DR. HYMAN+

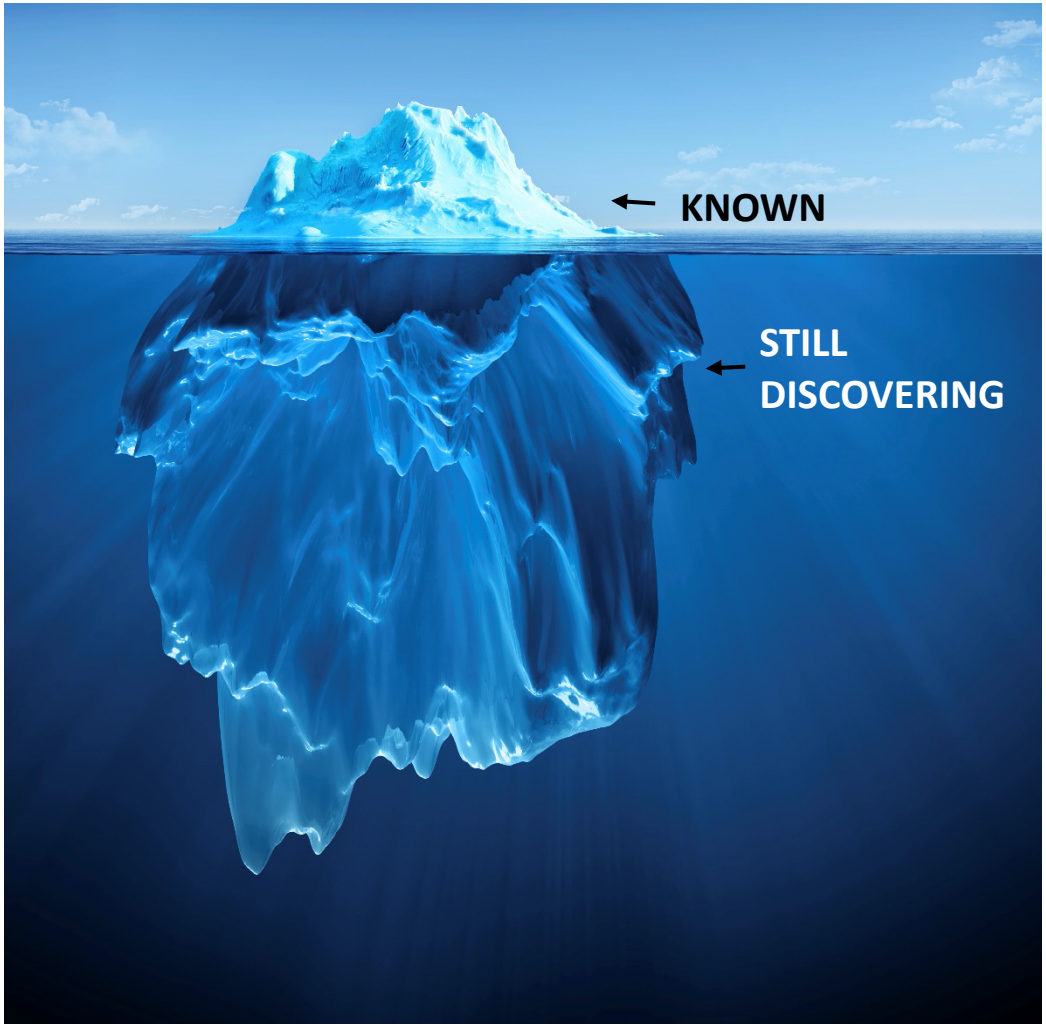
It Might Be Mold, Now What?

Ann Shippy, MD, ABIM, CIFMP
Board Certified Internal Medicine
Certified Functional Medicine
AnnShippyMD.com

Ann Shippy MD
EVERY LIFE WELL.

