
MOSAIC
DIAGNOSTICS
Formerly Great Plains Laboratory
Using Toxicant Testing In The Real World
Becoming A ToxDetective
Michelle Maddux, ND

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Dr Michelle Maddux received her doctorate of naturopathic medicine from Sonoran University of Health Sciences (formerly SCNM) and her Bachelor of Science in Business Management from the University of Phoenix. She has completed additional training in integrative and functional medicine, laboratory medicine, eating disorders, meditation, yoga, and mindfulness.

She primarily works with highly functioning women, teaching them how to take care of themselves no matter how messy life gets. Dr Maddux has been an educator in the Specialty Diagnostics space for over a decade and is happy to continue learning and sharing knowledge as part of the Mosaic Diagnostics team.

Topics Covered

- Scope of the problem
- Sources of common environmental toxins/toxicants
- Symptoms associated with environmental toxins/toxicants
- Case study
- Review basics of building protocols for this group of patients

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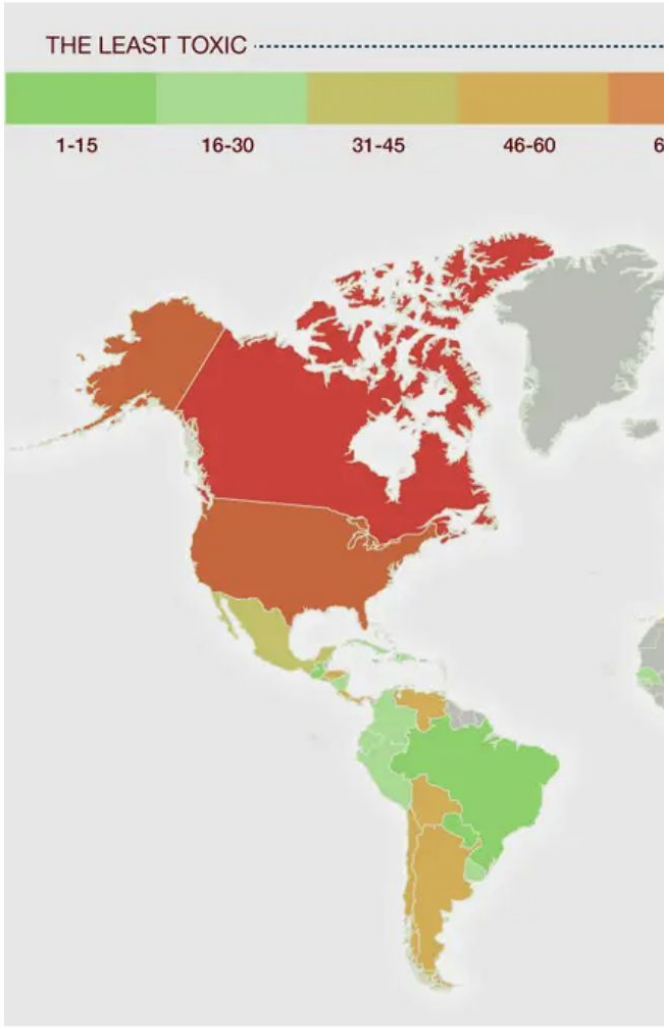
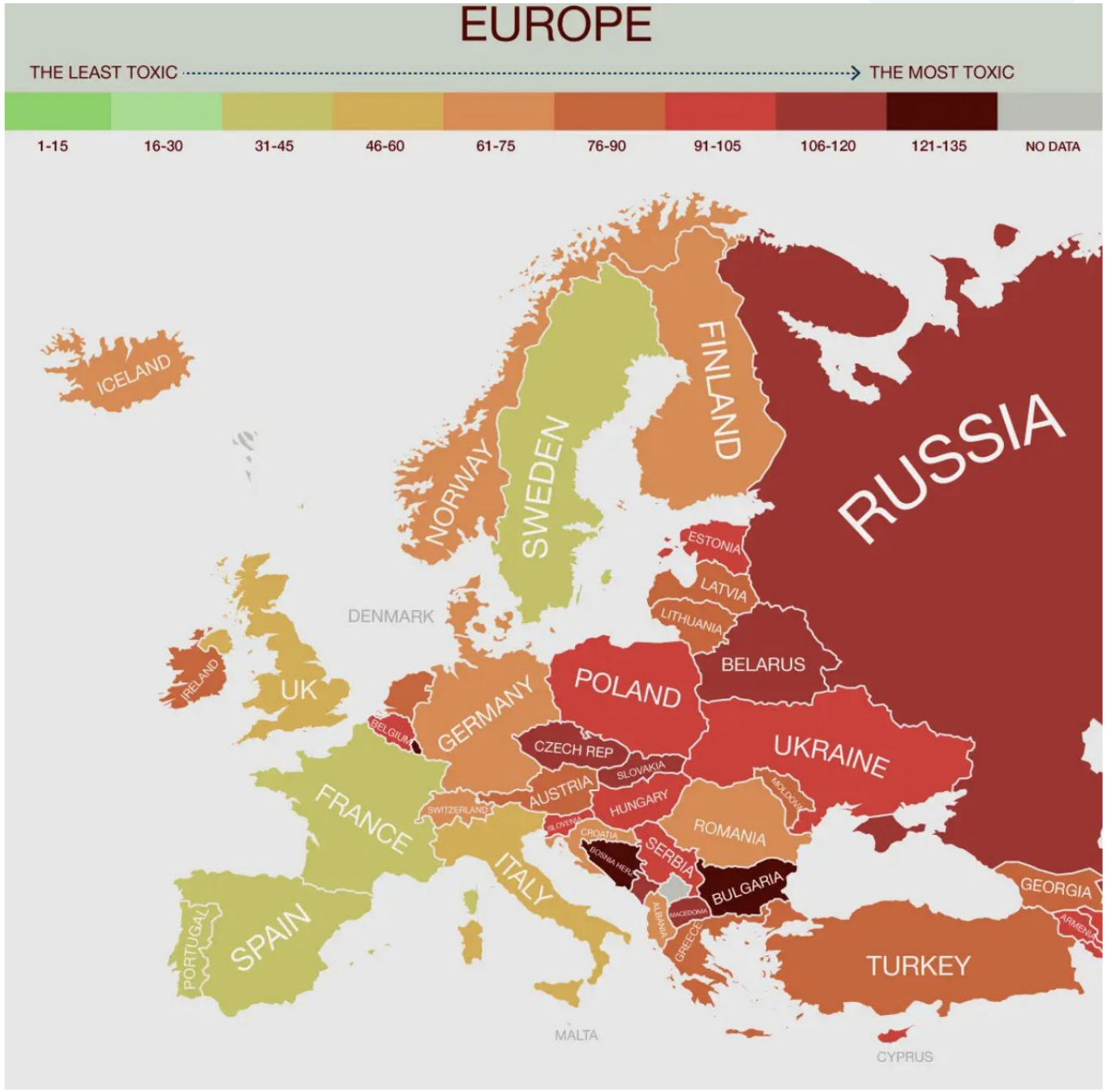
In 2017



The Eco Experts



The Eco Experts

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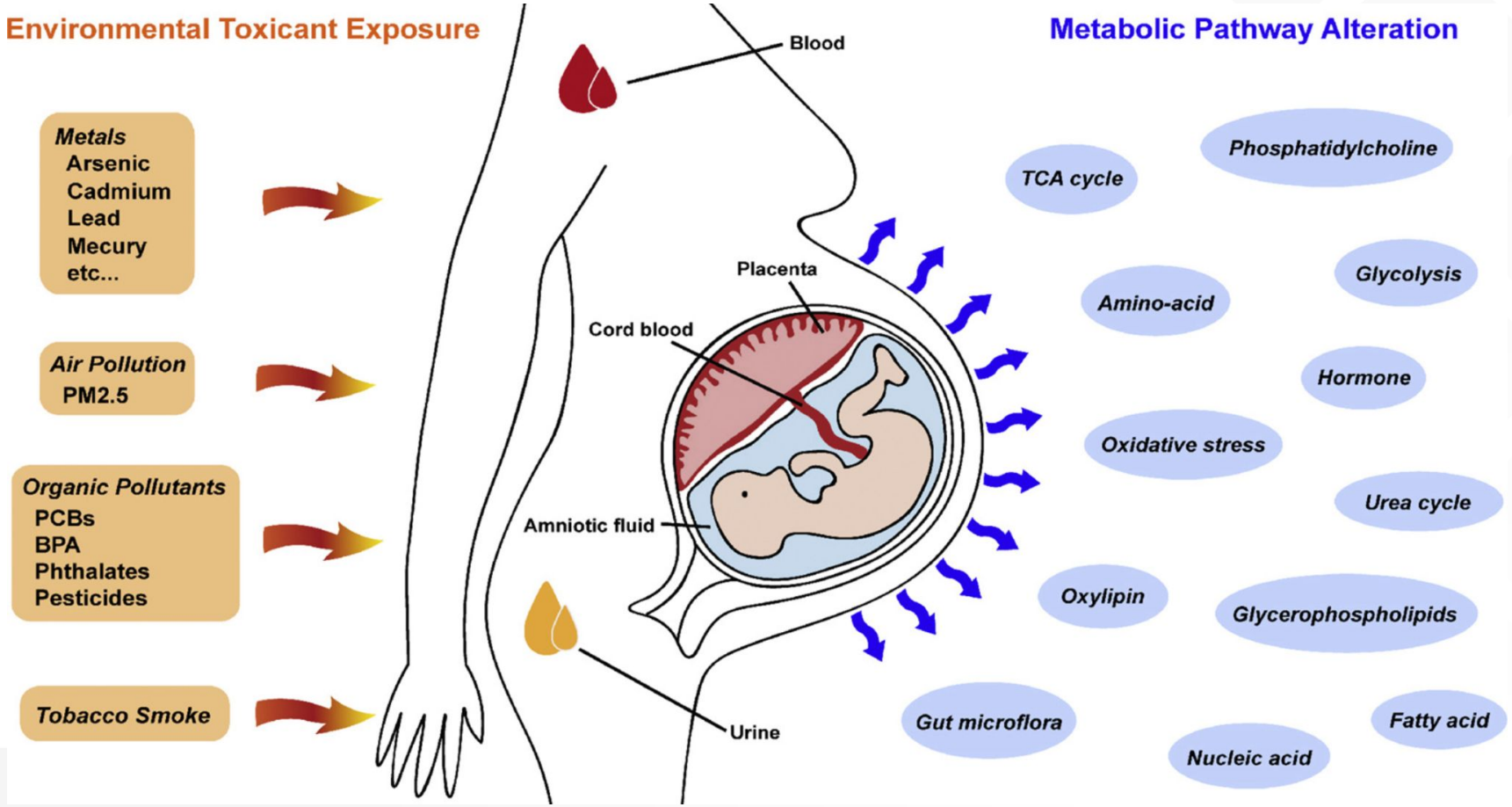
"**This review highlights the evidence linking maternal exposure to metals, organic pollutants, smoking, and air pollution to metabolic disorders in both mothers and fetuses.** Changes in metabolic pathways involve lipids, amino acids, and nucleic acids, which are mainly related to energy metabolism, hormone metabolism, oxidative stress and inflammation."



