

# The Missing Link:

*Balancing Tiny Explosions*



**Nina-Marie Rueda, ND**



## Who is she?

### *Nina-Marie Rueda, ND*

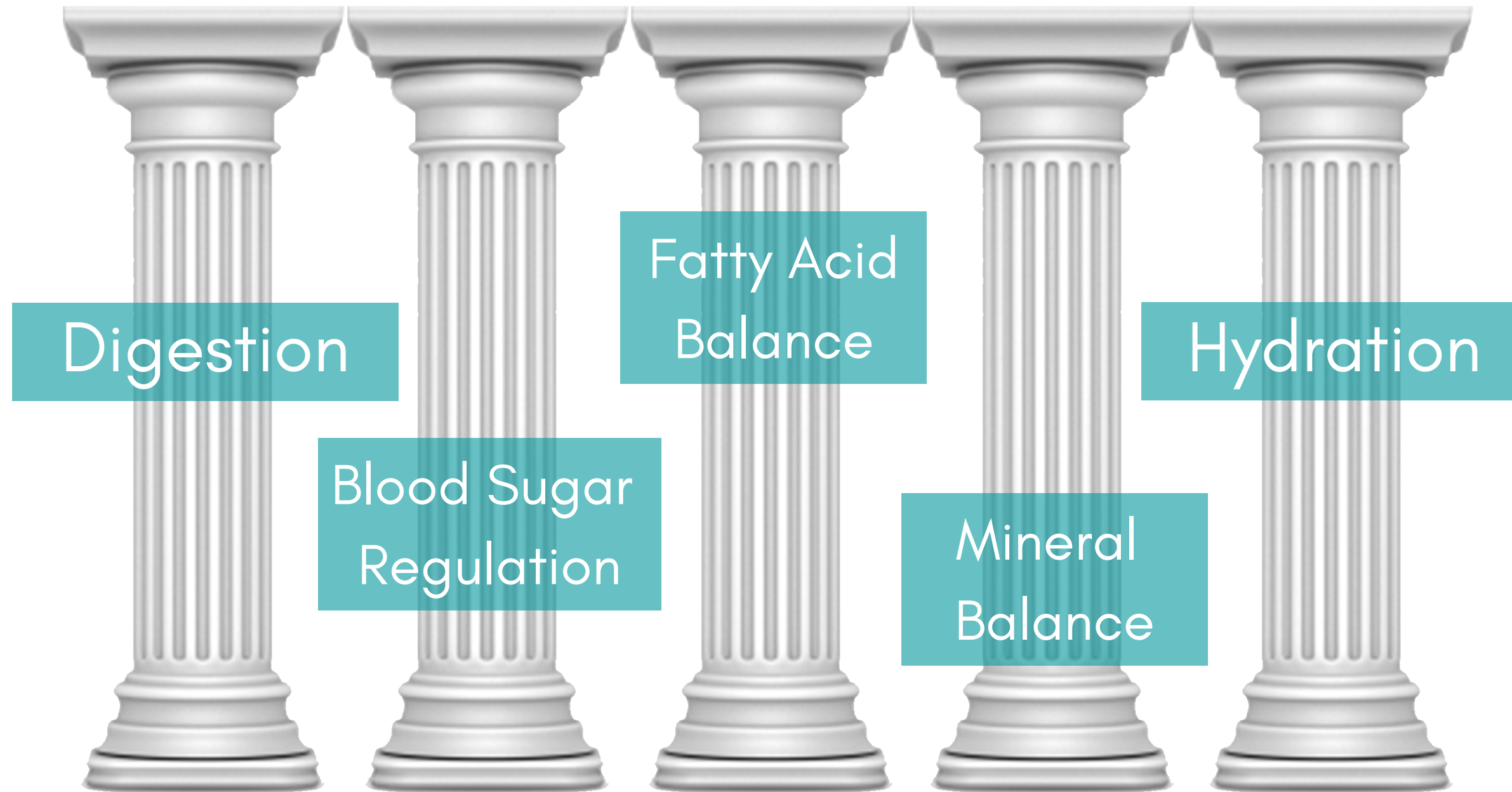
- wife
- mother
- naturopath
- functional nutritionist
- labor doula
- postpartum doula
- lactation educator
- former postpartum private chef
- educator