It’s Personal

Mold Knowledge

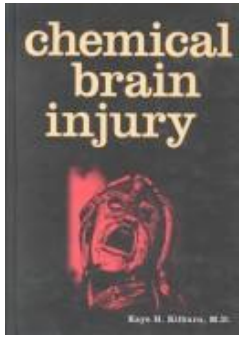


MOLD - Definitions

- Spores
- Mycotoxins
- MVOC's
- Grow with gram negative Bacteria and mycobacteria in water damaged buildings
- Other toxins

Chemical Brain Injury

Kaye Kilburn,1998



- Hypothesis: "A Hidden Pandemic"
- Toxic exposures (arsenic, chlordane, PCBs, TCE, toluene, etc.) frequently lead to misdiagnoses of psychiatric illnesses, including somatization disorder and PTSD.
- Since the limbic system is most intertwined with the olfactory (the portal of entry), it displays the greatest effects, i.e. emotions

Table 1: Pesticides & Childhood Health Harms

		Childhood Health Harms*					
		Brain & nervous system impacts	Childhood cancers	Birth defects	Reproductive & developmental harms	Metabolic effects (e.g., obesity, diabetes)	Immune disorders, asthma
Pesticides	**Herbicides** 442 million lbs † *e.g., atrazine, glyphosate, 2,4-D*	✓	✓	✓	✓		✓
	Insecticides 65 million lbs *e.g., chlorpyrifos, malathion, permethrin*	✓	✓		✓	✓	✓
	Fungicides 44 million lbs *e.g., mancozeb, chlorothalonil*	✓	✓	✓	✓		✓
	Fumigants 108 million lbs *e.g., metam sodium, methyl bromide, chloropicrin*	✓	✓		✓		

Researchers have linked exposure to various pesticides with a range of childhood health harms. A ✓ indicates that links to the health harm are particularly well supported by scientific evidence.

* See Appendix A and www.pesticideinfo.org

† 2007 use estimates, refers to "active ingredient." From *Pesticide Industry Sales & Usage, 2006 and 2007 Market Estimates*, U.S. EPA, Washington, DC, Feb 2011. See www.epa.gov/opp00001/pestsales/07pestsales/market_estimates2007.pdf. Table 3.4.

http://www.panna.org/publication/generation-in-jeopardy

EXS. 2010;100:31-63.

Toxicology of mycotoxins.

Paterson RR[1], Lima N.

Author information

Mycotoxins are more toxic than pesticides

Fungal metabolites have synergistic effects

Abstract

Humans are exposed to mycotoxins via ingestion, contact and inhalation. This must have occurred throughout human history and led to severe outbreaks. Potential diseases range from akakabio-byo to stachybotryotoxicosis and cancer. The known molecular bases of toxicology run the gamut of 23 compounds, from aflatoxins (AFs) to zearalenone, ochratoxin A and deoxynivalenol. Ergotism is one of the oldest recognized mycotoxicosis, although mycotoxin science only commenced in the 1960s with the discovery of AFs in turkey feed. AFs are carcinogenic. Some others are suspected carcinogens. The effects of mycotoxins are acute or chronic in nature. Mycotoxins are well known in the scientific community, although they have a low profile in the general population. An incongruous situation occurs in United States where mycotoxins from "moldy homes" are considered to be a significant problem, although there is a general debate about seriousness. This contrasts with the thousands of deaths from mycotoxins that occur, even now, in the technologically less developed countries (e.g., Indonesia, China, and Africa). Mycotoxins are more toxic than pesticides. Studies are moving from whole animal work to investigating the biochemical mechanisms in isolated cells, and the mechanisms of toxicity at the molecular level are being elucidated. The stereochemical nature of AFs has been shown to be important. In addition, the effect of multiple mycotoxins is being increasingly investigated, which will more accurately represent the situation in nature. It is anticipated that more fungal metabolites will be recognized as dangerous toxins and permitted statutory levels will decrease in the future.

Mold and Mental Health Diagnosis

- Health Hazard Evaluation Report HETA 2005-0135-3116 Alcee Fortier Senior High School New Orleans, Louisiana September 2010 DEPARTMENT OF HEALTH AND HUMAN SERVICES Centers for Disease Control and Prevention Workplace Safety and Health National Institute for Occupational Safety and Health

