLA-DR)
4. Multiple chemical sensitivity
5. Mast cell activation Syndrome
6. Fibromyalgia
7. Chronic Fatigue Syndrome
8. Lupus

Somppi TL. Non-Thyroidal Illness Syndrome in Patients Exposed to Indoor Air Dampness Microbiota Treated Successfully with Triiodothyronine. *Front Immunol*. 2017;8:919. Published 2017 Aug 7. doi:10.3389/fimmu.2017.00919
Rosenblum Lichtenstein JH, Hsu YH, Gavin IM, et al. Environmental mold and mycotoxin exposures elicit specific cytokine and chemokine responses. *PLoS One*. 2015;10(5):e0126926. Published 2015 May 26. doi:10.1371/journal.pone.0126926
Brain JD, Sieber NL, Rosenblum Lichtenstein JH. Killing Two Birds with One Stone: Mold-induced Pulmonary Immune Responses and Arterial Remodeling. *Am J Respir Cell Mol Biol*. 2020;62(5):537-538. doi:10.1165/rcmb.2019-0386ED

Autoimmune Thyroid Disorders

M. A. Iddah [1,2] and B. N. Macharia[3]
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Academic Editor: D. F. Skafar

Received	Accepted	Published
09 May 2013	04 Jun 2013	26 Jun 2013

Abstract

Purpose of Review. Studies have been published in the field of autoimmune thyroid diseases since January 2005. The review is organized into areas of etiology, autoimmune features, autoantibodies, mechanism of thyroid cell injury, B-cell responses, and T-cell responses. Also it reviews the diagnosis and the relationship between autoimmune thyroid disease, neoplasm, and kidney disorders. *Recent Findings.* Autoimmune thyroid diseases have been reported in people living in different parts of the world including North America, Europe, Baalkans, Asia, Middle East, South America, and Africa though the reported figures do not fully reflect the number of people infected per year. Cases are unrecognized due to inaccurate diagnosis and hence are treated as other diseases. However, the most recent studies have shown that the human autoimmune thyroid diseases (AITDs) affect up to 5% of the general population and are seen mostly in women between 30 and 50 years. *Summary.* Autoimmune thyroid disease is the result of a complex interaction between genetic and environmental factors. Overall, this review has expanded our understanding of the mechanism involved in pathogenesis of AITD and the relationship between autoimmune thyroid disease, neoplasm, and kidney disease. It has opened new lines of investigations that will ultimately result in a better clinical practice.

Detection of Mycotoxins in Patients with Chronic Fatigue Syndrome

Joseph H. Brewer,[1,*] Jack D. Thrasher,[2] David C. Straus,[3] Roberta A. Madison,[4] and Dennis Hooper[5]

Author information · Article notes · Copyright and License information Disclaimer

See letter "Comment on Detection of Mycotoxins in Patients with Chronic Fatigue Syndrome. *Toxins* 2013, *5*, 605–617" in volume 8, 322.
See the reply "Reply to Comment on Detection of Mycotoxin in Patients with Chronic Fatigue Syndrome. *Toxins* 2013, *5*, 605-617 by Mark J. Mendell." in volume 8, 325.
See the reply "Reply to Comment on Detection of Mycotoxins in Patients with Chronic Fatigue Syndrome *Toxins* 2013, *5*, 605–617 by John W. Osterman, M.D." in volume 8, 323.
See letter "Comment on Detection of Mycotoxins in Patients with Chronic Fatigue Syndrome *Toxins* 2013, *5*, 605–617" in volume 8, 324.

This article has been cited by other articles in PMC.

Abstract

Go to:

Over the past 20 years, exposure to mycotoxin producing mold has been recognized as a significant health risk. Scientific literature has demonstrated mycotoxins as possible causes of human disease in water-damaged buildings (WDB). This study was conducted to determine if selected mycotoxins could be identified in human urine from patients suffering from chronic fatigue syndrome (CFS). Patients (n = 112) with a prior diagnosis of CFS were evaluated for mold exposure and the presence of mycotoxins in their urine. Urine was tested for aflatoxins (AT), ochratoxin A (OTA) and macrocyclic trichothecenes (MT) using Enzyme Linked Immunosorbent Assays (ELISA). Urine specimens from 104 of 112 patients (93%) were positive for at least one mycotoxin (one in the equivocal range). Almost 30% of the cases had more than one mycotoxin present. OTA was the most prevalent mycotoxin detected (83%) with MT as the next most common (44%). Exposure histories indicated current and/or past exposure to WDB in over 90% of cases. Environmental testing was performed in the WDB from a subset of these patients. This testing revealed the presence of potentially mycotoxin producing mold species and mycotoxins in the environment of the WDB. Prior testing in a healthy control population with no history of exposure to a WDB or moldy environment (n = 55) by the same laboratory, utilizing the same methods, revealed no positive cases at the limits of detection.

Mold exposure at home could increase risk for sarcoidosis

Date: October 22, 2012
Source: American College of Chest Physicians
Summary: People who are exposed to mold in their homes could be at an increased risk for sarcoidosis, a chronic inflammatory lung disease.

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FULL STORY

People who are exposed to mold in their homes could be at an increased risk for sarcoidosis, a chronic inflammatory lung disease.

Researchers from Sweden and Slovenia tested 62 nonsmoking patients with sarcoidosis, 34 of whom had extrapulmonary manifestations (EPM). Patients were tested for β-glucan, an immune-modulating agent found in fungi, and accompanying inflammatory biomarkers, including interleukin (IL)-6, IL-10, and IL-12. Serum samples were also obtained from 18 control subjects with no pulmonary disease or respiratory symptoms.

Results showed that levels of IL-6 and IL-12 were higher among subjects with sarcoidosis as compared with controls, and IL-12 was significantly higher among subjects with EPM. There also was a significant relation between β-glucan and mold/fungi levels in the home.

Researchers conclude that the results further support the hypothesis that exposure to fungi is important for the risk of sarcoidosis.

Mold in the Studies

More research needs to be conducted to fully connect CIRS to some of these chronic conditions

Mold and Mental Illness

Toxicol Ind Health. Oct-Nov 2009;25(9-10):577-81. doi: 10.1177/0748233709348393.

Neurologic and Neuropsychiatric Syndrome Features of Mold and Mycotoxin Exposure

L D Empting [1]

Affiliations + expand

PMID: 19854819 DOI: 10.1177/0748233709348393

Abstract

Human exposure to molds, mycotoxins, and water-damaged buildings can cause neurologic and neuropsychiatric signs and symptoms. Many of these clinical features can partly mimic or be similar to classic neurologic disorders including pain syndromes, movement disorders, delirium, dementia, and disorders of balance and coordination. In this article, the author delineates the signs and symptoms of a syndrome precipitated by mold and mycotoxin exposure and contrasts and separates these findings neurodiagnostically from known neurologic diseases. This clinical process is designed to further the scientific exploration of the underlying neuropathophysiologic processes and to promote better understanding of effects of mold/mycotoxin/water-damaged buildings on the human nervous system and diseases of the nervous system. It is clear that mycotoxins can affect sensitive individuals, and possibly accelerate underlying neurologic/pathologic processes, but it is crucial to separate known neurologic and neuropsychiatric disorders from mycotoxin effects in order to study it properly.