# What will we cover?

- Know what the roles of various minerals are in health
  - with special emphasis on Ca, Mg, Na, K
- Case studies:
  - fertility/blood pressure
  - eczema
  - PANDAS
  - Autism
  - pregnancy

# Pillars to Health



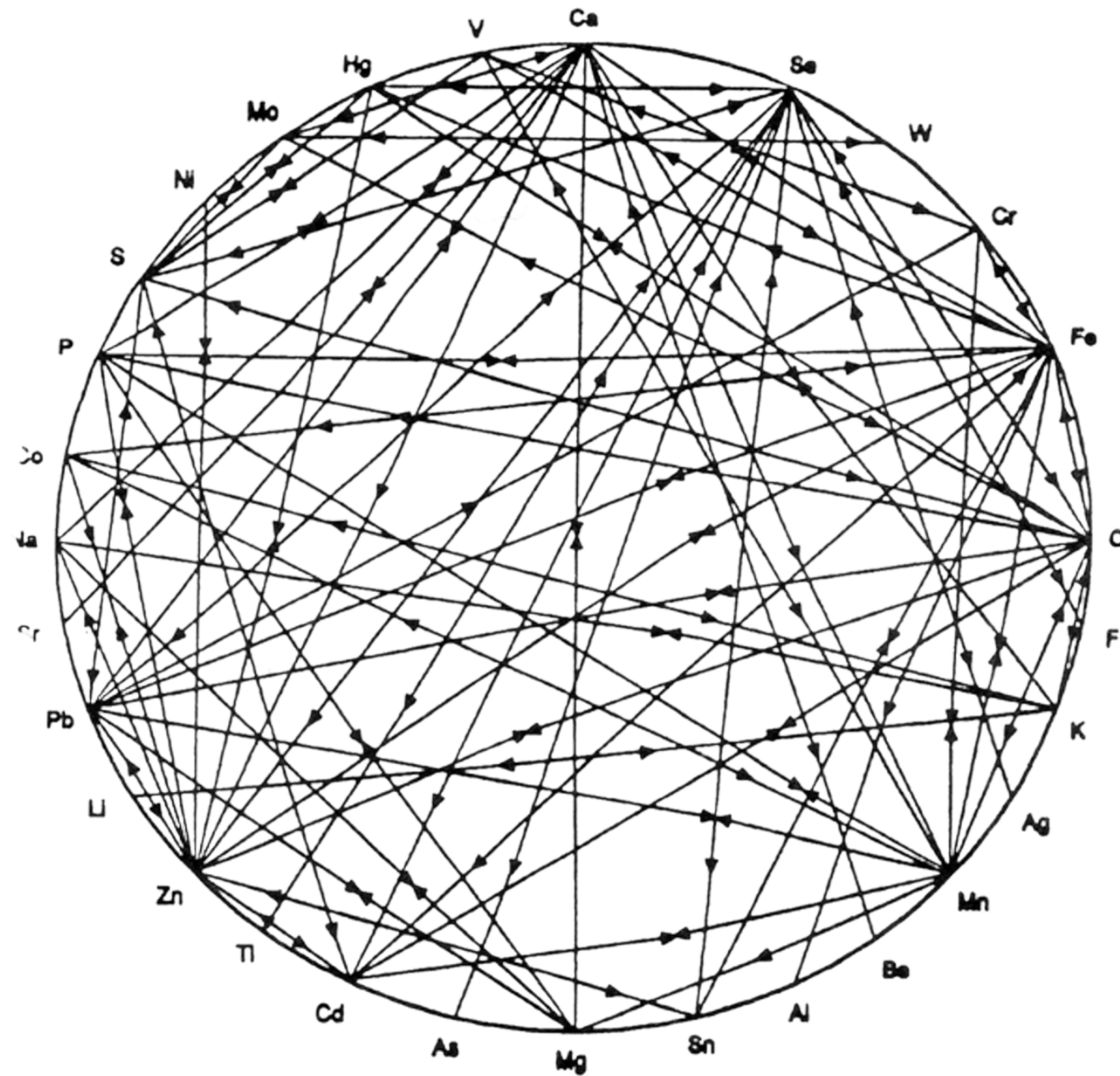
# What are minerals, anyway?