Lower Respiratory				
Cough	35 (43)	11 (10)	4.16 (2.26, 7.68)	<0.01
Wheezing or whistling in chest	19 (23)	2 (2)	12.13 (2.91, 50.62)	<0.01
Chest tightness	22 (27)	0	+inf (7.69, +inf)[†]	<0.01
Unusual shortness of breath	19 (24)	4 (4)	6.22 (2.20, 17.56)	<0.01
Upper Respiratory				
Sinus problems	27 (33)	14 (13)	2.44 (1.37, 4.35)	<0.01
Dry or irritated eyes	16 (20)	12 (11)	1.72 (0.86, 3.44)	0.12
Nosebleeds	3 (4)	1 (1)	3.70 (0.53, 47.02)	0.33
Sore or dry throat	21 (24)	13 (13)	1.95 (1.04, 3.67)	0.03
Frequent sneezing	17 (20)	4 (4)	5.23 (1.83, 14.96)	<0.01
Stuffy nose	25 (29)	10 (10)	3.09 (1.57, 6.07)	<0.01
Runny nose	22 (25)	7 (7)	3.87 (1.73, 8.62)	<0.01
Constitutional				
Fever or sweats	14 (16)	4 (4)	4.10 (1.40, 12.01)	<0.01
Aching all over	12 (14)	4 (4)	3.71 (1.24, 11.08)	0.01
Unusual tiredness or fatigue	25 (31)	18 (17)	1.78 (1.04, 3.03)	0.03
Headache	30 (35)	21 (20)	1.74 (1.08, 2.81)	0.02
Neurobehavioral				
Difficulty concentrating	15 (18)	4 (4)	4.63 (1.60, 13.44)	<0.01
Confusion or disorientation	8 (10)	2 (2)	5.05 (1.25, 29.56)	0.02
Trouble remembering things	15 (17)	5 (5)	3.59 (1.36, 9.47)	<0.01
Irritability	19 (22)	15 (14)	1.51 (0.82, 2.80)	0.18
Depression	6 (7)	2 (2)	3.74 (0.87, 20.82)	0.14
Change in sleep patterns	16 (19)	4 (4)	4.99 (1.73, 14.37)	<0.01
Rash, dermatitis, or eczema (on face, neck, arms, or hands)	12 (14)	4 (4)	3.70 (1.24, 11.06)	0.01

Symptoms - continued

- Fatigue
- Night Sweats
- Sugar Cravings / Loss of appetite
- Urticaria / Hives / Rash / Eczema
- Allergies/ Sinus congestion
- Asthma / Chronic cough
- Heart burn / Nausea
- Abdominal pain / Bloating
- Urinary urgency / Incontinence
- Weight gain
- Weight loss due to malabsorption
- Food sensitivities
- Excessive thirst, dehydration
- Autoimmune disorders
- Raynaud's syndrome
- Inflammatory bowel disease
- Recurrent/chronic infections
- Miscarriages
- Birth Defects
- Nose bleeds
- Leukopenia,
- Thrombocytopenia
- Alopecia
- Myalgia, arthralgia

Symptoms

- Headache
- Fasciculations
- Neuropathy – weakness, pain
- Transient numbness, Tingling
- Dizziness / Vertigo
- **“Brain Fog”**
- **Memory loss**
- **Computational skills**
- **Lower executive function**
- Decision making
- ADHD, ADD, Autism
- Tremor
- Tics
- **Depression / Anxiety / OCD**
- **Irritability**
- **Easily frustrated or angered**
- Poor depth perception
- Insomnia
- Leukopenia
- Autonomic dysfunction

Neurocognitive Symptoms

- Measured IQ scores in children exposed to indoor mold for more than 2 years showed statistically significant IQ deficits of approximately 10 points using the WISC-R scale of intelligence.
  - Longer exposure tripled the risk of low IQ scores
  - Depression increased in exposure to damp indoor environments
- Patients present with other classic neurologic disorders including:
  1. Pain syndromes
  2. Movement disorders
  3. Delirium
  4. Dementia
  5. Disorders of balance and coordination

Routes of Exposure

- **Gastrointestinal:** through ingestion of contaminated food, beverages and water
- **Respiratory:** inhalation of aerosolized particles
- **Mucous**
- **Cutaneous**

Inhalation

- Experiments studying effects of acute inhalation of T2 mycotoxins in both young and mature mice showed that inhalation of T2 mycotoxins is:
  - At least 10 times more toxic than systemic administrations
  - At least 20 times more toxic than dermal administration

Research on Mycotoxins and mVOC's

- Increasing body of research
- Increasing understanding of cellular mechanisms and impact on animal and human health
- This will help us understand the importance of limiting exposures
- Illuminate potential treatments

What are the Mechanisms?