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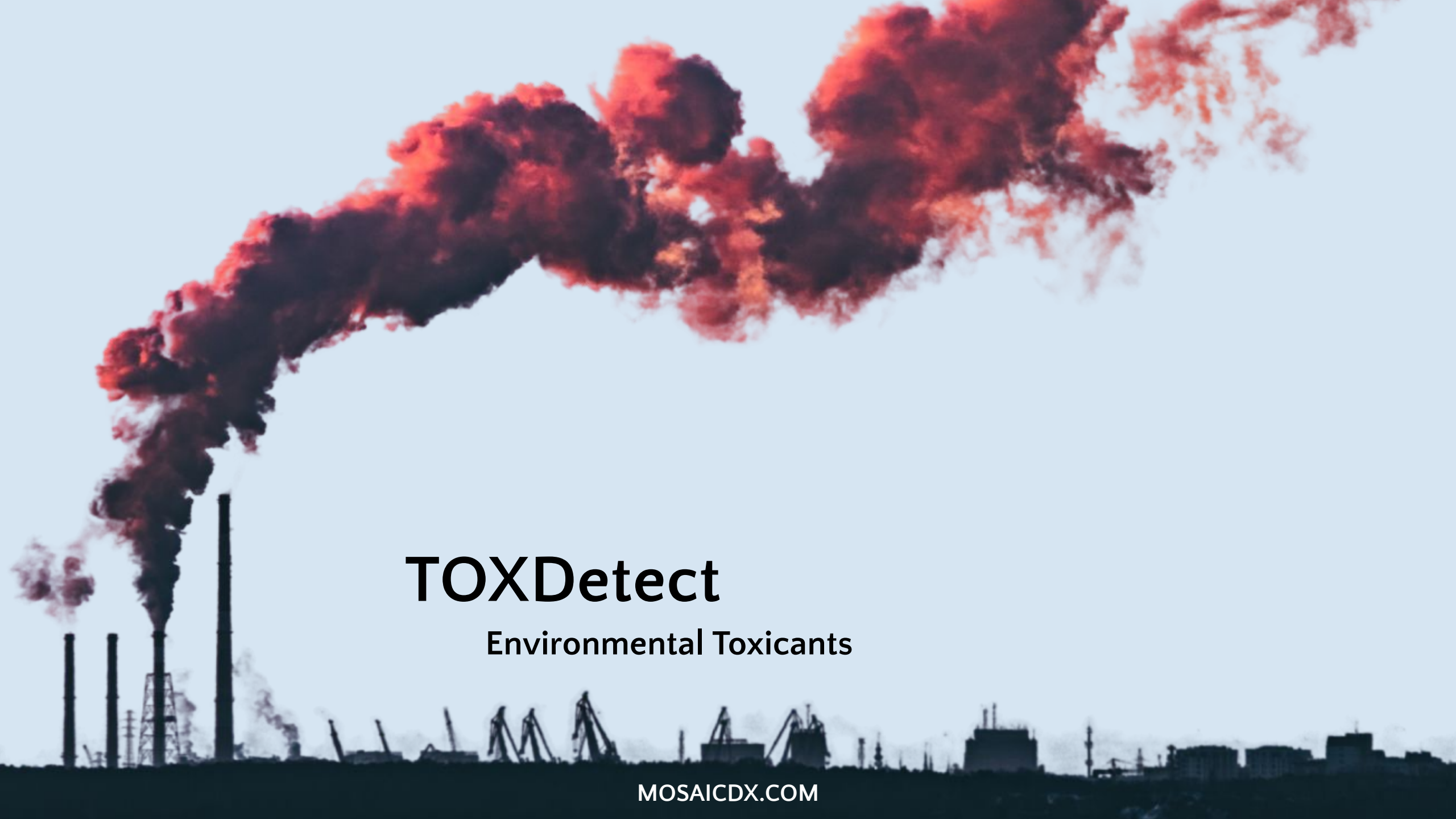
https://www.sciencedirect.com/science/article/abs/pii/S0048969720331466



TOXDetect

Environmental Toxicants

MOSAICDX.COM

What Are We Testing?

TOXDetect PROFILE

The labeling of things as a “toxin” is highly controversial

“Controversial” environmental toxicants

- Organophosphates
- Phthalates
- Food additives
- Xylenes
- Bisphenols

Items banned in one country are often allowed in others

- Allowed parts per are also often different
- How this applies to imports varies by country imported to and from

https://echa.europa.eu/regulations/prior-informed-consent/list-chemicals
https://www.eea.europa.eu/en/topics/in-depth/chemicals
https://www.ewg.org/news-insights/news/2022/10/personal-care-product-chemicals-banned-europe-still-found-us

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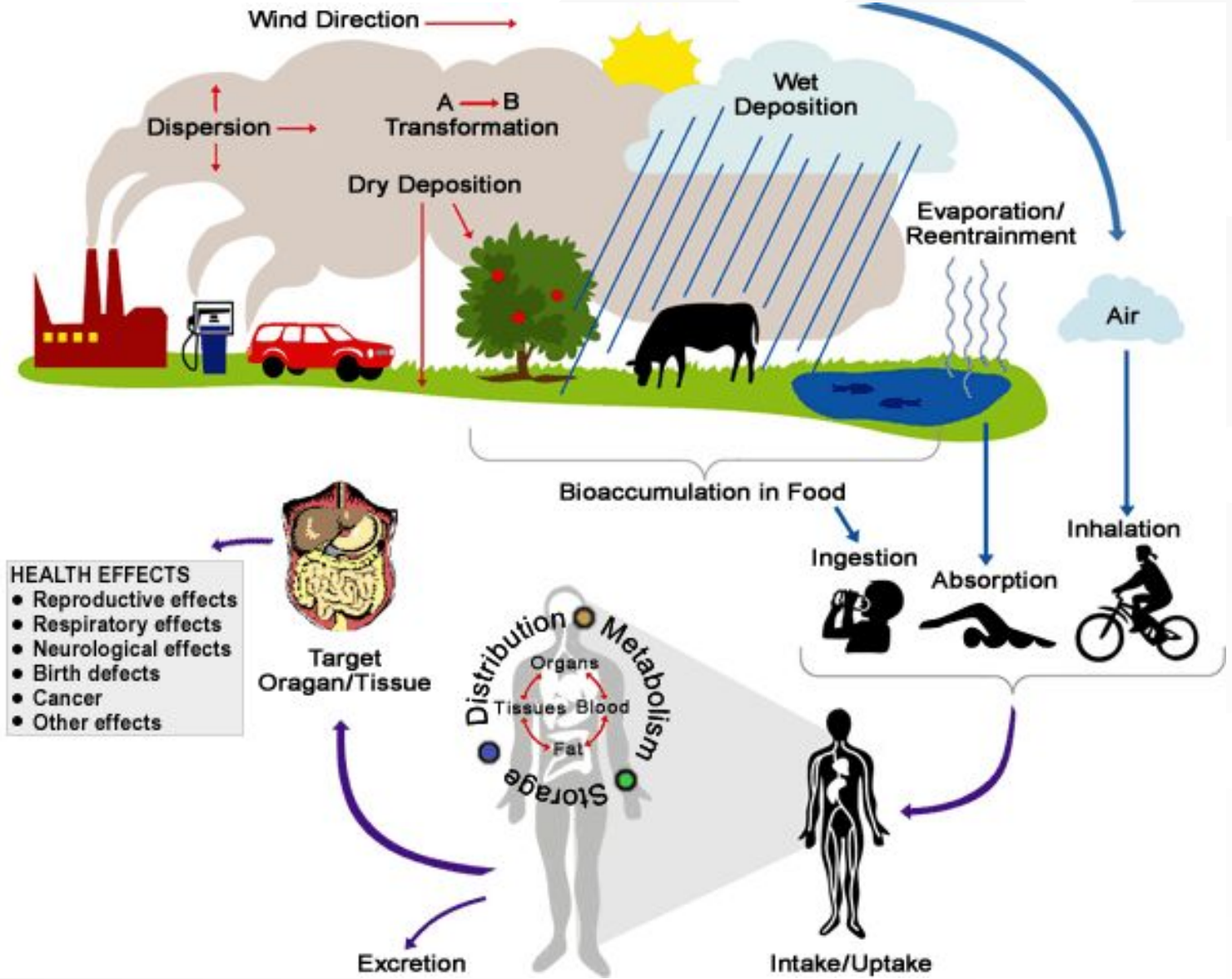
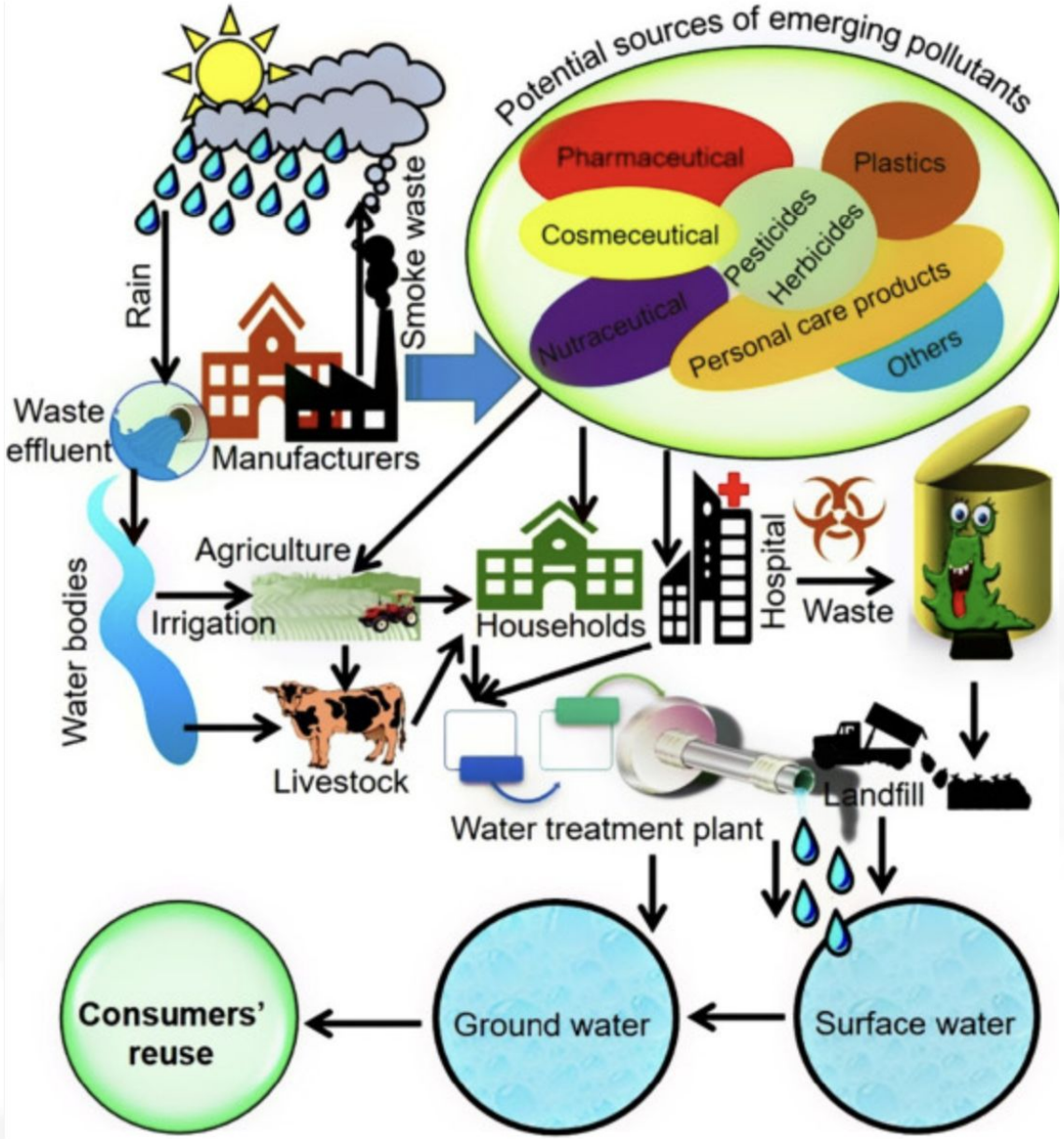
Ubiquitous and Harmful to Humans and the Environment



https://www.in.gov/idem/toxic/health-risks-and-environmental-effects/



https://www.sciencedirect.com/science/article/abs/pii/B9780128147191000124
https://www.sciencedirect.com/science/article/pii/S0160412018322013
https://envhealthcenters.usc.edu/2021/09/new-research-exposure-to-persistent-environmental-toxins-in-everyday-products-may-increase-diabetes-risk-in-latina-adolescents.html

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PROFILE

https://www.lcbcontracting.com/heating-and-cooling/indoor-air-quality/

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Patient Population

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Known exposures

- Occupational
- Living near industry
- Know regional contamination
- Consuming contaminated water & food sources

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9266352/

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Patient Population

TOXDetect PROFILE

- Cardiovascular disease
- Metabolic syndrome
- Cancers
- Cognitive dysfunction
- ADD/ADHD
- Depression, anxiety
- Asthma, wheezing, apnea, COPD
- Fatigue
- Parkinsons
- NASH, NAFLD
- Eye irritation
- Autoimmune disease
- Allergies
- Neurotoxicity
- Infertility
- Hormone dysregulation
- Osteoporosis
- Blood disorders
- Headache
- IBD, nausea, vomiting
- Behavioral abnormalities

https://www.cdc.gov/exposurereport/
https://www.integrativepractitioner.com/practice-management/news/environmental-medicine-expert-shares-top-10-toxic-compound-list
https://www.cdc.gov/niosh/topics/indoorenv/moldsymptoms.html; https://www.cdc.gov/mold/faqs.htm#;
https://www.euro.who.int/__data/assets/pdf_file/0017/43325/E92645.pdf