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Science News *from research organizations*

Household Mold Linked To Depression

Date: August 30, 2007

Source: Brown University

Summary: A groundbreaking public health study has found a connection between damp, moldy homes and depression. The scientists said the findings came as a complete surprise. This was a large study, analyzing data from 5,882 adults in 2,982 households. Molds are toxins, and some research has indicated that these toxins can affect the nervous system or the immune system or impede the function of the frontal cortex, the part of

What about mold and children?

- A study in Poland measured IQ scores in children exposed to indoor mold for greater than two years, showed statistically significant IQ deficits in children exposed to indoor mold. This study controlled for multiple variables and involved testing of 277 term babies at age 6 years using intelligence tests and measuring neuropsychological function. Children exposed to indoor mold showed a statistically significant deficit of approximately 10 points. The longer exposure to indoor mold tripled the risk for low IQ scores defined as values below the 25th percentile.
- Signs of mold illness in children: bed wetting and new diagnosis of asthma

Jedrychowski W, Maugeri U, Perera F, et al. Cognitive function of 6-year old children exposed to mold-contaminated homes in early postnatal period. Prospective birth cohort study in Poland. *Physiology & Behavior*. 2011;104(5):989–995

Case Reports > Aging (Albany NY). 2016 Feb;8(2):304-13. doi: 10.18632/aging.100896.

Inhalational Alzheimer's Disease: An Unrecognized – And Treatable – Epidemic

Dale E Bredesen [1] [2]

Affiliations + expand

PMID: 26870879 PMCID: PMC4789584 DOI: 10.18632/aging.100896

Free PMC article

Abstract

Alzheimer's disease is one of the most significant healthcare problems today, with a dire need for effective treatment. Identifying subtypes of Alzheimer's disease may aid in the development of therapeutics, and recently three different subtypes have been described: type 1 (inflammatory), type 2 (non-inflammatory or atrophic), and type 3 (cortical). Here I report that type 3 Alzheimer's disease is the result of exposure to specific toxins, and is most commonly inhalational (IAD), a phenotypic manifestation of chronic inflammatory response syndrome (CIRS), due to biotoxins such as mycotoxins. The appropriate recognition of IAD as a potentially important pathogenetic condition in patients with cognitive decline offers the opportunity for successful treatment of a large number of patients whose current prognoses, in the absence of accurate diagnosis, are grave.

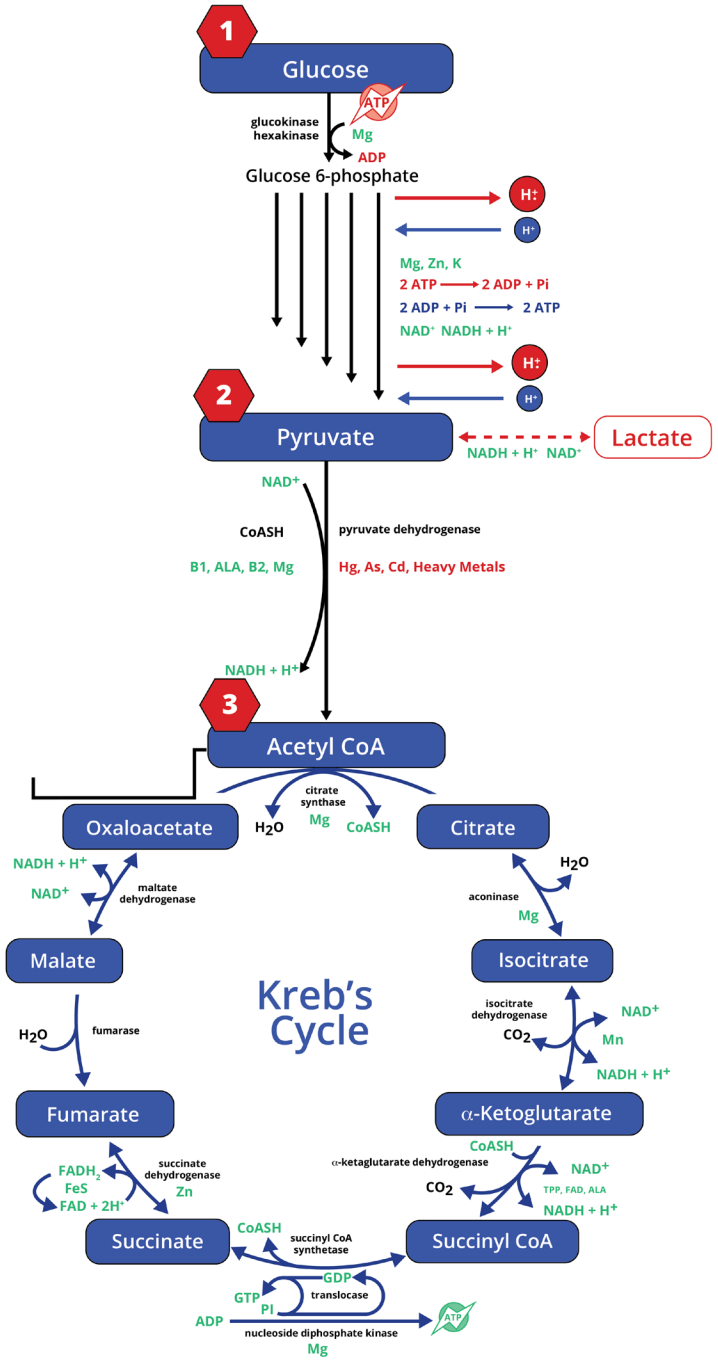
Mold and Neurodegenerative Conditions

Mold and Cancer

- 1. Hepatocellular cancer
- 2. Bladder cancer
- 3. Lymphoma
- 4. Hormone related cancers: zearalenone and ochratoxin signal estrogenically, meaning they have the ability to bind to estrogen receptors on the cells where they stimulate growth and proliferation.
- 5. Leukemia

https://www.sciencedirect.com/topics/neuroscience/mycotoxins

Rosenblum Lichtenstein JH, Hsu YH, Gavin IM, et al. Environmental mold and mycotoxin exposures elicit specific cytokine and chemokine responses. *PLoS One*. 2015;10(5):e0126926. Published 2015 May 26. doi:10.1371/journal.pone.0126926



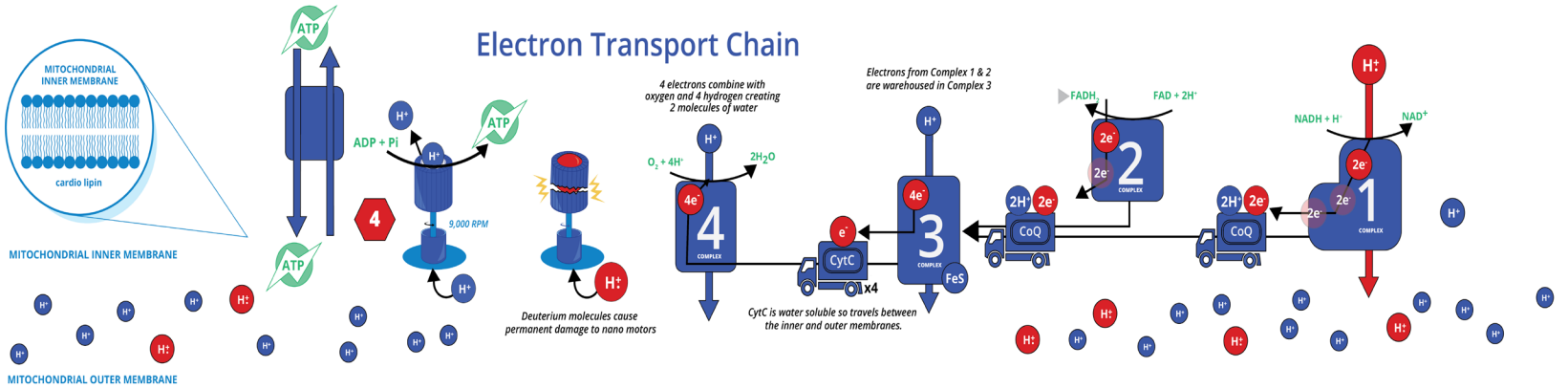
Cellular biochemistry: How do Mycotoxins Damage Mitochondria?