- Inflammation
- Mitochondrial damage
- Immune system disruption
- Cytotoxic
- Genotoxic
- Cell membrane damage
- Glutathione depletion
- Cell apoptosis
- Microbiome disruption

MYCOTOXINS

- Hepatotoxins
- Nephrotoxins
- **Neurotoxins**
- **Immunotoxins**
- Teratogens
- Mutagens,
- Carcinogens
- Allergens
- Most Physicians are unaware of the effects of mycotoxins

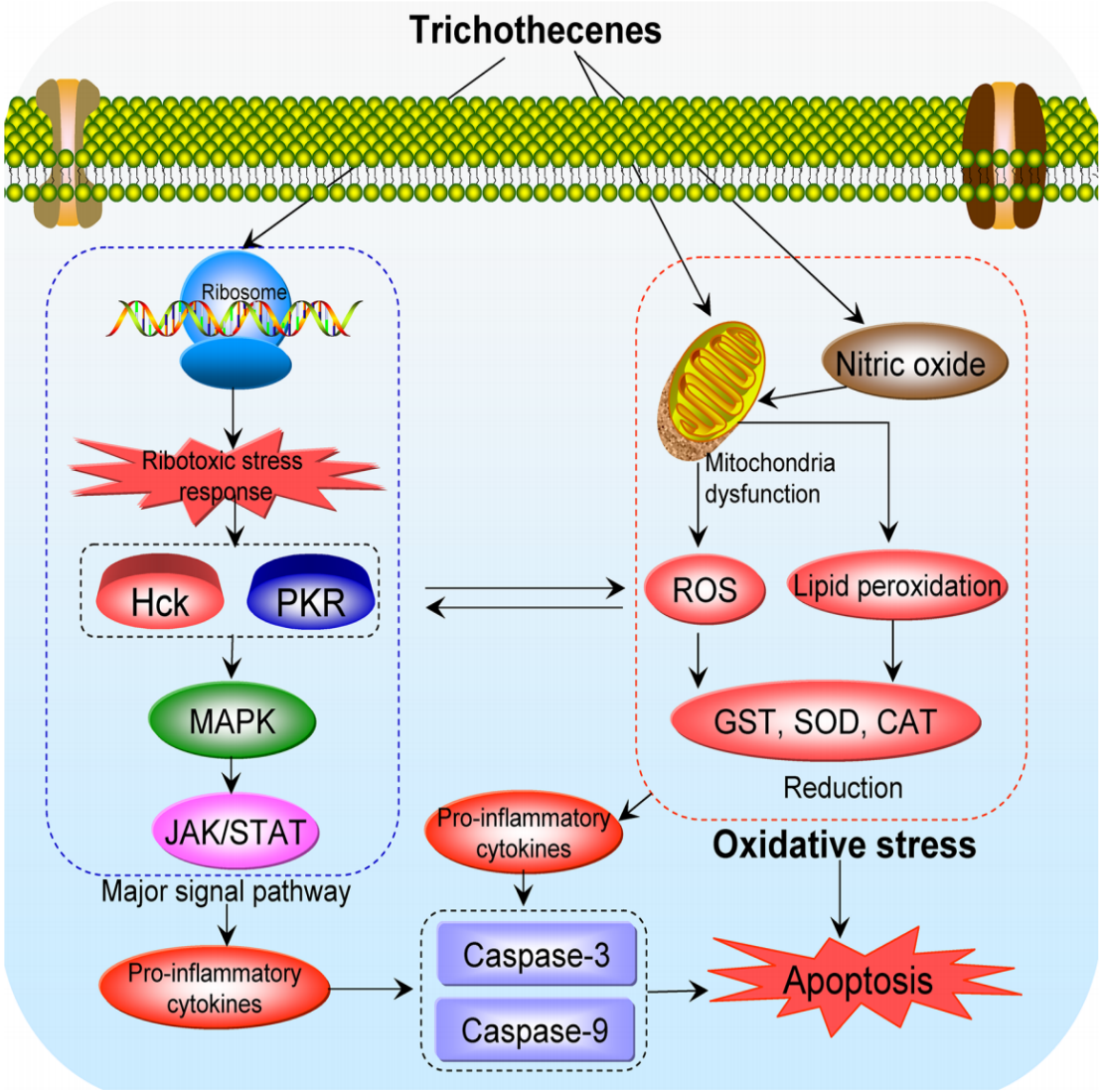
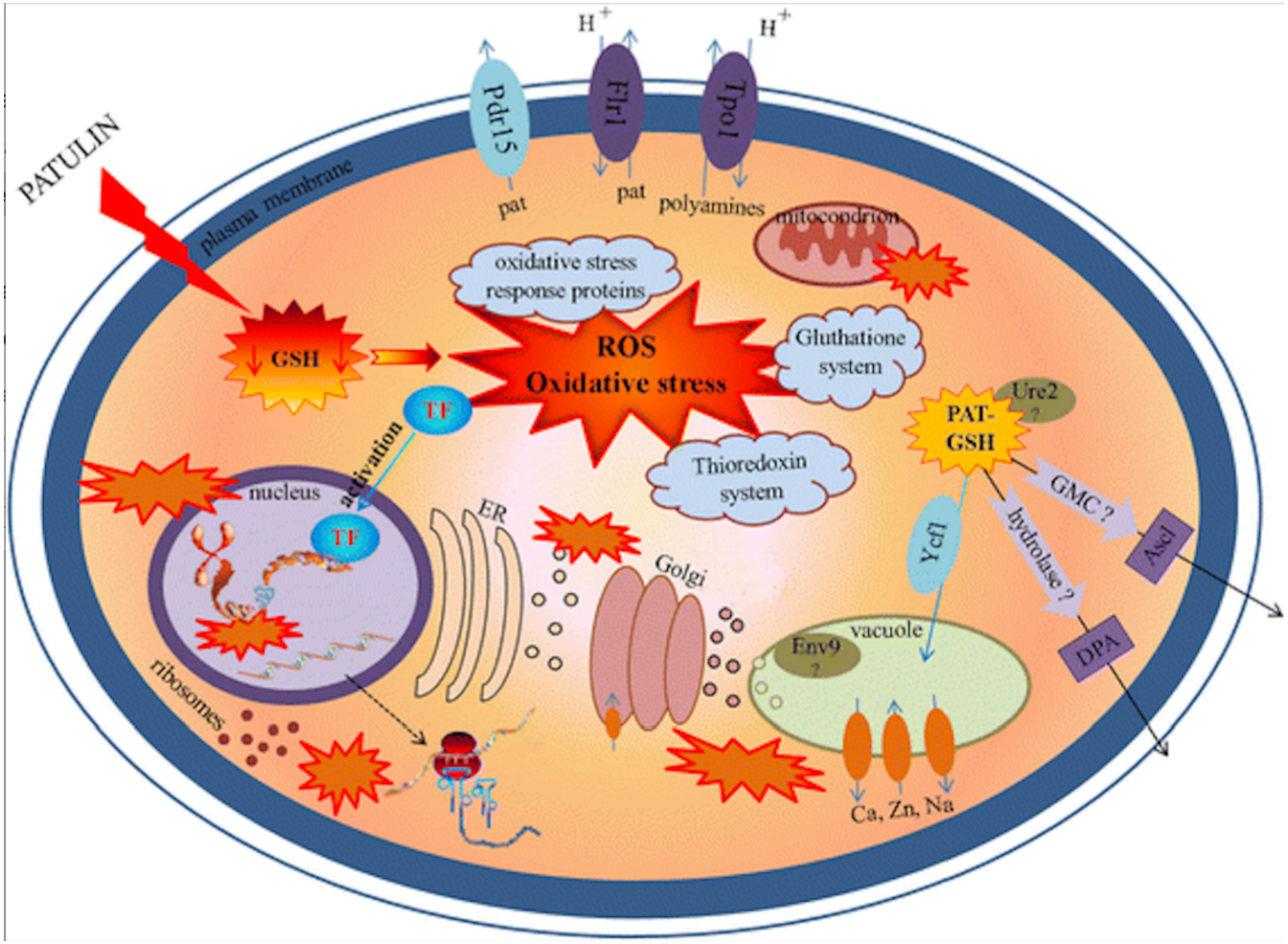
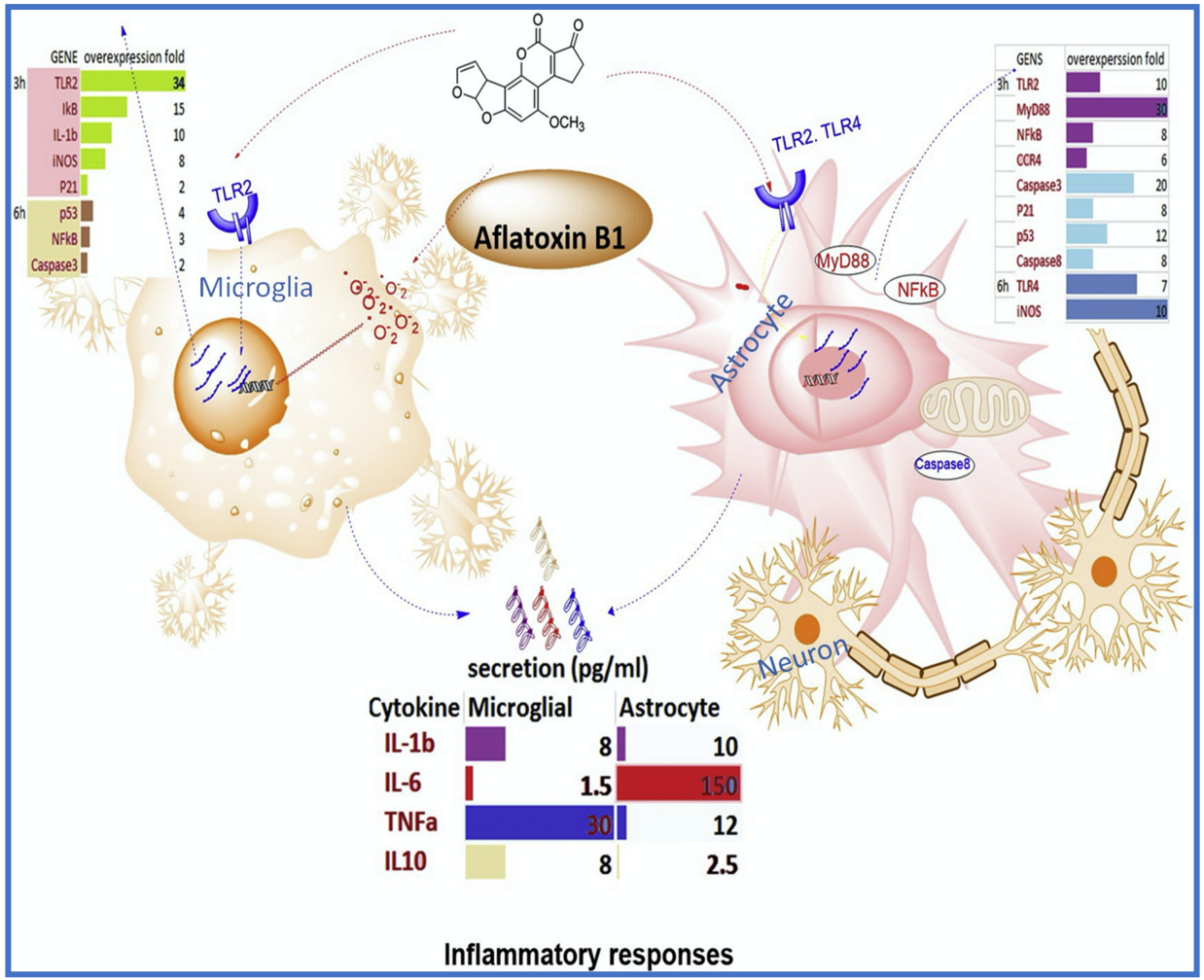