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Health Impacts

- OXIDATIVE STRESS
- INFLAMMATION
- CELL DEATH
- MITOCHONDRIA DYSFUNCTION
- IMPAIRED IMMUNE FUNCTION

Nervous

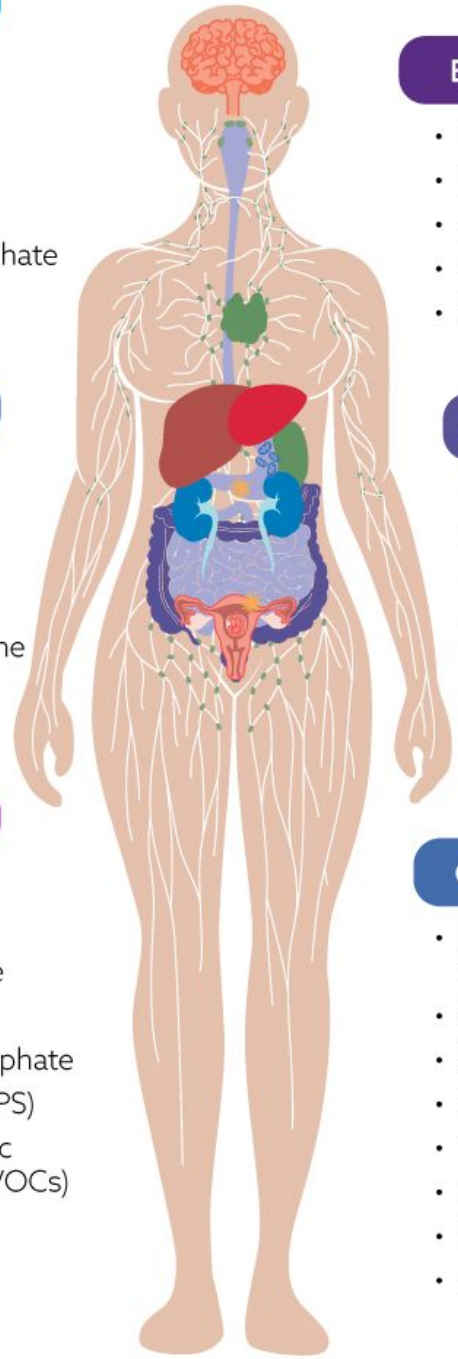
- Phthalates
- Xylene
- Styrene
- Benzene
- Organophosphate Pesticides

Respiratory

- Phthalates
- Styrene
- Benzene
- Acrylonitrile
- 1-bromopropane

Reproductive

- Phthalates
- Styrene
- Ethylene Oxide
- Vinyl Chloride
- Triphenyl Phosphate
- Bisphenol S (BPS)
- Volatile Organic
- Compounds (VOCs)



Endocrine

- Phthalates
- Benzene
- Acrylamide
- Bisphenol S (BPS)
- Perchlorate

Cardovascular

- Benzene
- Pyrethroids
- Acrylamide
- Bisphenol S (BPS)

Carcinogen

- Di(2-ethyhexyl) Phthalate
- Benzene
- Styrene
- Acrylamide
- 1,3 butadiene
- Ethylene Oxide
- Vinyl Chloride
- Acrylamide

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TOXDetect PROFILE

REQUISITION #	9900001	COLLECTION TIME	
PATIENT NAME	Report Sample	COLLECTION DATE	
DATE OF BIRTH	Apr 10, 2005	SAMPLE TYPE	
GENDER	M	REPORT DATE	
PRACTITIONER	NO PHYSICIAN		

Summary of Elevated Results

The results below lists metabolites with elevated results detected in the profile. Yo
results and a more detailed description of each metabolite starting on the TOXDete
section. Please note that each value in the report needs to be considered in the cor
health and environment. Contact a qualified healthcare provider for further assista
of results.

Color Key: LOW | MODERATE | HIGH

Creatinine Value: * 100.00 mg/dl

METABOLITE	RESULTS
Parent	ug/g creatinine

HIGH RESULTS

		75th
6) 2-3-4 Methylhippuric Acid (2,-3-,4-MHA) Xylene	1,603.00	208.00
12) 2-Hydroxyethyl Mercapturic Acid (HEMA) Ethylene Oxide, Vinyl Chloride	6.20	1.86
13) 2,4-Dichlorophenoxyacetic Acid (2,4-D) 2,4-Dichlorophenoxyacetic Acid (2,4-D)	5.10	0.58
16) Diphenyl Phosphate (DPP) Triphenyl Phosphate	8.00	1.63
17) N-Acetyl (Carbomethyl) Cysteine Acrylamide	220.00	93.40
18) Perchlorate (PERC) Perchlorate	16.00	4.01

*Methodology: LC-MS/MS. *The creatinine test is performed to adjust metabolic marker results for differences in fluid intake. Urinary creatinine, from a diagnostic value due to variability as a result of recent fluid intake. The results should be interpreted in conjunction with the complete clinical picture, given patient history and presentation, and at the discretion of the*

TOXDetect PROFILE — Results - Continued

Color Key: LOW | MODERATE | HIGH

Creatinine Value: * 100.00 mg/dl

METABOLITE	RESULTS	PERCENTI
Parent	ug/g creatinine	75% | 95

VOC - VOLITILE ORGANIC COMPOUNDS

		75th	95th
6) 2-3-4 Methylhippuric Acid (2,-3-,4-MHA) Xylene	1,603.00	256.70	1,205.00

Parent Compound: Xylene
Xylene is widely used in industry and medical laboratories. Xylene is released primarily from industrial sour
One can also come in contact with xylene through automobile exhaust and a variety of consumer products
cigarette smoke, paints, varnish, rust preventives, and shellac. Literature suggests that xylene exposure ca
toxic effects on various systems of the body. Longer term effects can damage the liver and kidneys.

		75th	95th
7) Phenylglyoxylic Acid (PGO) Styrene/Ethylbenzene	120.00	306.00	509.00

Parent Compound: Styrene/Ethylbenzene
Styrene is widely used to make plastics and rubber, which are used to manufacture a variety of products, su
insulation, pipes, automobile parts, printing cartridges, food containers, and carpet backing. Exposure may
through ingestion via transfer to foods, especially fatty foods heated in styrene containers, through breathi
indoor air that has styrene vapors from building materials, photocopiers, tobacco smoke, and other produc
Styrene and styrene oxide have been implicated as reproductive toxicants, neurotoxicants, and linked to an
increased risk of leukemia and lymphoma.

		75th	95th
8) N-Acetyl Phenyl Cysteine (NAP) Benzene	2.80	1.35	2.98

Parent Compound: Benzene
Benzene has been used extensively in the past as an industrial solvent; however, due to its toxicity and pot
health hazards, its use has been reduced. Exposure can occur occupationally, in the general environment a
the home as a result of the ubiquitous use of benzene-containing petroleum products, including motor fuel
solvents. Benzene exposure has been linked to respiratory, hepatic, cardiovascular, immune, nervous, and
endocrine system dysfunction.

Interpretation Continued

VOC - VOLITILE ORGANIC COMPOUNDS

Color Key: LOW | MODERATE | HIGH

2-3-4 Methylhippuric Acid (2,-3-,4-MHA) Xylene	1,603.00	N-Acetyl Phenyl Cysteine (NAP) Benzene	2.80
Phenylglyoxylic Acid (PGO) Styrene/Ethylbenzene	120.00		

METHYLHIPPURIC ACID (2,-3-,4-MHA)

Is a metabolite generated as a result of exposure to xylene, an aromatic hydrocarbon widely used in industry and medical laboratories. It is used extensively as a solvent in the rubber, printing, and leather industries. It is also used as a thinner for paints, cleaning agents, and varnishes. Xylene is released primarily from industrial sources. One can also come in contact with xylene through automobile exhaust and a variety of consumer products such as cigarette smoke, paints, varnish, rust preventives, and shellac. Literature suggests that xylene exposure causes toxic effects on various systems of the body. Central nervous system toxicity may lead to headaches, irritability, depression, insomnia, agitation, extreme tiredness, tremors, impaired concentration, and damage to short-term memory. Longer term effects can damage the liver and kidneys. Xylene is primarily eliminated through metabolism in the liver and subsequent excretion of 70-80% of metabolites in urine within 24 hours after exposure. Xylene is metabolized in the liver by side-chain (CH3) dehydroxylation, finally forming the metabolite methylhippuric acid.

PHENYLGLYOXYLIC ACID (PGO)

Is a metabolite generated as a result of exposure to styrene/ethylbenzene widely used to make plastics and rubber, which are used to manufacture a variety of products, such as insulation, pipes, automobile parts, printing cartridges, food containers, and carpet backing. Exposure occurs through breathing indoor air that has styrene vapors from building materials, photocopiers, tobacco smoke, and other products. Styrene may also leach from polystyrene containers used for food products, especially when food is heated in these containers. Short term exposure can cause CNS depression and skin and respiratory irritation. Long term exposure can damage the reproductive system and cause problems such as infertility and birth defects, can cause neurological damage such as memory loss, difficulty concentrating, and can cause impaired motor function. Exposure to PGO has been linked to an increased risk of leukemia and lymphoma. In the liver, styrene is metabolized to styrene-7,8-oxide (SO) by cytochrome P-450 enzymes. SO can then be further metabolized to styrene glycol, mandelic acid, and phenylglyoxylic acid, which are excreted in the urine. Glutathione conjugation is also a significant pathway for detoxification.

N-ACETYL PHENYL CYSTEINE (NAP)

Is a metabolite generated as a result of the exposure to benzene, an industrial solvent. Its use has been reduced due to toxicity and potential health hazards. Exposure has been associated with a range of acute and long-term adverse health effects and diseases, including cancer and hematological effects. Exposure can occur occupationally, in the general environment and in the home as a result of the ubiquitous use of benzene-containing petroleum products, including motor fuels and solvents. Active and passive exposure to tobacco smoke is also a significant source of exposure. Benzene exposure has been linked to respiratory, hepatic, cardiovascular, immune, nervous, and endocrine system dysfunction. High exposure to benzene may cause nausea, vomiting, dizziness, poor coordination, central nervous system depression, and even death. 22,23 The metabolism of benzene is complex and involves multiple enzymatic pathways. Benzene is primarily metabolized in the liver by the cytochrome P450 enzyme system. It undergoes oxidation to form several metabolites. These metabolites can further undergo conjugation with glucuronic acid or sulfate to form more water-soluble compounds that can be excreted in urine.

NHANES

TOXDetect PROFILE

National Health And Nutrition Examination Survey

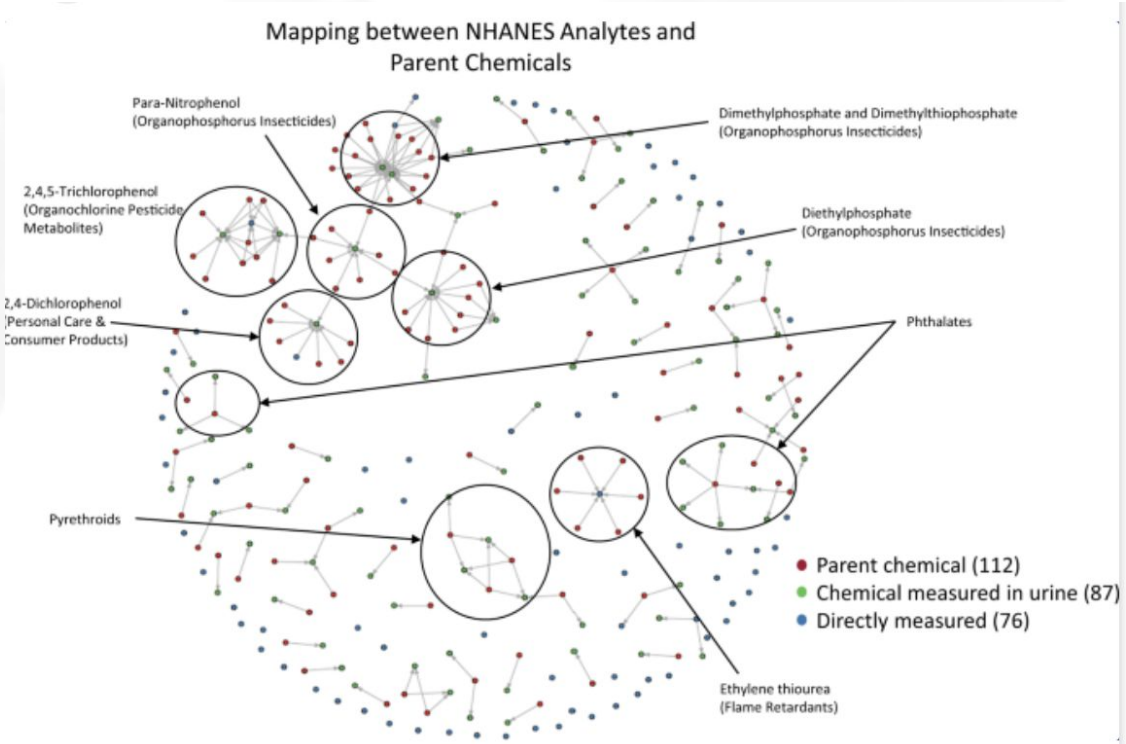
Most commonly referenced data set

Not available for all toxins

- Heavily focused on nutrient & toxic metals

Ages 6 – 92

- Male & Female data



https://www.nature.com/articles/s41370-022-00459-0
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5693367/
https://wwwn.cdc.gov/Nchs/Nhanes/2013-2014/UM_H.htm