Mycotoxins cause ROS utilizing oxygen molecules. Without oxygen, we cannot proceed into cellular respiration and form lactic acid=pain.

Mold can disrupt mitochondrial complexes and the electromagnetic current generated by Krebs cycle

Mycotoxins and damage to the electron transport chain

- Electrons can leak out of electron transport chain and can reduce oxygen, which can produce **free radicals** such as superoxide and hydrogen peroxide.



Hope J. A review of the mechanism of injury and treatment approaches for illness resulting from exposure to water-damaged buildings, mold, and mycotoxins. *ScientificWorldJournal*. 2013;2013:767482. Published 2013 Apr 18. doi:10.1155/2013/767482

Case Study 1

- Dec 2018: 61 yo WF with SIBO, chronic fatigue, food sensitivities with histamine rich foods, brain fog “always feels high,” and tinnitus who presents to me at Nourish Medical center. Had seen multiple previous doctors with no one believing her and making mild strides in her health.
- PMH: Happy and Healthy childhood. H/o shigella after coming back from Guatemala.
- ROS: No joint pains. No bloating after meals. No undigested food in your stool. No history of Mono. Bronchitis off and on. No h/o headaches.
- +static shocks at night +random SOB +increased urinary frequency
- TGF beta of 10,390 (normal reference 500-2300) and VIP of 10

Case Study 1

- Upon further questioning-Black mold discovered in home 15 years ago due to water damaged house. It was cleaned up immediately so she believed everything was ok. 15 years ago=autoimmunity sx began
- Men in hazmat suits tore “everything” down. Still live in same house and house backs up to conventional tomato farm where they spray herbicide.
- Lives in three cell towers as well.

Case study 1 First Mycotox

Mycotox Profile

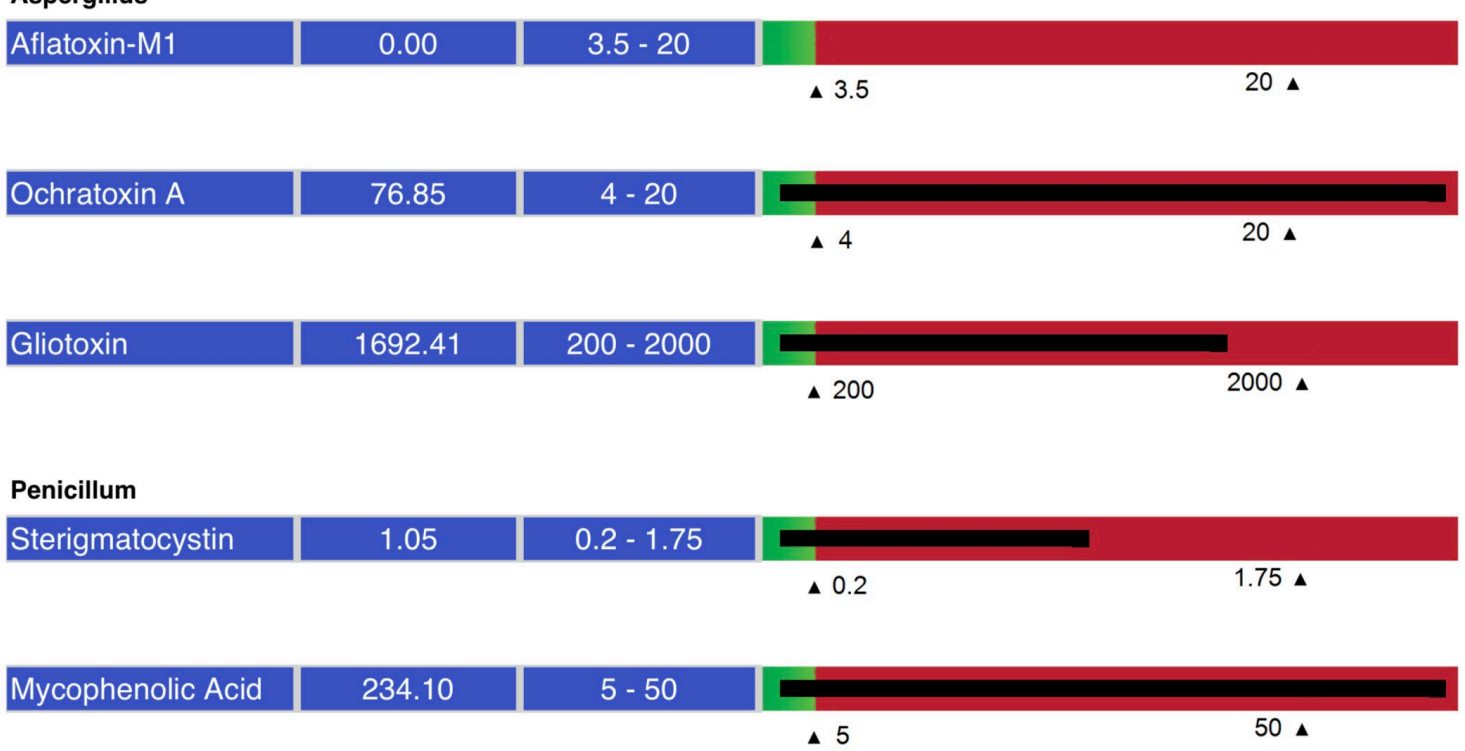
Creatinine Value: 118.57 mg/dl

Metabolite	Results (ng/g creatinine)	Normal Range *	Abnormal Range
Aspergillus			
Aflatoxin-M1	0.00	< 0.5	▲ 0.5
Ochratoxin A	14.34	< 7.5	▲ 7.5
Gliotoxin	0.00	< 200	▲ 200
Penicillum			
Sterigmatocystin	0.00	< 0.4	▲ 0.4
Mycophenolic Acid	0.00	< 37.4	▲ 37.4