Figure 3: Proposed mechanisms of oxidative stress-mediated toxicity of trichothecenes.

Patulin's Cellular Effects



Aflatoxin Effects



The Role of Autoimmunity

Toxicol Ind Health. 2018 Jan;34(1):44-53. doi: 10.1177/0748233717733852. Epub 2017 Oct 25.

Neural autoantibodies in patients with neurological symptoms and histories of chemical/mold exposures.

Abou-Donia MB[1], Lieberman A[2], Curtis L[2].

Author information

Abstract

A number of studies have linked exposures to industrial and household chemicals and biological toxins to increased risk of autoimmunity in general and elevated levels of autoantibodies to neural antigens specifically. Elevated neural autoantibodies are biomarkers for many diseases such as multiple sclerosis and Parkinson's disease. Our study reports levels of six types of neural autoantibodies in a group of 24 toxicant-exposed patients. The patients were exposed to a variety of toxicants including contaminated drinking water (four patients), building water/mold damage (eight patients), pesticides (four patients), and other assorted toxic chemicals (eight patients). Levels of all six neural autoantibodies were significantly elevated in most patients and in the patient group at large, with mean antibody levels for the 24 chemically exposed patients (relative to a healthy control population), in descending order: 475% for tau proteins, 391% for microtubule associated proteins-2, 334% for neurofilament proteins (NFP), 302% for myelin basic protein, 299% for glial fibrillary acidic proteins, and 225% for tubulin. Tau protein autoantibodies were significantly elevated in the patient groups with peripheral neuropathy, muscle and joint pain, asthma, and chemical sensitivity. Autoantibodies to tubulin were significantly higher in the chemical sensitivity and asthma patients, autoantibodies to NFP were significantly higher in the patients with sleep apnea, whereas S-100B autoantibodies were significantly increased in patients with muscle/joint pain, asthma, and apnea/insomnia. In patients exposed to environmental toxicants, measurements of autoantibodies may be useful for prevention, diagnosis, and treatment. This study adds to the scientific literature the ability of a broad spectrum of environmental triggers adversely affecting the nervous system through the process of autoimmunity, which may explain the increasing incidence of neurodegenerative diseases.

KEYWORDS: Chemical exposures; antibody; mold; neural autoantibodies; pesticides; tau proteins

The Role of Inflammation

J Neuroimmunol. 2017 Dec 15;313:92-98. doi: 10.1016/j.jneuroim.2017.10.016. Epub 2017 Oct 28.

Inflammation-induced depression: Its pathophysiology and therapeutic implications.

Jeon SW[1], Kim YK[2].

Author information

Abstract

Inflammation is not the only cause of depression and cannot explain its entire pathophysiology, but it is an important pathogenic factor that explains one possible mechanism of depression, with the kynurenine (KYN) pathway of tryptophan at its center. In particular, greater impairment seems to exist in the KYN pathway in inflammation-induced depression related to immunotherapy, autoimmune disease, and infection. In patients with these conditions, immunopharmacology is likely to be an important therapy. To develop this therapy, clear evidence of the immune-KYN pathway must be established via multiple types of experiments. This paper reviews the body of evidence, not only for the action of tryptophan (TRY) and consequent serotonin depletion, but also for the detrimental effects of TRY catabolites and the key enzymes in the KYN pathway that play important roles in the pathophysiology of inflammation-induced depression. In addition, this paper explores a potential treatment strategy for inflammation-induced depression using KYN metabolism.

KEYWORDS: Depression; Immunopharmacology; Inflammation; Kynurenine pathway; Tryptophan

PMID: 29153615 DOI: 10.1016/j.jneuroim.2017.10.016

mVOC's Affect Bone Marrow and increase Cell Membrane Fluidity

Can J Microbiol. 2014 Jan;60(1):1-4. doi: 10.1139/cjm-2013-0708. Epub 2013 Nov 15.

The effects of fungal volatile organic compounds on bone marrow stromal cells.