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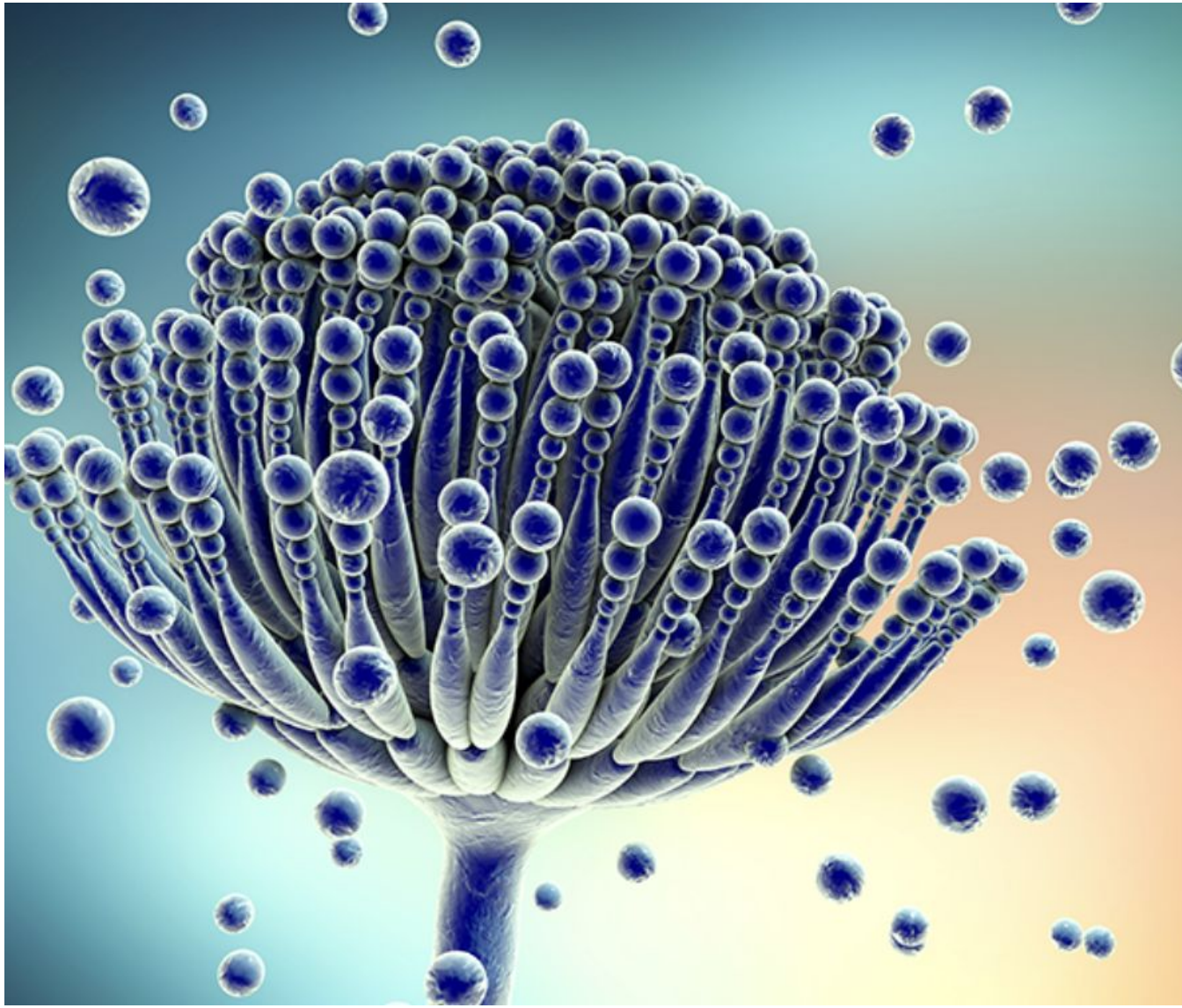
MOSAIC DIAGNOSTICS

Mycotoxins



Mycotoxins

- Small, toxic molecules
- Can bioaccumulate
- Difficult to eradicate
- Health impacts are numerous and systemic

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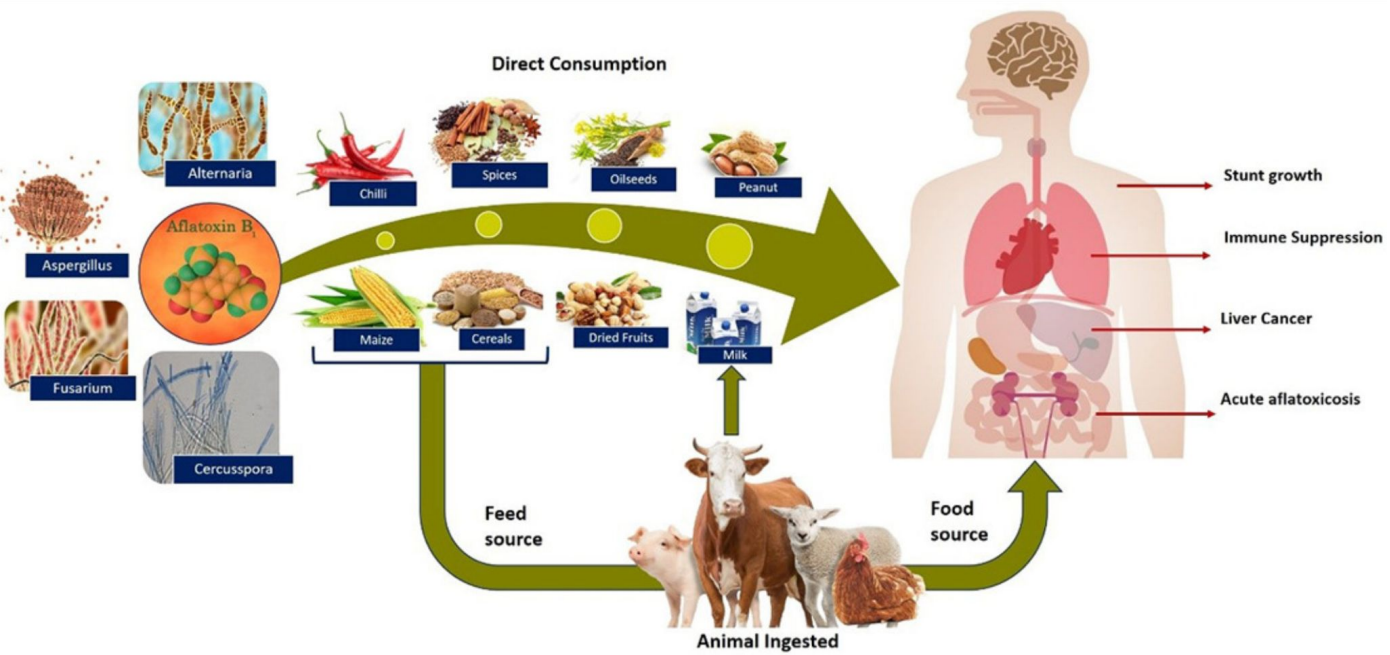
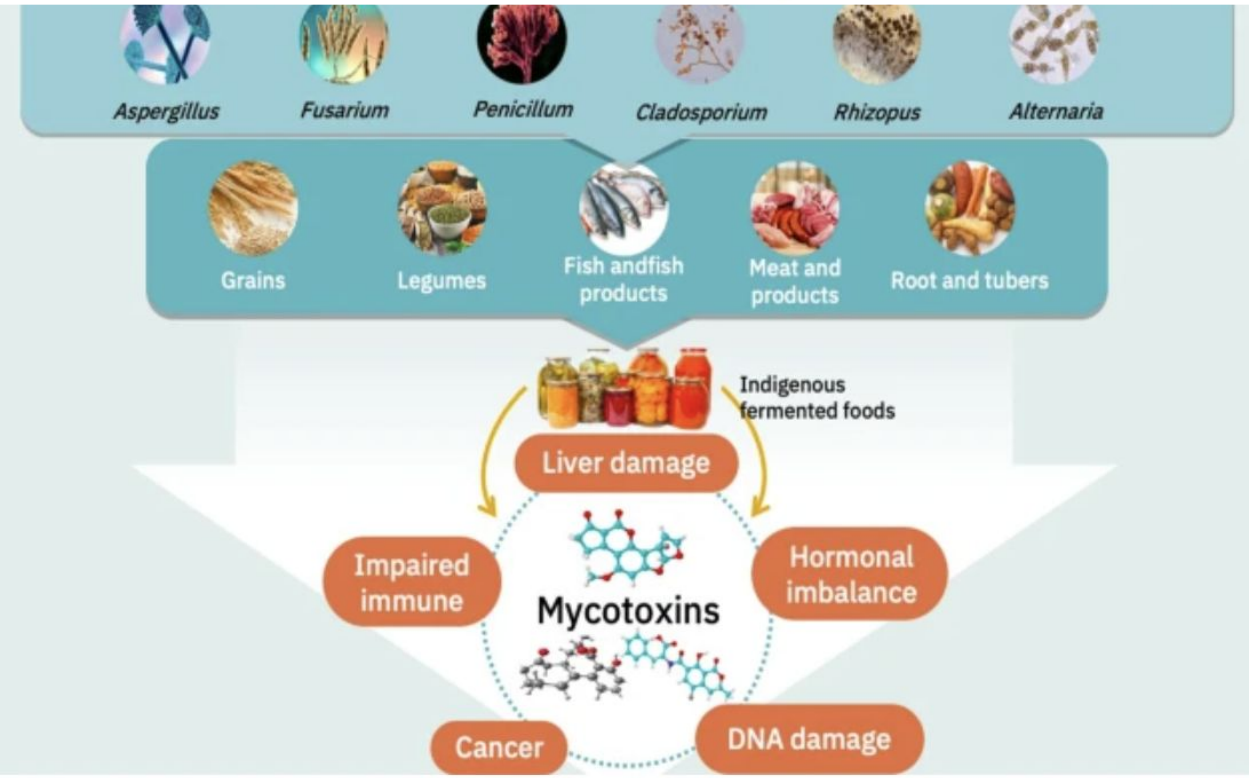
https://www.sciencedirect.com/science/article/abs/pii/S0924224418305715
https://www.sciencedirect.com/science/article/abs/pii/B9780128096338210352
https://www.intechopen.com/chapters/78611

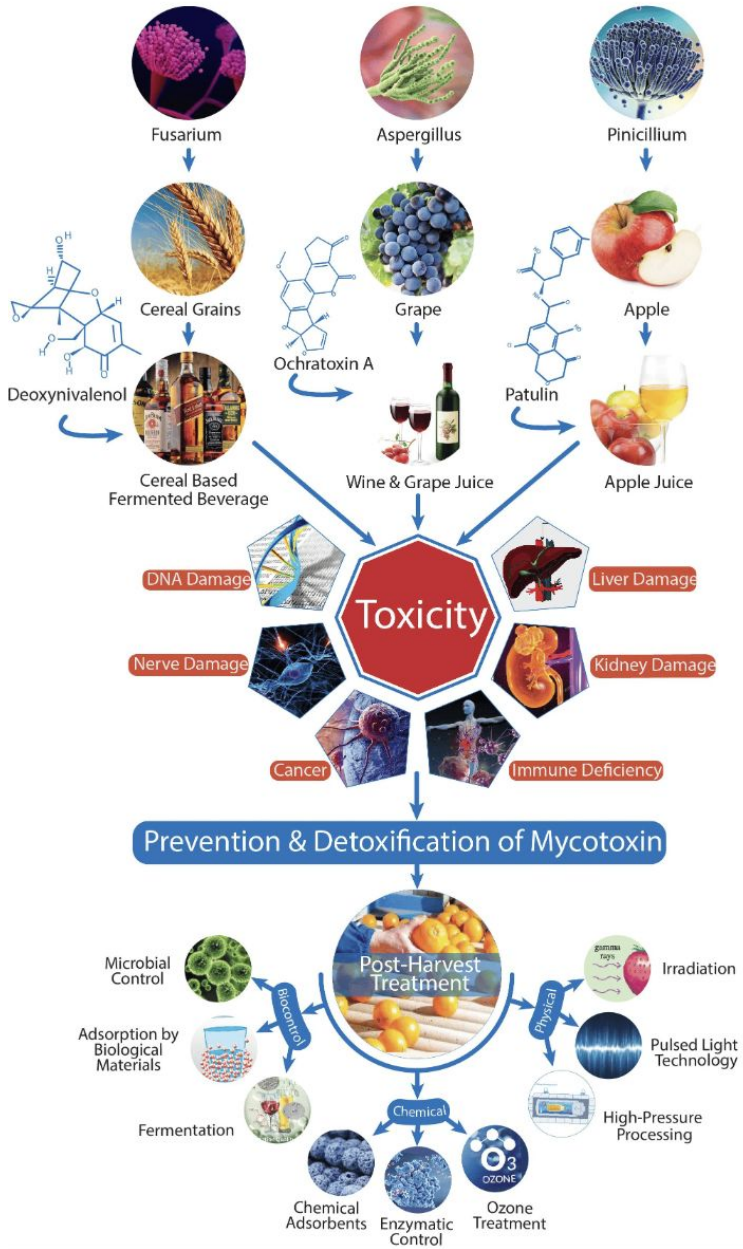
What Are Mycotoxins?