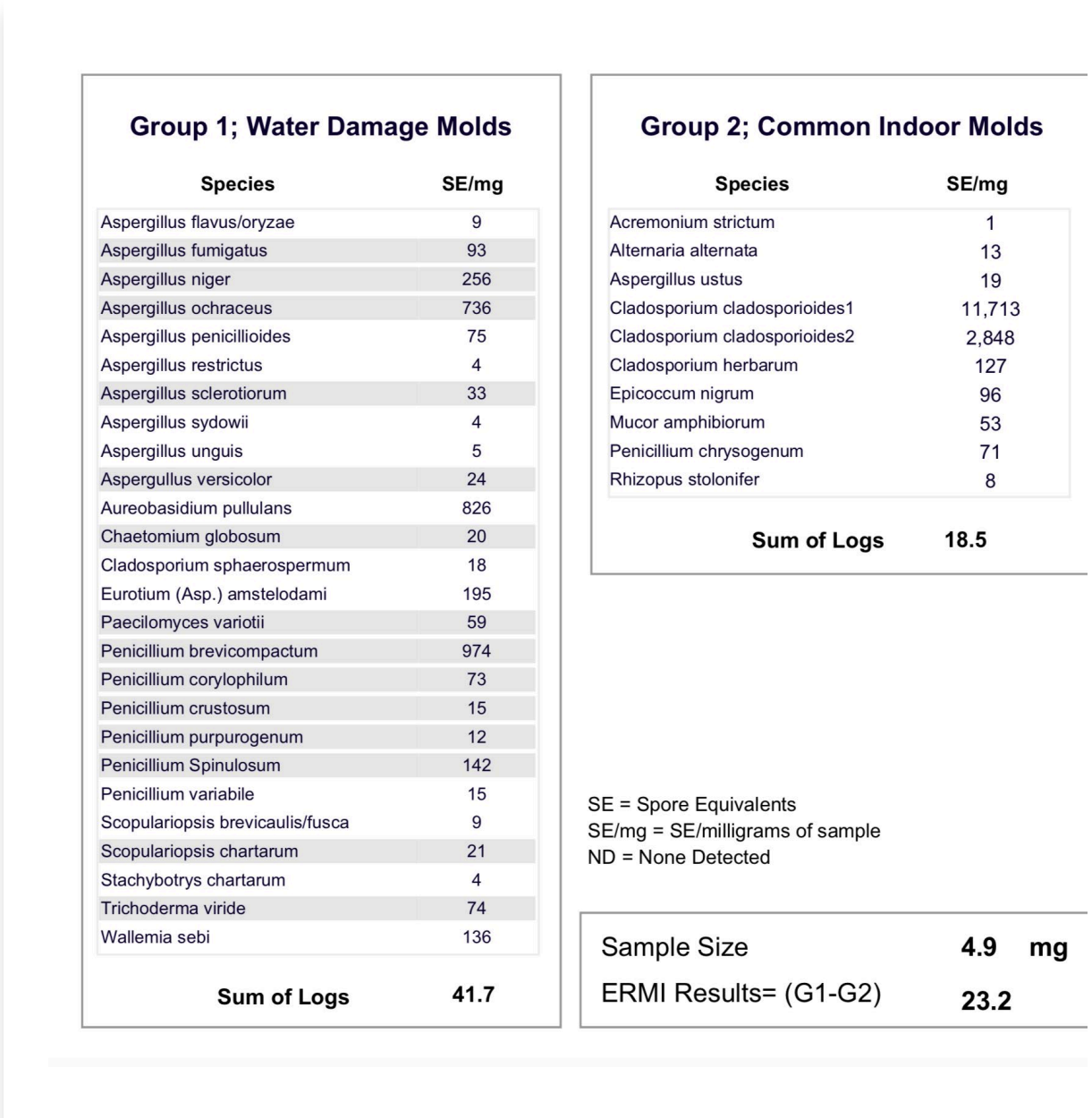
Case study 1 Second Mycotox (2 months later)

MycoTox Profile

Metabolite	Results (ng/g creatinine)	Common Range of Positive Results
Aspergillus		
Aflatoxin-M1	0.00	3.5 - 20
Ochratoxin A	76.85	4 - 20
Gliotoxin	1692.41	200 - 2000
Penicillum		
Sterigmatocystin	1.05	0.2 - 1.75
Mycophenolic Acid	234.10	5 - 50
Stachybotrys		



Case Study 1 continued



Group 1; Water Damage Molds

Species	SE/mg
Aspergillus flavus/oryzae	9
Aspergillus fumigatus	93
Aspergillus niger	256
Aspergillus ochraceus	736
Aspergillus penicillioides	75
Aspergillus restrictus	4
Aspergillus sclerotiorum	33
Aspergillus sydowii	4
Aspergillus unguis	5
Aspergullus versicolor	24
Aureobasidium pullulans	826
Chaetomium globosum	20
Cladosporium sphaerospermum	18
Eurotium (Asp.) amstelodami	195
Paecilomyces variotii	59
Penicillium brevicompactum	974
Penicillium corylophilum	73
Penicillium crustosum	15
Penicillium purpurogenum	12
Penicillium Spinulosum	142
Penicillium variabile	15
Scopulariopsis brevicaulis/fusca	9
Scopulariopsis chartarum	21
Stachybotrys chartarum	4
Trichoderma viride	74
Wallemia sebi	136
Sum of Logs	**41.7**

Group 2; Common Indoor Molds

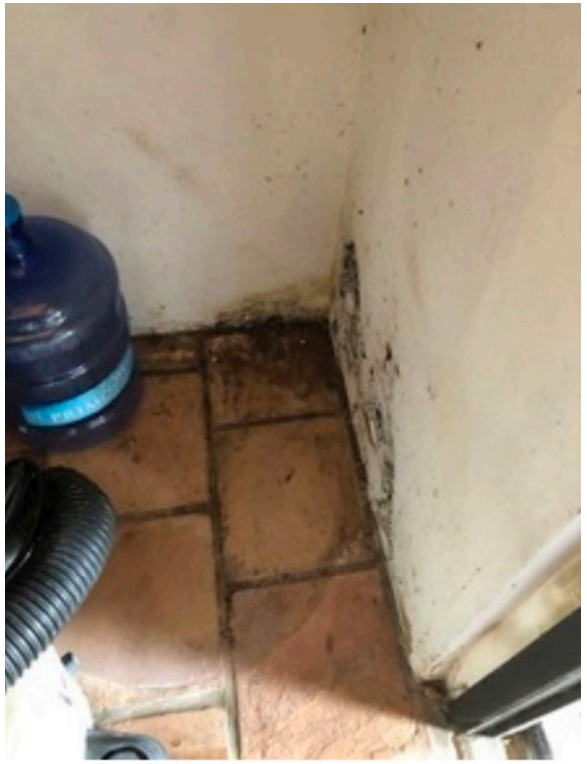
Species	SE/mg
Acremonium strictum	1
Alternaria alternata	13
Aspergillus ustus	19
Cladosporium cladosporioides1	11,713
Cladosporium cladosporioides2	2,848
Cladosporium herbarum	127
Epicoccum nigrum	96
Mucor amphibiorum	53
Penicillium chrysogenum	71
Rhizopus stolonifer	8
Sum of Logs	**18.5**