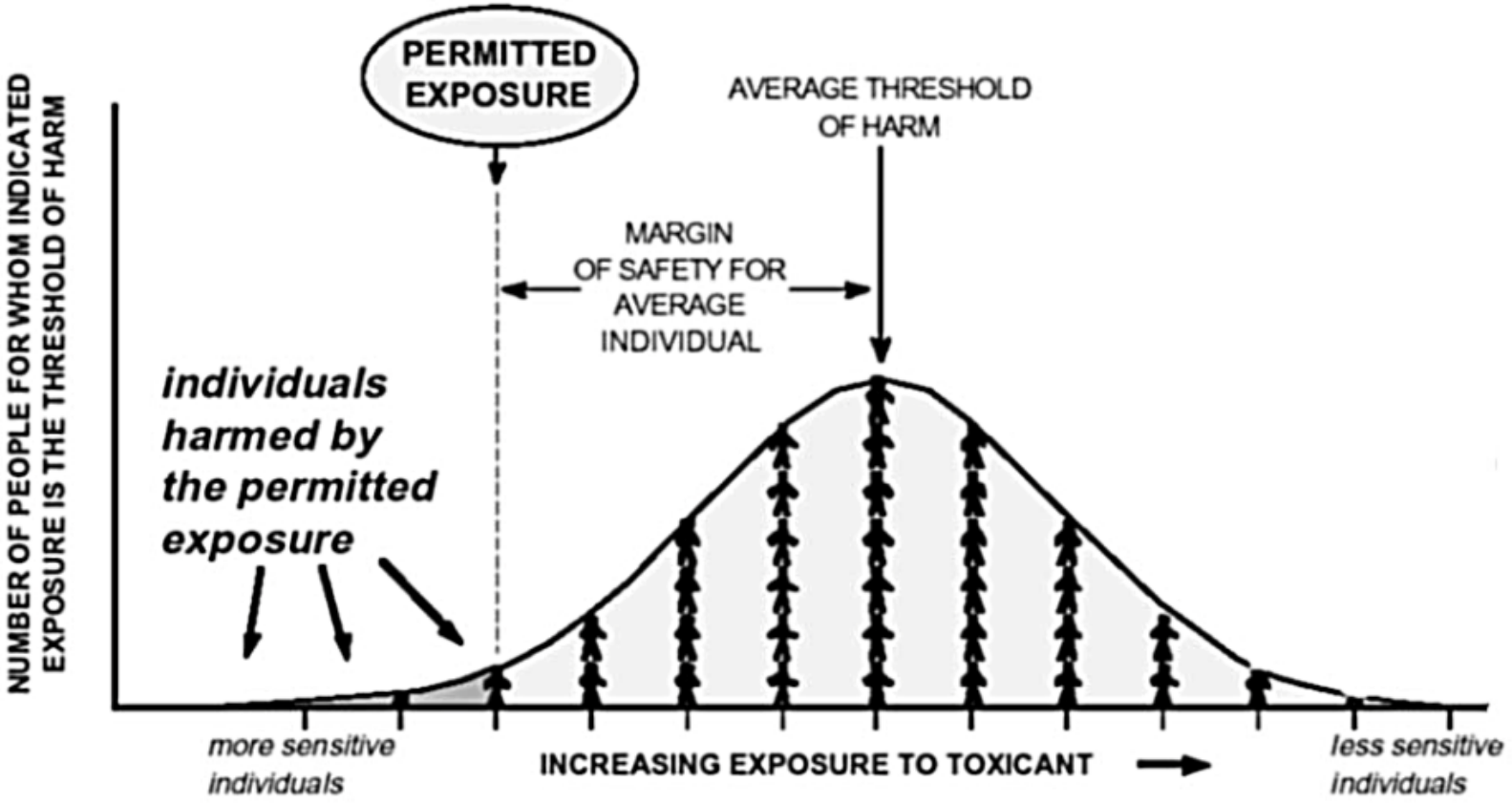
Hokeness K[1], Kratch J, Nadolny C, Aicardi K, Reid CW.

Author information

Abstract

Evidence has shown that individuals exposed to indoor toxic molds for extended periods of time have elevated risk of developing numerous respiratory illnesses. It is not clear at the cellular level what impact mold exposure has on the immune system. Herein, we show that 2 fungal volatiles (E)-2-octenal and oct-1-en-3-ol have cytotoxic effects on murine bone marrow stromal cells. To further analyze alterations to the cell, we evaluated the impact these volatile organic compounds have on membrane composition and hence fluidity. Both (E)-2-octenal and oct-1-en-3-ol exposure caused a shift to unsaturated fatty acids and lower cholesterol levels in the membrane. This indicates that the volatile organic compounds under investigation increased membrane fluidity. These vast changes to the cell membrane are known to contribute to the breakdown of normal cell function and possibly lead to death. Since bone marrow stromal cells are vital for the appropriate development and activation of immune cells, this study provides the foundation for understanding the mechanism at a cellular level for how mold exposure can lead to immune-related disease conditions.

Spectrum of Vulnerability



Who is Susceptible?

- **Everyone** with high enough exposure
- Immunosuppressed, Fetus, Children and Elderly
- Genetic (HLA, P450, methylation, comt, glutathione, NAT, VDR, hist)
- Chronic or high dose exposure
- Other toxic load compromising detox pathways, immune system and repair
- Those exposed to Synergistic toxins

Who is Most Affected by Mold?

- High Exposure or Chronic Exposure
- Children (increased respiratory rate, developing immune, detox and neurological systems)
- Pets….
- Nutrient deficiencies
- High sugar, low protein, low fat diet
- Toxin Load: heavy metals, pesticides, solvents and plastics
- Stress, emotional trauma
- Intestinal dysbiosis
- Detox Methylation and Immune Genomics SNP’s