- Metabolites produced by some fungi
- Ingested, inhaled, contact with skin or eyes
- Some are used as antibiotics, other drugs, growth accelerants
- Some are incompatible with life
  - Level of concern varies widely depending on mycotoxin, who is being exposed and what type of exposure are they having
  - Chemical warfare agents
    - Aflatoxins
    - “Yellow Rain”
  - Sick building syndrome
  - Animal feed
  - Food contamination

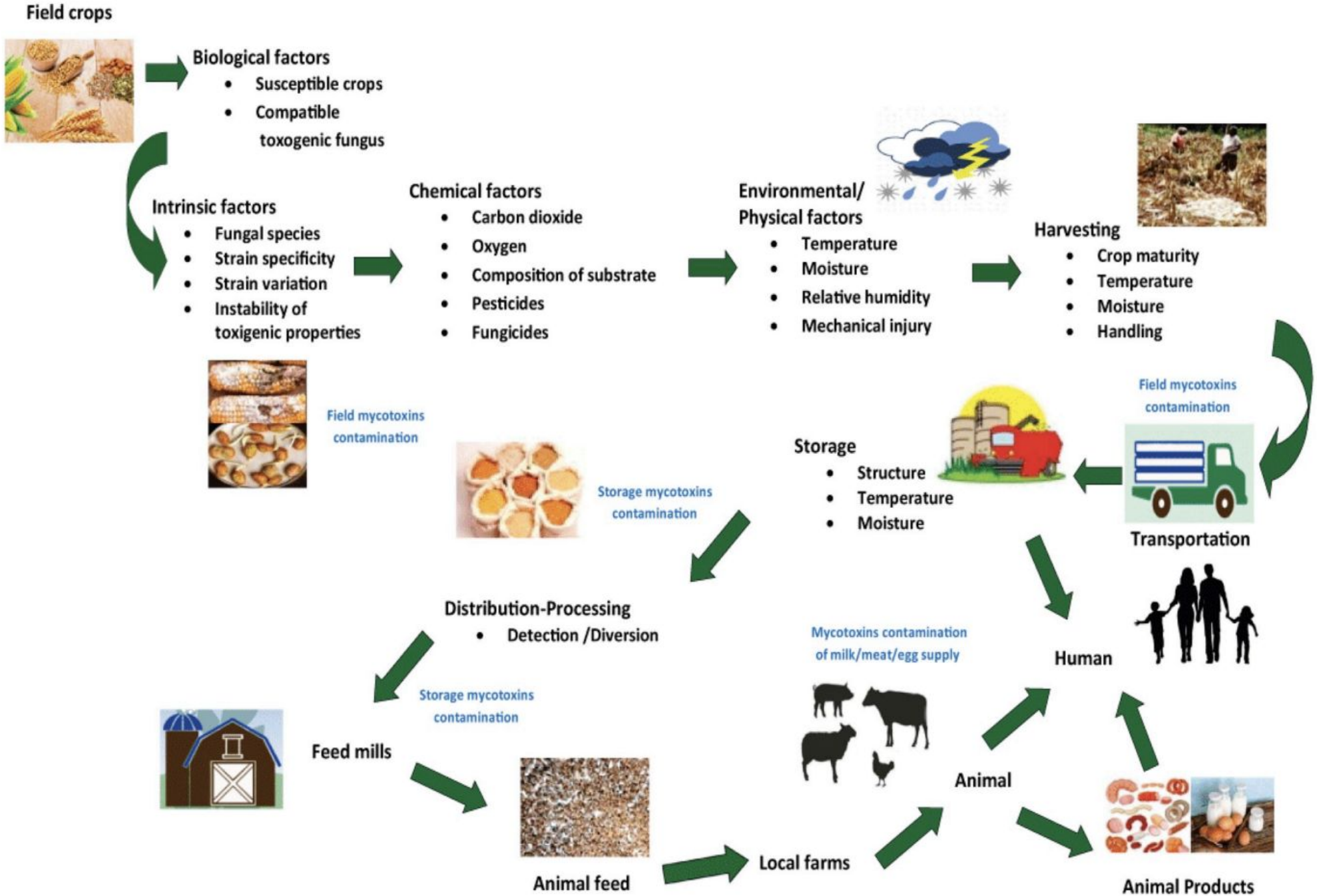
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC164220/
https://extension.psu.edu/what-are-mycotoxins
https://www.fda.gov/food/natural-toxins-food/mycotoxins
https://www.frontiersin.org/articles/10.3389/fcimb.2018.00060/full
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6354945/
https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/mycotoxin
https://www.who.int/news-room/fact-sheets/detail/mycotoxins#:~:text=Mycotoxins%20are%20naturally%20occurring%20toxins,under%20warm%20and%20humid%20conditions.







https://www.mdpi.com/2072-6651/13/5/323#
https://www.nature.com/articles/s41538-022-00152-4
https://www.sciencedirect.com/science/article/pii/S2590259822000371
https://extension.psu.edu/what-are-mycotoxins



https://www.sciencedirect.com/science/article/pii/S2590259822000371

Patient Population

Known exposure: Past or Present

- Building/Home
- Occupational
- Diet
  - Direct or Secondary

Oxidative Stress

- Liver
- Kidneys

Psychosis

- Especially acute with no personal or family history

Symptoms of

- Cough, wheeze, asthma, dyspnea, apnea
- Conjunctivitis
- Nausea, vomiting, GI changes
- Rash
- Bone marrow failure
- Cancer
- Hormone dysregulation
- Brain fog, dementia
- Mood disorders
- Immune disorders
- Fatigue/malaise

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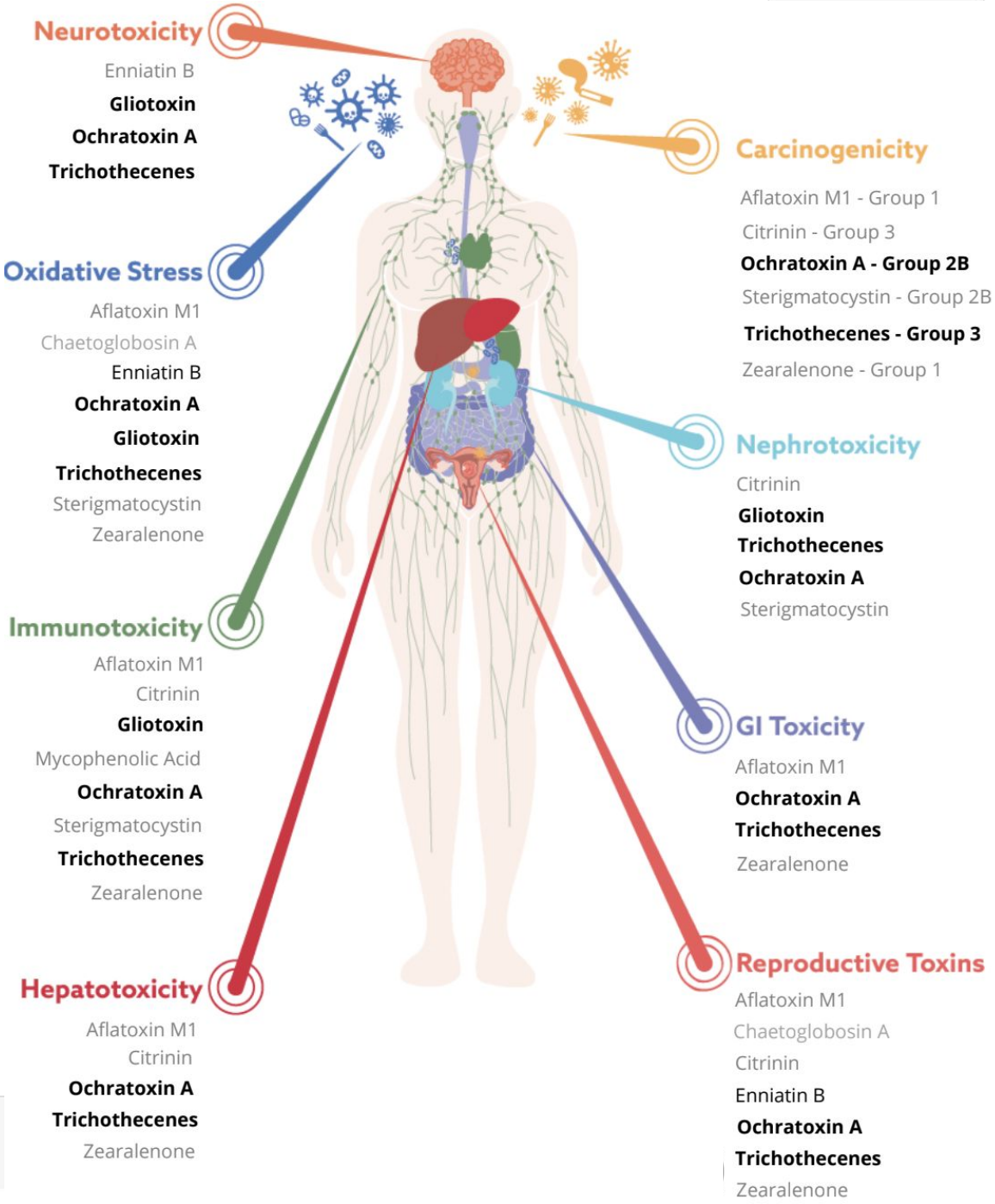
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC164220/
https://www.fda.gov/food/natural-toxins-food/mycotoxins
https://www.sciencedirect.com/science/article/abs/pii/S1538544206000599
https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/mycotoxin
https://www.sciencedirect.com/science/article/abs/pii/S1538544206000599

WHO calls mycotoxins

"The Great Masquerader"



https://www.ncbi.nlm.nih.gov/pmc/articles/PMC164220/

MycoTO
PROFILE

REQUISITION #	9900001
PATIENT NAME	Report
DATE OF BIRTH	Mar 9, 19
GENDER	F
PRACTITIONER	NO PHYS

Summary of Elevate

The results below lists mycotoxin(s) more detailed description of each my value in this report needs to be cons healthcare provider for further assist

For information about mold species and/or the source chart found at the

Color Key NORMAL HIGH

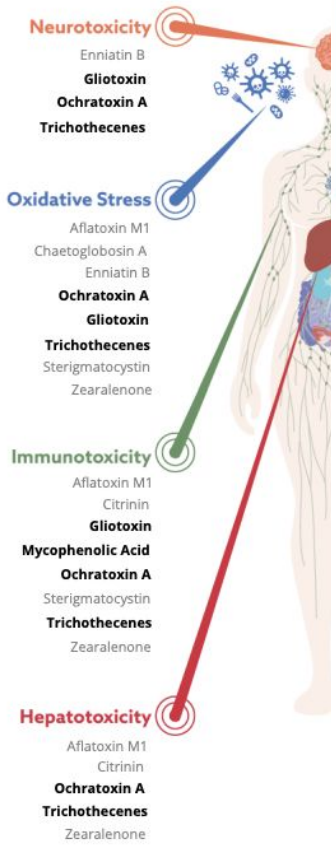
Creatinine Value: 100.00 mg/dl

NOR (ng

Ochratoxin A (OTA)	<
Roridin E (ROE)	<
Verrucarin A (VRA)	<
Gliotoxin (GTX)	<
Mycophenolic Acid (MPA)	<

How Mycotoxins Affect

The image below visually represents the pot specific mycotoxins and their health impact. with elevated results are shown below in **bo**



Mycotoxin impacts noted in the figure above have been compiled from a literature review of in vitro, in vivo animal and human studies.

MycoTOX
PROFILE

MycoTOX Profil

The profile results offer a com mycotoxin levels, grouped by Ochratoxin, Trichothecene, Ze

Color Key NORMAL HIGH

Creatinine Value: 100.00 mg/dl

NORMAL (ng/g cre

AFLATOXIN

Aflatoxin M1 (AFM1)	<

OCHRATOXIN

Ochratoxin A (OTA)	<

TRICHOTHECENE

Roridin E (ROE)	<
Verrucarin A (VRA)	<

ZEARALENONE

Zearalenone (ZEA)	< 3.2

<DL

Interpretations

The information provided in is intended solely for educat treatment recommendation healthcare provider for any and interpretations can be fo

AFLATOXINS

Aflatoxin M1 (AFM1) <DL
Normal Range <0.5

Aflatoxins are a group of toxic seco and *A. parasiticus*, and the most im a hydroxylated metabolite of AFB1 a that have consumed aflatoxin-conta dairy products. AFB1 is extremely h Health Association (WHO).

SOURCE
Aflatoxins have been found in samp results from direct ingestion of cont oilseeds (soybean, sunflower and co their butters; or from products creat milk and milk products); and inhalati in storage and processing facilities.