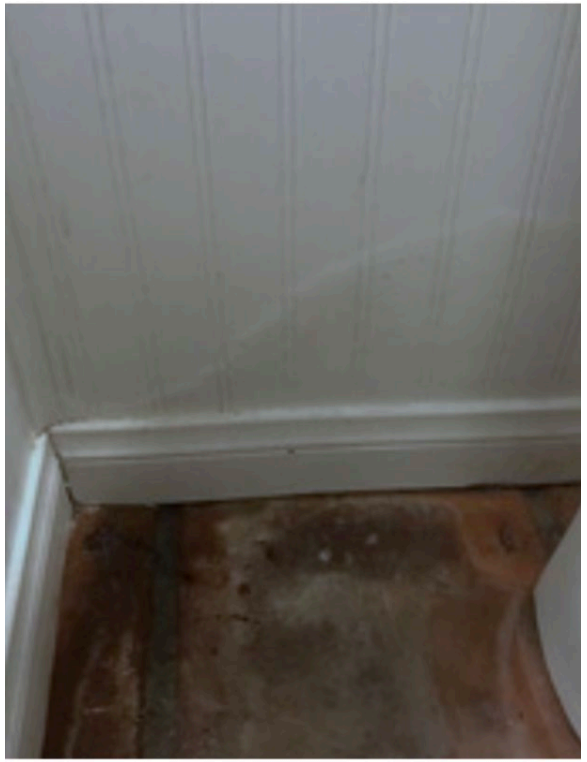
SE = Spore Equivalents
SE/mg = SE/milligrams of sample
ND = None Detected

Sample Size	**4.9**	**mg**
ERMI Results= (G1-G2)	**23.2**	

Mold hides behind walls & in invisible places in the home

Places to look for mold: behind appliances, underneath sinks, leaky roof and window sills, warped or bubbled wood, check ceiling/roof for dampness, cracking or discoloration, anywhere where piping runs, laundry rooms, any areas outside the house where water gathers, gutters, rising damp, attic and crawl spaces





Case Study 2

- Feb 2020: 57 yo WM with PMH of badder cancer in situ, obesity but has lost 12 lbs since diagnosis, seasonal allergies, dairy sensitivity
- When diagnosed, he had a CT due to vague abdominal pain and they thought he had a UTI and was given 2 rounds of abx until before they found the tumor.
- 1/3/20-diagnnosed with cancer in situ of bladder
- PMH: happy and healthy childhood-exposed to second hand smoke growing up
  asthmatic as a child
  since giving up dairy his asthma has resolved
  Got a lot of abx growing up
  fully vaccinated
  had mercury amalgams & dentist removed them unsafely
- Genotype: HLA DR1,3,4,5,DQB1

Reference Number	Locations	Result EU/mg
203663-2	Ambient Living Area - Composite Rooms	49,187

Color-coded interpretation	
If 200 or below	Normal levels.
If between 200 to < 1000	Borderline. Further remediation and re-assessment is indicated.
If greater than 1000	Remediation is needed.

Group 1; Water Damage Molds

Species	SE/mg
Aspergillus flavus/oryzae	N D
Aspergillus fumigatus	5
Aspergillus niger	88
Aspergillus ochraceus	132
Aspergillus penicillioides	32
Aspergillus restrictus	N D
Aspergillus sclerotiorum	2
Aspergillus sydowii	N D
Aspergillus unguis	N D
Aspergillus versicolor	30
Aureobasidium pullulans	1,906
Chaetomium globosum	2
Cladosporium sphaerospermum	19
Eurotium (Asp.) amstelodami	64
Paecilomyces variotii	1,124
Penicillium brevicompactum	187
Penicillium corylophilum	40
Penicillium crustosum	17
Penicillium purpurogenum	2
Penicillium Spinulosum	108
Penicillium variabile	N D
Scopulariopsis brevicaulis/fusca	2
Scopulariopsis chartarum	2
Stachybotrys chartarum	N D
Trichoderma viride	41
Wallemia sebi	27
Sum of Logs	28.8

Group 2; Common Indoor Molds

Species	SE/mg
Alternaria alternata	N D
Acremonium strictum	10
Aspergillus ustus	20
Cladosporium cladosporioides1	459
Cladosporium cladosporioides2	94
Cladosporium herbarum	26
Epicoccum nigrum	283
Mucor amphibiorum	15
Penicillium chrysogenum	53
Rhizopus stolonifer	N D
Sum of Logs	13.7

SE = Spore Equivalents
SE/mg = SE/milligrams of sample
Logs = Logarithms
N D = None Detected

Sample Size	1.0	mg
ERMI Results= (G1-G2)	15.1	

Case Study 2 continued

- ERMI test which showed G4 reading equaling a score of 15 and 49,000 on the LPS endotoxin score (should've been less than 1000).

Level	ERMI Values	Interpretation	Comment
Q 1	Less than - 4	Low Relative Moldiness Index	Further investigation is not needed to determine the sources of the mold.
Q 2	-4 to < 0	Low - Medium Relative	Further investigation may be needed to determine the sources of the mold if occupants have been reactive, sensitized, genetically predisposed or otherwise immuno-compromised.
Q 3	0 to < 5	Medium- High Relative	
Q 4	5 to < 20	High Relative Moldiness Index	Source and cause of mold should be determined and remediation is undertaken, reducing the ERMI to levels below Q2.
	> 20	Very High Relative	

Gender: M Print Date: Jun 11, 2020

Mycotox Profile

Creatinine Value: 123.92 mg/dl

Metabolite	Results (ng/g creatinine)	Normal Range *	Abnormal Range
Aspergillus			
Aflatoxin-M1	0.00	< 0.5	▲ 0.5
Ochratoxin A	25.31	< 7.5	▲ 7.5
Gliotoxin	0.00	< 200	▲ 200
Penicillum			
Sterigmatocystin	0.00	< 0.4	▲ 0.4
Mycophenolic Acid	591.05	< 37.4	▲ 37.4

Case Study 2

Case Study 2 continued

Case Study 2 continued

Questions for your patients:

- Has your work or home recently been flooded or ever had water damage?
- Have you noticed mold in your work or home?
- Are any of your family members or coworkers chronically sick or experiencing similar symptoms to you?
- Do your symptoms get worse on rainy days?
- What do you do for work?
- Are you exposed to dust, chemicals, or fumes at work?
- Do your symptoms change when you're in a particular location? (Keep in mind, sometimes when a person is ill due to mold exposure they increasingly stay at home, which worsens their condition if that's the source.)
- Be sure to rule out other conditions.

Mold and serum labs

- Besides having the haplotype, patients also have: A positive MARCoNS nasal swab.
  - **Exotoxin- and hemolysin-producing, multiply antibiotic resistant coagulase-negative staph (MRCoNS)** (detects biofilms and is a marker of low MSH).
    - exotoxins that may damage MSH & impair its ability to coordinate dendritic cell responses within gut and respiratory mucous membrane compartments.
    - Release hemolysins, which disrupt red blood cell and endothelial membranes, increasing the risk of coagulation abnormalities and anti-phospholipid antibody activity. (risk for Lupus)

Mold and serum labs

Elevated C4a level -C4a elevations represent an excessive innate immune response to biotoxins. Seen in CIRS, lupus and Lyme disease.

Elevated MMP-9 level (an innate immune system activity marker). In biotoxin-related illnesses, MMP-9 is a gelatinase enzyme that tunnels through endothelial and matrix tissue barriers. Higher levels of MMP-9 have been associated with increased tumor invasiveness and with increased permeability in the blood-brain barrier, or leaky brain.