MECHANISM OF ACTION
Aflatoxins are metabolized via the c species or ROS) that preferentially b potential induction of hepatocarcino mutations of mitochondrial membra compromise of cellular antioxidant r (aflatoxicosis); interfere with critical where they exert developmental an

HEALTH IMPACT
Carcinogenicity, GI Toxicity, Hepato Neurotoxicity, Reproductive Toxicity

CLINICAL INSIGHT
AFB1, the most toxic of all aflatoxins P450 enzymes of Phase I and glucur elimination; given that, support of t

Sources of Mycotoxins

MYCOTOXIN	GENUS/SPECIES	SOURCES	POTENTIAL TOXICITY
Aflatoxins	*Aspergillus flavus* *A. nomius* *A. parasiticus* *Penicillium*	Water-damaged buildings (AFB1, AFB2). Corn, rice, pasta, Brazil nuts, peanuts, peanut butter, pistachios, cassava, tobacco, cottonseed cake, oilseeds, figs, milk, cheese, butter, yoghurt, spices, baby foods.	Carcinogenicity – Group 1 GI toxicity Hepatotoxicity Immunotoxicity Oxidative stress Reproductive toxicity
Ochratoxins	*Aspergillus* *A. ochraceus* *Penicillium* *P. nordium* *P. verrucosum*	Dust samples of water-damaged buildings, offices and ventilation systems (OTA). Corn, rice, rye, wheat, buckwheat, barley, millet, oats, cereals, raisins, currants, nuts, coffee, cocoa, spices, beer, pork, cheese, smoked and salted dried fish, dried beans, chickpeas, dried fruit, sesame seeds, grapes and grape products, wines, apples, pears, peaches, citrus, figs, strawberries.	Carcinogenicity – Group 2B GI toxicity Hepatotoxicity Immunotoxicity Nephrotoxicity Neurotoxicity Oxidative stress Reproductive toxicity
Trichothecenes	*Cephalosporium* *Fusarium* *Myrothecium* *Stachybotrys* *Trichoderma* *Trichothecium* *Verticimonosporium*	Water-damaged buildings (trichothecenes). Corn, popcorn, rice, rye, wheat, wheat flour, bread, buckwheat, barley, barley products, oats, sorghum, triticale, breakfast cereals, noodles, baby and infant foods, malt, beer.	Carcinogenicity – Group 3 GI toxicity Hepatotoxicity Immunotoxicity Nephrotoxicity Neurotoxicity Oxidative stress Reproductive toxicity
Zearalenones	*Fusarium* *F. culmorum* *F. equiseti* *F. graminearum*	Dust samples from water-damaged buildings. Corn, wheat, wheat flour, bread, breakfast cereals, noodles, rice, barley, oats, sorghum, walnuts, milk, corn beer, meat, animal-feed products, vegetable oil.	Carcinogenicity – Group 1 GI toxicity Hepatotoxicity Immunotoxicity Oxidative stress Reproductive toxicity

MOSAIC DIAGNOSTICS

The EnviroTOX Suite of Panels

EnviroTOX

Integrated Tests:

- Organic Acids Test
- TOXDetect Profile
- Glyphosate Test

EnviroTOX Complete

Integrated Tests:

- Organic Acids Test
- TOXDetect Profile
- Glyphosate Test
- + **MycoTOX Profile**

EnviroTOX Complete + Metals

Integrated Tests:

- Organic Acids Test
- TOXDetect Profile
- Glyphosate Test
- MycoTOX Profile
- + **Metals – Toxic Elements**

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MOSAIC™
DIAGNOSTICS

Case Study:
The Renovator

43yoF

- Refinishing older home
  - Doing much of the work herself
- Did not wear a mask during early stages of demo
- Sleeping in one of the bedrooms
  - Only room with a HEPA filter
- Visible mold in many rooms that have already been worked on
- Diet is predominantly take-out/eating out
  - “Tries” to make healthy choices

Symptoms

- Difficulty sleeping
- Resurgence of asthma type symptoms
- Headaches
- Brain feels foggy “slow to fire”
- GI changes: diarrhea, bloating
- “Everything” seems to bother her: smells, lights in the supermarket, people
- Mood changes – not as friendly/easy going
    - Thinks it just stress and not sleeping

ToxDetect

METABOLITE Parent	RESULTS ug/g creatinine	PERCENTILE 75% | 95%
HIGH RESULTS		
4) **Mono-(2-ethyl-5-oxohexyl) phthalate (MEOHP)** Di(2-ethylhexyl) Phthalate (DEHP)	**15.26**	75th 5.19 / 95th 14.40
10) **N-Acetyl (Propyl) Cysteine (NAPR)** 1-bromopropane	**769.03**	75th 11.10 / 95th 47.80
12) **2-Hydroxyethyl Mercapturic Acid (HEMA)** Ethylene Oxide, Vinyl Chloride	**190.13**	75th 1.86 / 95th 4.83
18) **Perchlorate (PERC)** Perchlorate	**23.06**	75th 4.01 / 95th 9.39
MODERATE RESULTS		
1) **Monoethylphthalate (MEP)** Diethylphthalates	**69.08**	75th 1.50 / 95th 275.00
6) **2-3-4 Methylhippuric Acid (2,-3-,4-MHA)** Xylene	**315.39**	75th 208.00 / 95th 1,010.00
7) **Phenylglyoxylic Acid (PGO)** Styrene/Ethylbenzene	**445.56**	75th 306.00 / 95th 509.00

MOSAIC DIAGNOSTICS
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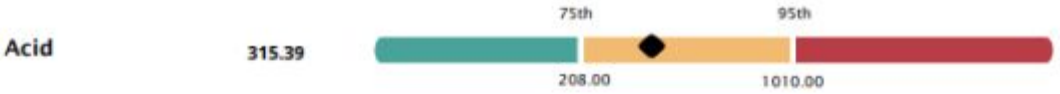
PHTHALATES

Phthalates are a family of widely used chemicals found in most products that have contact with plastics during production, packaging, or delivery. These plasticizers which make plastic more flexible, and durable are associated with a number of health problems including reproductive, neurological, respiratory, and increased risk of certain types of cancer. Most significantly they are known as endocrine disruptors. Phthalates are referred to as "the everywhere chemical" due to the fact they are used in hundreds of products, including toys, food packaging, shampoo, vinyl flooring, and more.

MOSAIC DIAGNOSTICS
Formerly Great Plains Laboratory

VOC - VOLATILE ORGANIC COMPOUNDS

6) **2-3-4 Methylhippuric Acid (2,-3-,4-MHA)** Xylene — **315.39**



Parent Compound: Xylene

Xylene is widely used in industry and medical laboratories. Xylene is released primarily from industrial sources. One can also come in contact with xylene through automobile exhaust and a variety of consumer products such as cigarette smoke, paints, varnish, rust preventives, and shellac. Literature suggests that xylene exposure causes toxic effects on various systems of the body. Longer term effects can damage the liver and kidneys.

7) **Phenylglyoxylic Acid (PGO)** Styrene/Ethylbenzene — **445.56**

Parent Compound: Styrene/Ethylbenzene

Styrene is widely used to make plastics and rubber, which are used to manufacture a variety of products, such as insulation, pipes, automobile parts, printing cartridges, food containers, and carpet backing. Exposure may occur through ingestion via transfer to foods, especially fatty foods heated in styrene containers, through breathing indoor air that has styrene vapors from building materials, photocopiers, tobacco smoke, and other products. Styrene and styrene oxide have been implicated as reproductive toxicants, neurotoxicants, and linked to an increased risk of leukemia and lymphoma.

8) **N-Acetyl Phenyl Cysteine (NAP)** Benzene

Parent Compound: Benzene

Benzene has been used extensively in the past as an industrial solvent; however, due to its toxicity and potential health hazards, its use has been reduced. Exposure can occur occupationally, in the general environment and in the home as a result of the ubiquitous use of benzene-containing petroleum products, including motor fuels and solvents. Benzene exposure has been linked to respiratory, hepatic, cardiovascular, immune, nervous, and endocrine system dysfunction.

VOC - VOLATILE ORGANIC COMPOUNDS

9) **N-Acetyl (2-Cyanoethyl) Cysteine (NACE)** Acrylonitrile

Parent Compound: Acrylonitrile

Acrylonitrile exposure occurs through the use of products containing acrylonitrile, such as acrylic fiber clothing or carpeting, acrylonitrile-based plastics, leaching into foods from plastic food containers, and cigarette smoke. Humans exposed to high levels via inhalation experienced respiratory tract irritation, labored breathing, dizziness, cyanosis, limb weakness and convulsions. It is considered a probable human carcinogen, with evidence suggesting an association with lung cancer.

10) **N-Acetyl (Propyl) Cysteine (NAPR)** 1-bromopropane

769.03

Parent Compound: 1-bromopropane

1-bromopropane is used as a solvent in adhesives, dry cleaning, degreasing, and electronic and metal cleaning industries. Health impacts of 1-bromopropane exposure include neurotoxicity, reproductive toxicity, hematopoietic disorders, DNA damage, and respiratory toxicity. It can also cause symptoms such as headache, mucosal irritation, decreased sensation, paresthesia, and stumbling.

11) **N-Acetyl (3,4-Dihydroxybutyl) Cysteine (NADB)** 1,3 butadiene

Parent Compound: 1,3 butadiene

1,3 butadiene is a petrochemical used to produce synthetic rubber used for car and truck tires and is also an environmental toxicant found in car exhaust, combustion of fuels for warmth or energy production and cigarette smoke. It is associated with adverse health impacts, including cancer, and cardiovascular disease. The International Agency for Research on Cancer (IARC) concluded that 1,3 butadiene is a human carcinogen.

VOC - VOLATILE ORGANIC COMPOUNDS

12) **2-Hydroxyethyl Mercapturic Acid (HEMA)** Ethylene Oxide, Vinyl Chloride

190.13

Parent Compound: Ethylene Oxide, Vinyl Chloride

Ethylene oxide is a man made substance widely used in the production of various chemicals such as plastics, textiles and antifreeze (ethylene glycol). Additionally, ethylene oxide is commonly used as a sterilizing agent for medical equipment. Inhalation is the most common route of exposure in occupational settings and via tobacco smoke. There is some evidence that exposure to ethylene oxide can cause a pregnant woman to lose a pregnancy. The International Agency for Research on Cancer (IARC) concluded that ethylene oxide is a known human carcinogen, exposure is linked to increased risk of leukemia and non-Hodgkin's lymphoma.

Vinyl chloride is colorless gas used primarily to manufacture polyvinyl chloride (PVC) and widely used in numerous products such as pipes, wire and cable insulation, packaging materials, various construction materials and disposable medical products. Inhalation is the most common route of exposure primarily in occupational settings, also via smoke from cigars or cigarettes. Acute high-level exposure can produce headaches, dizziness, drowsiness, and loss of consciousness. Long term exposure can result in hepatocellular changes and increased incidence of liver cancer. The International Agency for Research on Cancer (IARC) concluded that vinyl chloride is carcinogenic to humans.

PESTICIDES

13) **2,4-Dichlorophenoxyacetic Acid (2,4-D)** 2,4-Dichlorophenoxyacetic Acid (2,4-D)

Parent Compound: 2,4-Dichlorophenoxyacetic Acid (2,4-D)

2,4-Dichlorophenoxyacetic Acid (2,4-D) is one of the most widely used herbicides in the world. It is commonly used in agriculture and landscaping. Chronic exposure to lower levels of 2,4-D has been associated with potential health effects, including endocrine disruption, reproductive effects, developmental effects, and increased risk of non-Hodgkin lymphoma.

14) **3-Phenoxybenzoic Acid (3-PBA)**
Pyrethoids, Permethrin, Cypermethrin, Cyhalothrins, Fenpropathrin, Deltamethrin, Trihalomethrin

Parent Compound: Pyrethroids

Pyrethroids are widely used in agriculture, household insect control, and veterinary medicine. Pyrethroids work by targeting the nervous system of insects, causing hyperexcitation and paralysis. The most common potential impacts to health include neurobehavioral, neurodevelopmental, and endocrine disruption. Exposure has also been associated with an increased risk of all-cause and cardiovascular disease mortality.

15) **Diethylphosphate (DEP)**
Organophosphates

Parent Compound: Organophosphates

Organophosphate pesticides are widely used in agriculture to control pests, as well as in residential settings to manage insects and rodents. The organophosphate pesticides work by inhibiting the activity of acetylcholinesterase, an enzyme essential for proper nerve function. Exposure to organophosphates has been associated with neurological deficits, neurodegenerative diseases, peripheral nerve effects, and neurodevelopmental issues. Additionally, long-term exposure has been linked to oxidative stress, psychological effects, and liver function abnormalities.