Reduced MSH level (Melanocyte stimulating hormone is a marker of neuropeptide control of multiple functions including mucous membrane-based immune defenses). Alpha-MSH binding to receptors in the brain and on white blood cells reduces inflammatory responses, including decreased production of pro-inflammatory cytokines. Low MSH=susceptibility to mold illness, chronic fatigue, chronic pain (from decreased endorphin production), insomnia (from decreased melatonin production), sexual dysfunction, hormonal abnormalities.

Mold and Serum labs

Elevated TGF-beta 1 level (a marker of an overactive immune system)-cytokine causes tumor suppression, promotes tolerance to allergens and self-antigens. It has been shown to promote immune evasion leading to chronic infections, and chronic elevations result in fibrosis.

Reduced VEGF level (a marker of capillary hypoperfusion). A low level of skeletal muscle VEGF=decreased muscle endurance. Early in CIRS, VEGF can run high, a sign that it is trying to help compensate for low oxygen delivery to tissues.

Reduced VIP level (a marker of blood flow regulation and distribution). Low levels=capillary hypoperfusion and abnormal pulmonary artery pressure at rest or in response to exercise.

Mold and Serum labs

- **Elevated leptin level** (a marker of inflammation-induced disruption of hypothalamic and peripheral leptin receptor function). Leptin receptors exist in the brain and affect ADH levels. Leptin binds to receptors on immune cells, affecting cytokine balance. Weight gain ensues.
- **Reduced ADH and elevated osmolality levels** (a marker of disrupted MSH function). Reduced hypothalamic output of ADH in response to hyperosmolarity is associated with reduced VEGF production in response to low microcirculatory oxygen levels. Decreases in ADH receptor production are associated with autistic behaviors.
    - The low ADH levels found in CIRS patients could potentially account for the social avoidance tendencies described by some of these patients.

Mold and serum labs

Elevated anti-gliadin antibodies (markers of leaky gut and increased risk for autoimmune reactivity). In cases where intestinal hyperpermeability is present (more likely with a low MSH level), gluten reactivity may exist, usually as non-Celiac but can lead to full blown Celiac disease.

Steps to Healing

- The body must clear debris, waste, toxins, and pathogens. This is imperative for a successful healing.
- Glymphatic system of central nervous system was recently discovered. Yes, the brain has its own drainage pathway.
- Mold drastically damages mitochondrial function and ability to make ATP and perform oxidation.
- Lymphatic system, brain, mitochondria, bile, liver, lungs, kidneys, bowels, and excretion through skin must be running at peak performance.

CIRS/mycotoxin Illness Solutions

- Avoidance of any mold exposure and treatment of any other diagnoses (lyme etc). Move out of the moldy house or remediate with an expert.
- Best advice is to open drainage pathways prior to any detox or use of any binder. The patient will thank you later!
- So how did I heal the patients presented?

More on drainage pathways: Mitochondrial Mystery

- Symptoms: Chronic fatigue, brain fog, paresthesias, depression, pain, blood sugar issues
- Caused mainly by fluoroquinolones or other bacteriocidal antibiotics, HAART, steroids, birth control pills, SSRIs, long term infections and exposure to environmental toxicities such as heavy metals, radiation, mold
- How can we expect organs to drain properly and dump what we are killing if the very cells that make them up are not functional?
- Solutions include fulvic and humic acid, amino acids, coq10, NADH

1.Pavón N, Buelna-Chontal M, Macías-López A, et al. On the oxidative damage by cadmium to kidney mitochondrial functions. *Biochem Cell Biol*. 2019;97(2):187-192. doi:10.1139/bcb-2018-0196

2. Kalghatgi S, Spina CS, Costello JC, et al. Bactericidal antibiotics induce mitochondrial dysfunction and oxidative damage in Mammalian cells. *Sci Transl Med*. 2013;5(192):192ra85. doi:10.1126/scitranslmed.3006055

More on Drainage pathways- Brain Drain

- The first scholarly article on this brain-wide fluid transport system was published in August of 2012. Neuroscientist Dr. Maiken Nedergaard coined the term “glymphatic”
- Glymphatic system, in which cerebrospinal fluid is exchanged with interstitial fluid, facilitated by the aquaporin-4 water channels on the astroglial endfeet.
- This system drains best while sleeping. Sleeping also decreases cytokine release and inflammatory cascade initiated in CIRS.

Iliff, Jeffrey and Nedergaard, Maiken. “A Paravascular Pathway Facilitates CSF Flow Through the Brain Parenchyma and the Clearance of Interstitial Solutes, Including Amyloid β.” *Science Translational Medicine*. Vol. 4, No. 147, 15 Aug 2012

More on Drainage Pathways-Lymphatic system

- The glymphatic system empties into the deep cervical lymph nodes of the lymphatic system that drains the whole body
- Consists of spleen, thymus, adenoids, tonsils, MALT, GALT, bone marrow, Peyer's patches, lymph nodes and the appendix
- If sluggish, patients will not sweat, complain of rashes/pruritis and cellulite.
- Solutions include Restful sleep, Lymphatic compression, standing rather than sitting, craniosacral therapy, massage, dry-brushing, sauna, exercise

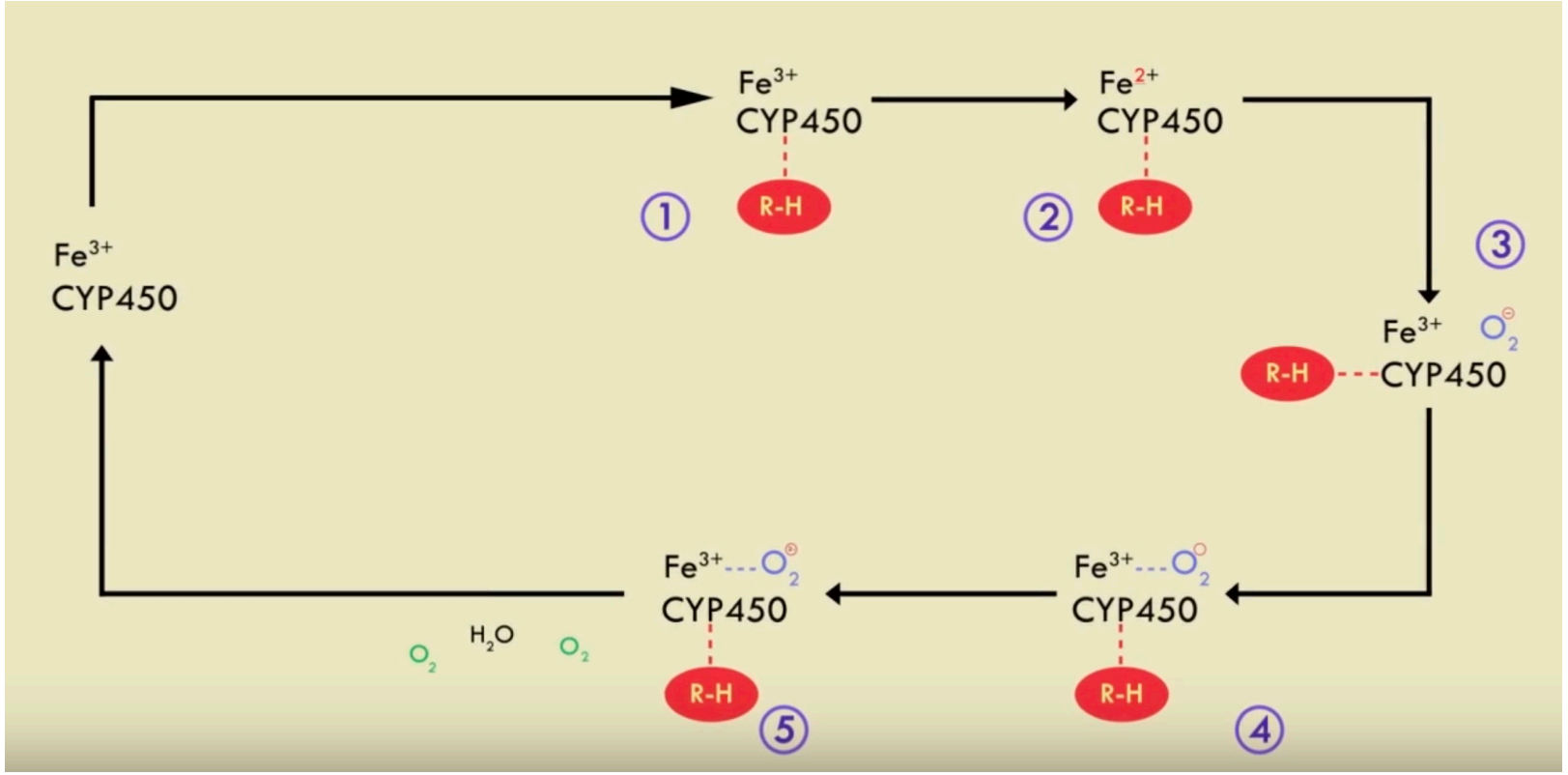
More on Drainage Pathways- Liver/bile toxicity