OTHER

16) Diphenyl Phosphate (DPP)
Triphenyl Phosphate

Parent Compound: Triphenyl Phosphate
Triphenyl phosphate is commonly used as a flame retardant in consumer products such as furniture, electronics, and textiles. It is also present in personal care products, such as nail polish and cosmetics, and contact with these products can lead to dermal absorption. Triphenyl phosphate can also be ingested from food and beverages due to migration from packaging materials or contamination during food processing. Exposure to triphenyl phosphate can alter endocrine function and impact reproduction. Altered thyroid function and decreased semen quality has been observed in humans.

17) N-Acetyl (Carbomethyl) Cysteine (NAE) Acrylamide

Parent Compound: Acrylamide
Acrylamide is formed when starchy foods, such as potatoes, grains, and coffee beans, are cooked at high temperatures. Other potential sources of acrylamide exposure include cigarette smoke, as acrylamide is formed during the combustion of tobacco, and certain cosmetic products that may contain acrylamide as a contaminant. Acrylamide has been linked to an increased risk of cancer, particularly in organs such as the kidneys, ovaries, and uterus. Other potential health effects include neurotoxicity, genotoxicity, reproductive toxicity, hepatotoxicity, immunotoxicity, and increased cardiovascular risk.

18) Perchlorate (PERC)
Perchlorate

Parent Compound: Perchlorate
Perchlorate is a chemical used in fireworks, road flares, explosives, and rocket fuel. Perchlorates are considered environmental contaminants due to their widespread use and persistence in the environment. Perchlorate can also enter the food supply through contaminated water used for irrigation or through food processing. Milk is also a source of perchlorate, the content in milk is related to the presence of perchlorate in feed. Perchlorate inhibits the thyroid's uptake of iodine. This interference can disrupt thyroid function and lead to health problems such as hypothyroidism (underactive thyroid) or other thyroid disorders. Pregnant women, infants, and children are particularly vulnerable to the effects of perchlorate exposure on thyroid function.

OTHER

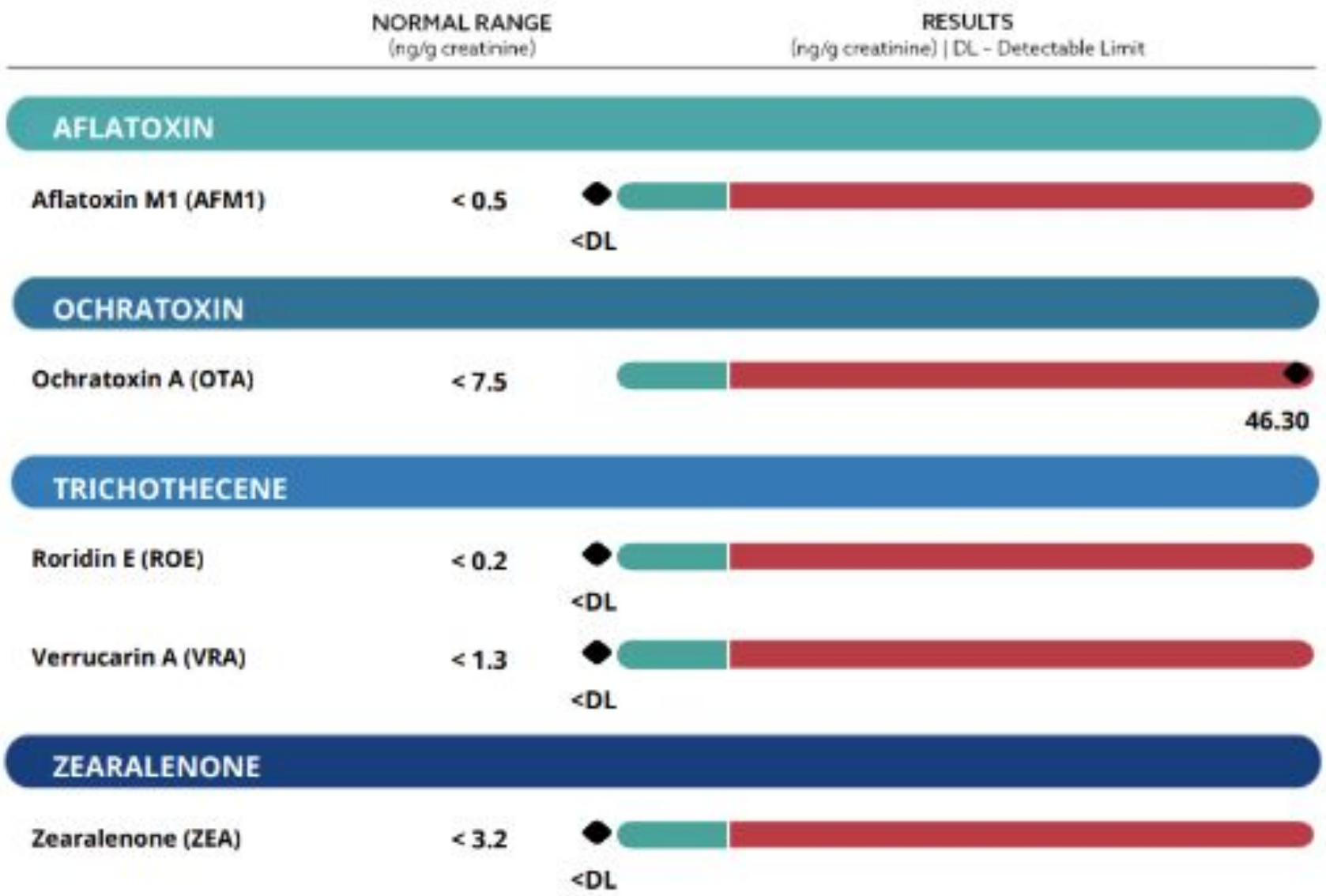
19) Bisphenol S (BPS)
Bisphenol S (BPS)

Parent Compound: Bisphenol S (BPS)

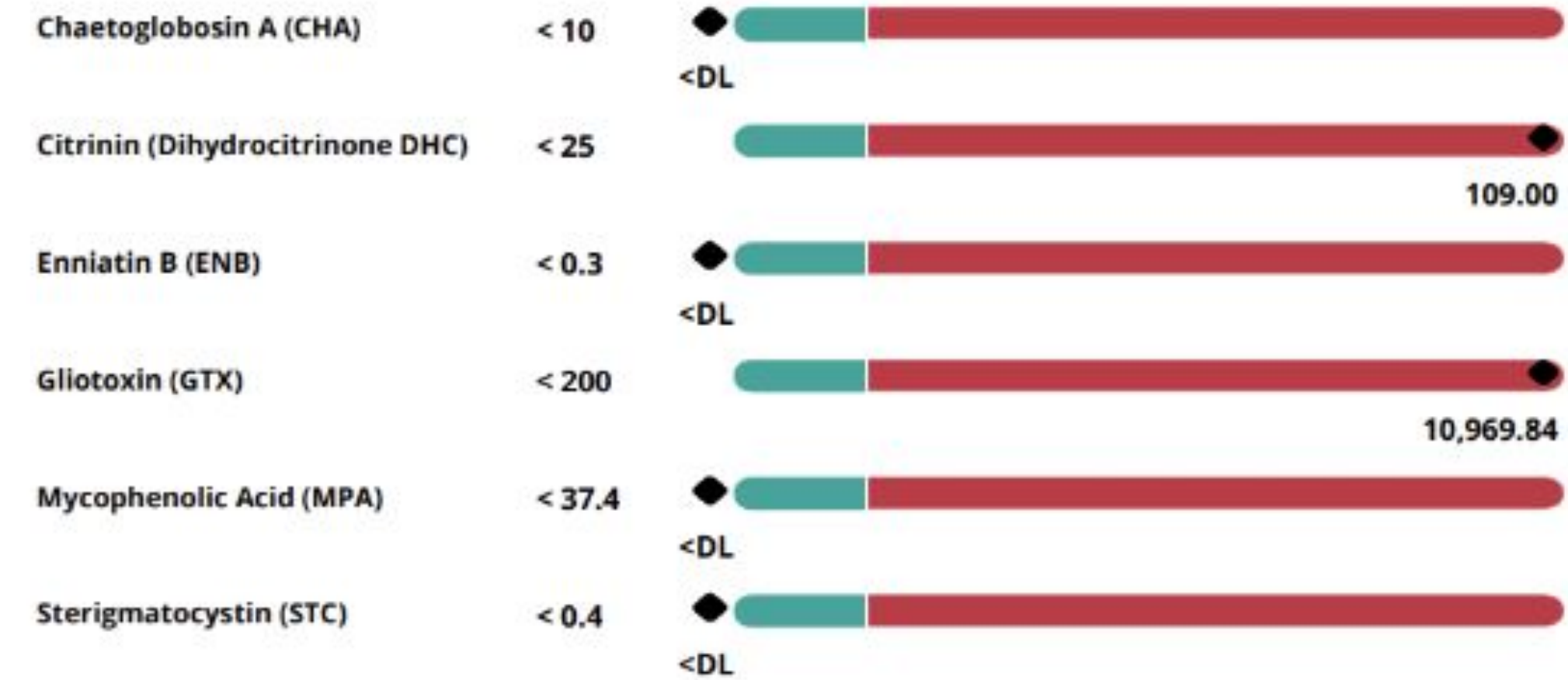
Bisphenols are synthetic compounds used in the production of plastics and resins, commonly found in various consumer products, including food and drink containers, water bottles, thermal receipt papers, dental sealants, toys, cosmetics, and the lining of canned goods. Along with being a known endocrine disruptor, BPA has raised concerns due to potential health impacts related to reproductive and developmental effects, increased risk of obesity, diabetes, cardiovascular disease, and certain cancers. In response to these concerns many companies now produce "BPA-Free" products; however, some BPA alternatives like BPS have also raised concerns about potential similar effects.

MycoTox

	NORMAL RANGE (ng/g creatinine)	RESULTS (ng/g creatinine) | DL – Detectable Limit
Ochratoxin A (OTA)	< 7.5	46.30
Citrinin (Dihydrocitrinone DHC)	< 25	109.00
Gliotoxin (GTX)	< 200	10,969.84


NORMAL RANGE
(ng/g creatinine)
RESULTS
(ng/g creatinine) | DL - Detectable Limit
AFLATOXIN
Aflatoxin M1 (AFM1)
< 0.5
<DL
OCHRATOXIN
Ochratoxin A (OTA)
< 7.5
46.30
TRICHOTHECENE
Roridin E (ROE)
< 0.2
<DL
Verrucarin A (VRA)
< 1.3
<DL
ZEARALENONE
Zearalenone (ZEA)
< 3.2
<DL

	NORMAL RANGE (ng/g creatinine)	RESULTS (ng/g creatinine) | DL – Detectable Limit
OTHER MYCOTOXINS		
Chaetoglobosin A (CHA)	< 10	<DL
Citrinin (Dihydrocitrinone DHC)	< 25	109.00
Enniatin B (ENB)	< 0.3	<DL
Gliotoxin (GTX)	< 200	10,969.84
Mycophenolic Acid (MPA)	< 37.4	<DL
Sterigmatocystin (STC)	< 0.4	<DL



OAT

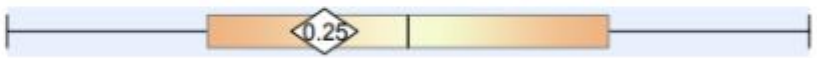
Tryptophan Metabolites				
38 5-Hydroxyindoleacetic (5-HIAA) *(serotonin)*		≤ 4.3	1.7	
39 Quinolinic	0.85	- 3.9	2.4	
40 Kynurenic		≤ 2.2	2.2	

Nutritional Markers

Vitamin B12						
50	Methylmalonic ✱		≤ 2.3		1.5	
Vitamin B6						
51	Pyridoxic (B6)		≤ 34		0	
Vitamin B5						
52	Pantothenic (B5)		≤ 10		5.5	
Vitamin B2 (Riboflavin)						
53	Glutaric ✱	0.04	- 0.36	H	0.73	
Vitamin C						
54	Ascorbic	10	- 200	L	2.2	
Vitamin Q10 (CoQ10)						
55	3-Hydroxy-3-methylglutaric ✱	0.17	- 39		12	
Glutathione Precursor and Chelating Agent						
56	N-Acetylcysteine (NAC)		≤ 0.28		0.02	
Biotin (Vitamin H)						
57	Methylcitric ✱	0.19	- 2.7		0.65	

✱ ***A high value for this marker may indicate a deficiency of this vitamin.***

Indicators of Detoxification

Glutathione						
58	Pyroglutamic ✱	10	- 33		30	
Methylation, Toxic exposure						
59	2-Hydroxybutyric ✱✱	0.03	- 1.8		1.7	
Ammonia Excess						
60	Orotic	0.06	- 0.54		0.25	
Aspartame, salicylates, or GI bacteria						
61	2-Hydroxyhippuric		≤ 1.3	H	1.7	