- Liver aminotransferases are not sensitive enough to detect a stagnant liver.
- NAFLD is an example of a stagnant liver-this is 25% of the population.
- If the liver or bile is blocked, patients taking antibiotics or natural remedies will not do well with an aggressive protocol.
- Phase I and Phase II liver detoxification push 80% of toxins into the bile. It could be said that bile is Phase III of the drainage/detoxification process.
- Clogging of the bile duct leads to biliary sludge and abnormal bile circulation. Toxins, invaders, and other debris build up, leading to chronic illness and disease.

Portillo-Sanchez P, Bril F, Maximos M, et al. High Prevalence of Nonalcoholic Fatty Liver Disease in Patients With Type 2 Diabetes Mellitus and Normal Plasma Aminotransferase Levels. *J Clin Endocrinol Metab*. 2015;100(6):2231-2238. doi:10.1210/jc.2015-1966

Lim JH, Kim SY, Park CM. Parasitic diseases of the biliary tract. *AJR Am J Roentgenol*. 2007;188(6):1596-1603. doi:10.2214/AJR.06.1172

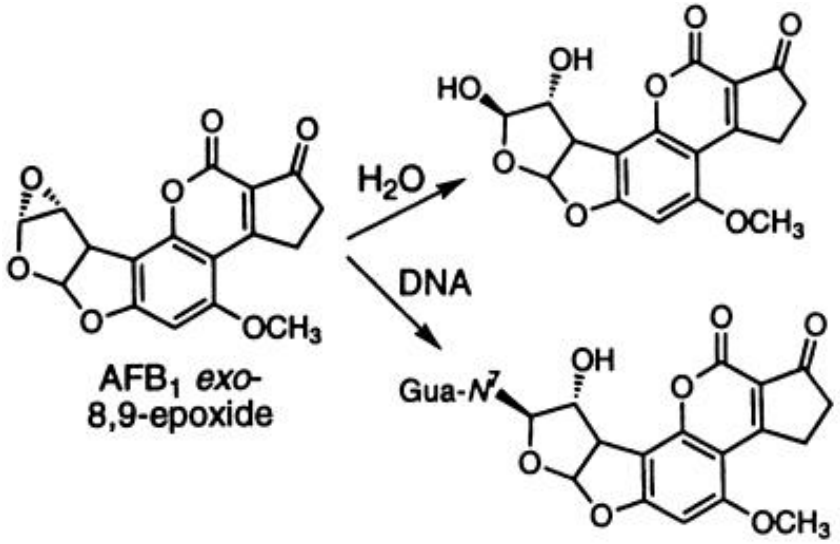
Mold and Phase 1 Liver CYP enzymes



- CYP450 must be reduced and then oxidized again in order to be re-used for phase one metabolism

Aflatoxin and Phase 1 bioactivation

- The pure form of aflatoxin B1 has no mutagenic activity. The biotransformation of this compound through the reaction of epoxidation is what changes the AFB1 to a potent carcinogen in phase one. The compound formed by epoxidation is highly electrophilic and can react quickly, through covalently with nucleophilic sites of macromolecules, such as DNA, RNA and proteins. It is the activity the gluthathione S transferase in phase 2 that determines how quickly this carcinogen can be inactivated



Hamid AS, Tesfamariam IG, Zhang Y, Zhang ZG. Aflatoxin B1-induced hepatocellular carcinoma in developing countries: Geographical distribution, mechanism of action and prevention. *Oncol Lett*. 2013;5(4):1087-1092. doi:10.3892/ol.2013.1169

Mycotoxins detoxify via different routes

Phase II Pathways and Associated Mycotoxins

Phase II Pathway / Mycotoxin	Unknown	Acetylation	Amino Acid Conjugation	Glutathione Conjugation	Glucuronidation	Methylation Conjugation	Sulfation
Aflatoxin B1				X			
Aflatoxin B2					?		
Alternaniol					X	X	
Citrinin	X						
Chaetoglobosin	X						
Doxynivalenol		X					
Diacetoxyscripenol (Type A Trichothecene)					X		
DON (Doxynivalenol)					X		X
Enniatin B	X						
Gliotoxin	X						
Mycophenolic Acid					X		
Nivalenol		X					
Ochratoxin			X	X	X		
Riordin E		X			X		
Sterigmatocystin					X		
T-2 Toxin (Trichothecene)					X		X
Verrucarin A (Trichothecene)		X			X		
Zearalenone					X	X	

https://www.betterhealthguy.com/episode122: Neil Nathan, MD

More on Drainage pathways-Liver/bile toxicity

- Solutions: tauroursodeocholic acid (water soluble bile acid), coffee enemas, castor oil packs
  - Coffee contains caffeine and choleretics, which are substances that increase the volume and secretion of bile.
  - Castor oil contains ricinoleic acid (RA), which has been shown in studies to exert remarkable analgesic and anti-inflammatory effects.

. Vieira C, Evangelista S, Cirillo R, Lippi A, Maggi CA, Manzini S. Effect of ricinoleic acid in acute and subchronic experimental models of inflammation. *Mediators Inflamm*. 2000;9(5):223-228. doi:10.1080/09629350020025737

Iqbal J, Zaib S, Farooq U, Khan A, Bibi I, Suleman S. Antioxidant, Antimicrobial, and Free Radical Scavenging Potential of Aerial Parts of Periploca aphylla and Ricinus communis. *ISRN Pharmacol*. 2012;2012:563267. doi:10.5402/2012/563267

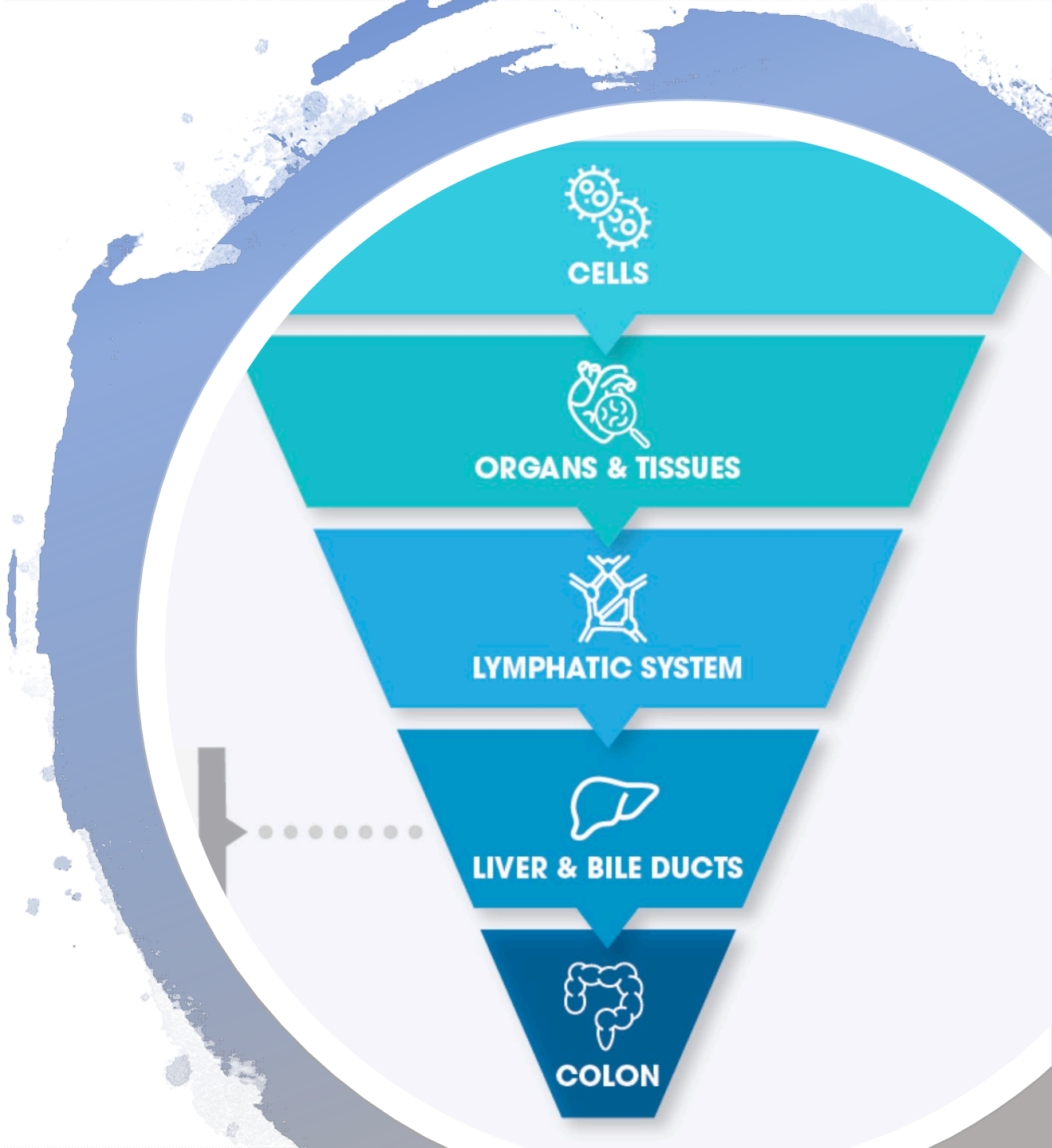
Kim ES, Chun HJ, Keum B, et al. Coffee enema for preparation for small bowel video capsule endoscopy: a pilot study. Clinical nutrition research 2014;3:134-41.

More on Drainage pathways- Colon/constipation

- Liver/bile duct drains into duodenum so if colon is sluggish than the whole drain will be backed up in the body.
- Constipation may be caused by stressed kidneys or slight dehydration
- Notice that patients that are more fatigued or have CFS are diagnosed with gut inflammation/constipation more as well. if they are not moving toxins from their body, mycotoxin spores included, this causes fatigue.
- Solutions: colonics, enemas, fiber, extra hydration, exercise, magnesium, senna, chew food well, bitters, eat whole and real foods without processed sugar including organic vegetables and whole grains.

CELLCORE DRAINAGE FUNNEL

- This prevents Herxheimer reactions and increases patient compliance
- Patient feels 50% of the way better just from returning body to homeostasis.
- Binders are the single most important supplement for CIRS, but must have bowel/sweat pathway open.
- Mold is lipophilic so need a binder that crosses the blood brain barrier/doesn't just stay in the gut



Comparison of other binders on the market

The new breakthrough in binders are bioactive carbons which make spent carbons obsolete. By adding polyelectrolytes and amino acids, you give it the ability to bind and repair, while not stripping nutrition. Increased microporosity gives it higher efficacy. NRF2 activated by sulfurophane

- https://www.betterhealthguy.com/episode122; Neil Nathan, MD

Binder / Mycotoxin	Activated Charcoal	Bentonite Clay	Chlorella	Cholestyramine	Diatomaceous Earth	Glucomannan	NAC	Propolmannan	Sacc B	Welchol	Zeolite
Aflatoxin	X	X	X		X	X					X
Chaetoglobosin	?	?	?	?			?		?		
Enniatin B		X							X		
Gliotoxin		X					X	X	X		
Ochratoxin	X			X	X	X				X	X
Trichothecene	X	?				X					X

Mycotoxin	Organ System for Detox
Ochratoxin A	Renal (Urinary)
Zearalenone	
AFB-1	
Patulin	
Ochatoxin A	Gastroinestinal (Fecal)
Zearalenone Chicory inulin	
T-2 Toxin (trichothecene)	
AFB-1	
DON	
Ochatoxin A	Enterohepatic Circulation
Zearalenone	

Mycotoxin detoxification via Organ System

Real Solutions and Science-based Products that work

- CT minerals to feed cells with amino acids and vital nutrition needed for organs and cells to function
- Advanced TUDCA to sequester and move bile and open up the liver pathway
- MitoATP to perform ATP production with oxygen as the last acceptor of an electron in the electron transport chain.
- Hydroxygen to hyperoxygenate the body, aiding in cellular mitochondrial recovery as well as supporting phase 1 CYP enzymes which utilize oxygen in their biochemical structure
- Inflammacontrol to calm the innate immune system response and subsequent inflammatory cascade; activates NRF2 pathway and enzymatic ROS systems in mitochondria

Supporting the body

- Supporting proper bowel movements, phase 1 and phase 2 liver detoxification and mitochondria is imperative
- Triggering the sweat pathway open with regular sauna sessions combined with binders
- Supplementing adequate omega 3's in diet and avoiding food that can grow mold. (corn, coffee, berries)
- Nasal sprays can be helpful.
- Be aware that mold often does not run alone- candida, tick associated illnesses, and viruses are often counterparts
- Listen to your body! It is smarter than all of us.