✱ *A high value for this marker may indicate a Glutathione deficiency.*

✱✱ *High values may indicate methylation defects and/or toxic exposures.*

Interventions - Lifestyle

- Stay somewhere else during renovation
  - Wear mask, gloves and protective clothing anytime at the house
- HEPA filters in all the rooms
- Ventilate the house
- Sauna daily for >20 minutes
  - Shower immediately after
  - Do not re-wear clothes or reuse towels from sauna

Interventions - Lifestyle

- Filter all water
  - Drinking & bathing
- Sleep hygiene
  - Minimize electronics, dim lights before bed
  - Bedroom as dark as possible
  - White noise
  - Sleep mask
  - Body scan meditation

Interventions - Diet

- Marshmallow root cold infusion and chamomile tea
  - Glass, ceramic or stainless steel containers only
- Whole foods based diet
  - Organic foods when possible
  - Eliminate dairy
  - No artificial sugars
  - Be mindful when eating out
  - Limit significant sources of mycotoxins shown positive on test
- 64oz (at least) of clean water daily

Interventions – Supplements

- Blended Binder Product: Bentonite clay, Zeolite, High density Chitosan, Modified Citrus Pectin, Aloe Vera, Silica
- MVM packs formulated for detox support, B Complex, Fish Oil, Probiotics (Lacto, Bifido, Sacch), ALA, Liposomal Glutathione
- GI Repair powder: Zn, Glutamine, Colostrum, Slippery Elm, Quercetin
- Chew DGL tabs as needed
- Complete digestive enzymes product with each meal
- Melatonin at bedtime

Additional Testing Considerations

- Heavy (Toxic) & Nutrient Metals
  - Additional insight into body burden
- Comprehensive stool test
  - Health of GI lining & gut microbiome
  - Inflammation markers
- Salivary hormones
  - Cortisol x4 & sex hormones
- DNA Methylation
  - COMT, MAO, MTHFR, etc

Toxins Impacts On OAT

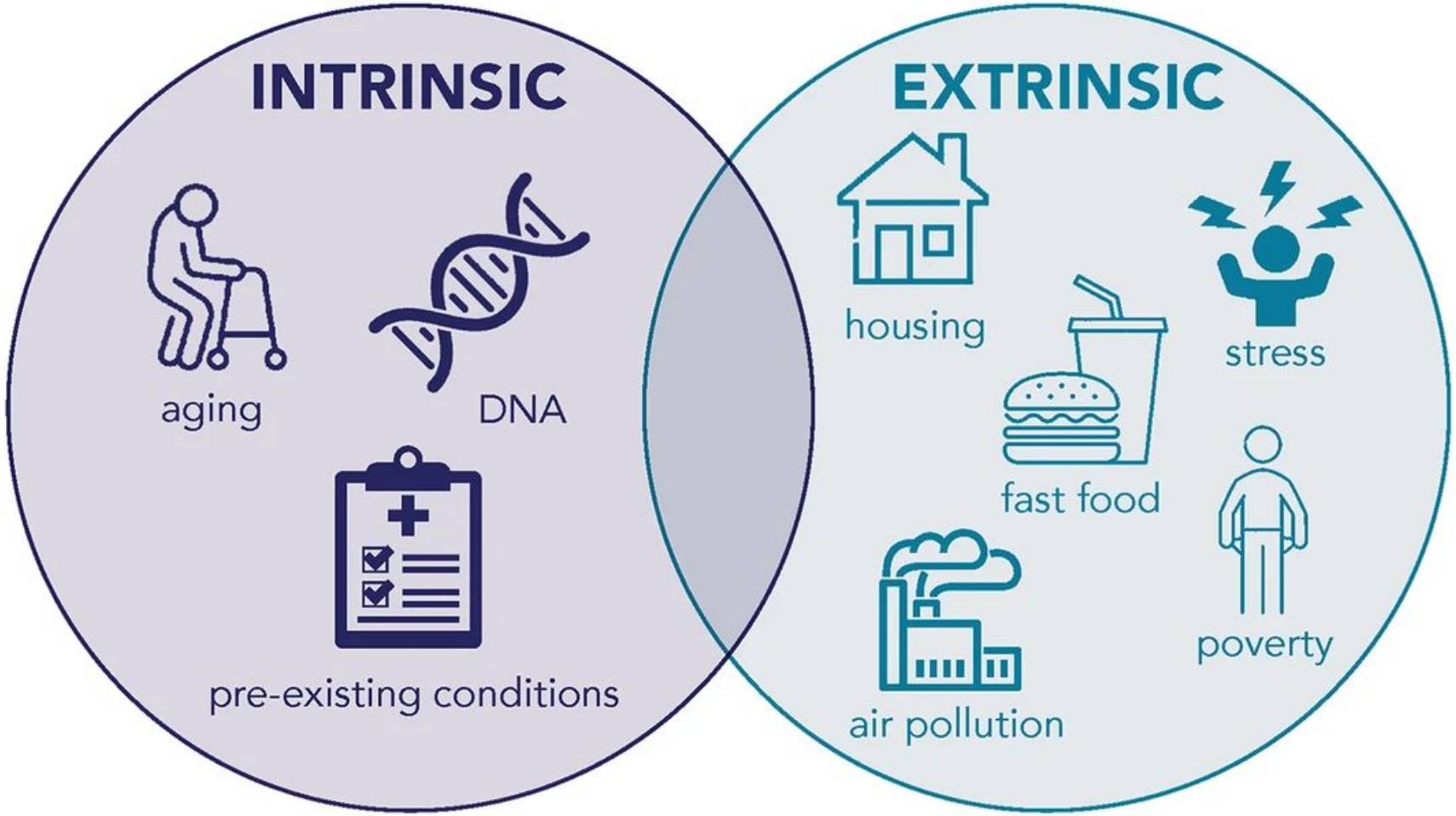
OAT
ORGANIC ACIDS TEST

- Intestinal microbial markers: mycotoxins, pesticides
- Krebs cycle markers: heavy metals & mycotoxins
- Neurotransmitter metabolites: heavy metals, pesticides, phthalates
- Detox markers: all environmental toxins/toxicants

MOSAIC DIAGNOSTICS

PMID: 17542490; 33132781; 29896184; 7628083; 22815244; 38099711; 36835457; 24250680; 9471920; 12641442; 9152016; 29206204; 16581550; 19821830; 28701428; 32179323; 37242973; 26908712; 24235282;
https://pubchem.ncbi.nlm.nih.gov/compound/440864

Building Protocols



PMID: 36635753

MOSAIC DIAGNOSTICS
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The Fundamentals

- Minimize exposure
  - Filter water & air
  - Address intake via food & personal care products
- Ensure they are able to eliminate toxins
  - Urine, feces, sweat, breath
    - Do not allow them to recirculate
  - Liver function, Kidney function, etc
- Good GI health
  - Gut microbiome, intestinal lining and enzymes

MOSAIC DIAGNOSTICS
Formerly Great Plains Laboratory

The Fundamentals

- Ensure
  - Macro & micro nutrient needs are met
  - Hydration needs are met
  - They are sleeping
  - They are moving daily
- Respect the patient's level of health
  - Are they able to handle any level of detoxification or are they too frail?
  - Meet them where they are at today
    - Recognize that might change

MOSAIC DIAGNOSTICS
Formerly Great Plains Laboratory

The Fundamentals

- Supplements
  - Fiber
  - Binders
  - Antioxidants
  - High quality MVM supplement
  - Omega 3s
  - Immune modulators
- Medications
  - Bile acid sequestrants
  - Antimicrobials
- Do not chelate or provoke until you have been well trained to do so

MOSAIC DIAGNOSTICS
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Additional Tests To Consider

- Comprehensive Stool testing
  - Health of GI, ability to handle detoxification, likelihood of recirculation of toxins/toxicants, inflammation, poor nutritional status
- OAT – Organic acids
  - Mitochondrial function, oxidative stress, nutritional needs, insight into detoxification, insight into bacterial balances
- Omega 3 Index Complete
  - Nutrition status, dietary fat make-up, pro/anti-inflammatory omega balance

MOSAIC DIAGNOSTICS
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Additional Tests To Consider

- Amino Acids Test
  - Nutrition status, ability to handle detoxification
- Urine Porphyrins
  - Functional assessment of suspected Pb, Hg, As toxicity
- IgG Food Map – Food sensitivity
  - Additional source of inflammation
- DNA Methylation Panel
  - Window into detoxification SNPs

MOSAIC DIAGNOSTICS
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Empower Your Patients

- Educating your patient is key
  - https://www.ewg.org/
  - https://www.thinkdirtyapp.com/
  - https://www.eea.europa.eu/en

- Do not overwhelm them (or yourself!)

EWG
https://www.ewg.org

Yuka

MOSAIC DIAGNOSTICS
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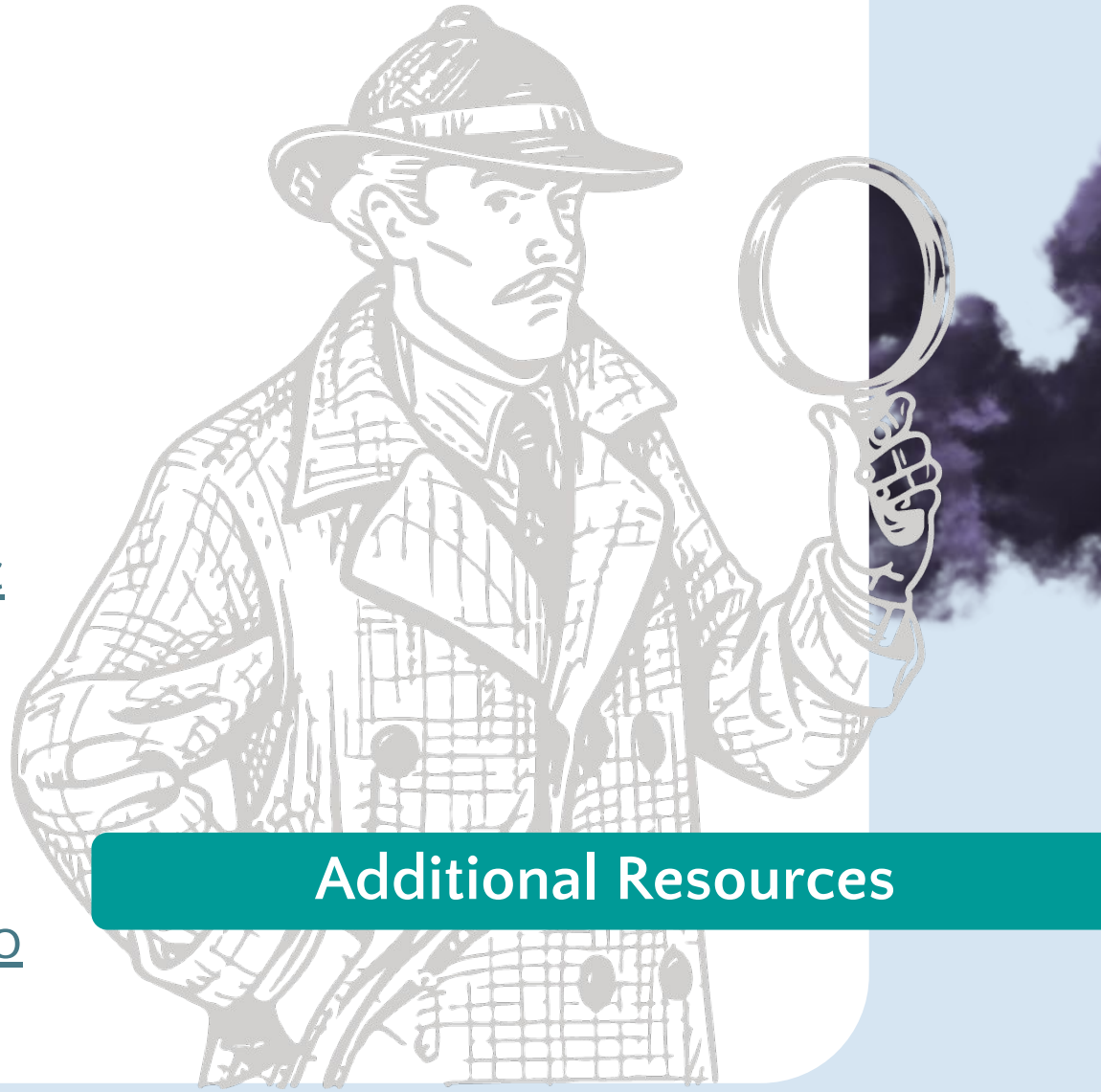
- National Association for Environmental Medicine
  - https://envmedicine.com/
- American Academy of Environmental Medicine
  - https://www.aaemonline.org/
- Health And Environment Alliance
  - https://www.env-health.org/
- Center for Science in the Public Interest
  - https://www.cspinet.org/page/chemical-cuisine-ratings
- European Environmental Agency
  - https://www.eea.europa.eu/en
- WHO Europe - Environment
  - https://www.who.int/europe/health-topics/environmental-health#tab=tab_1



Additional Resources


Questions?