- spark plugs to reactions in the body
- they are needed
  - to make hormones
  - eliminate toxins (detoxification)
  - make digestive juices
  - contract/relax muscles/tissues
  - create energy
  - produce neurotransmitters
  - and much more

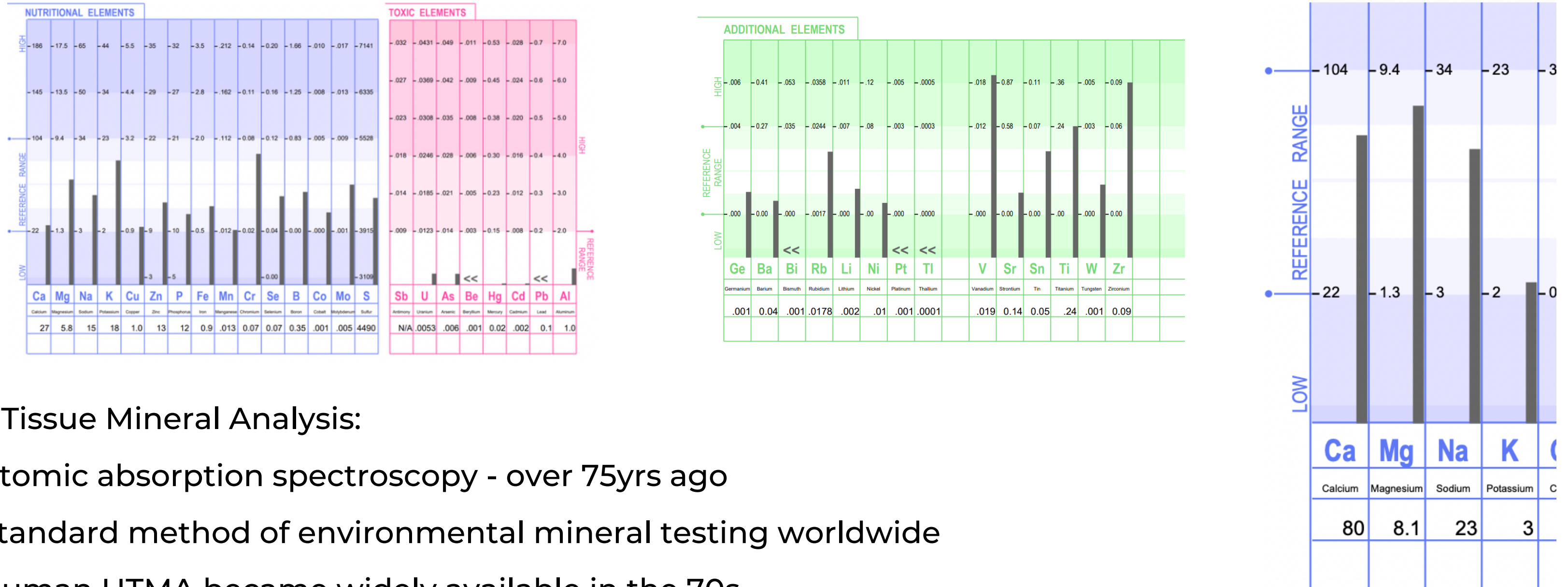


# What creates mineral imbalances?



- depleted soil
- medications
  - includes supplementation
- stress
  - birth/childhood
  - teens/college
  - adult years
  - pregnancy
  - breastfeeding
  - surgery/injury/illness
  - poor sleep

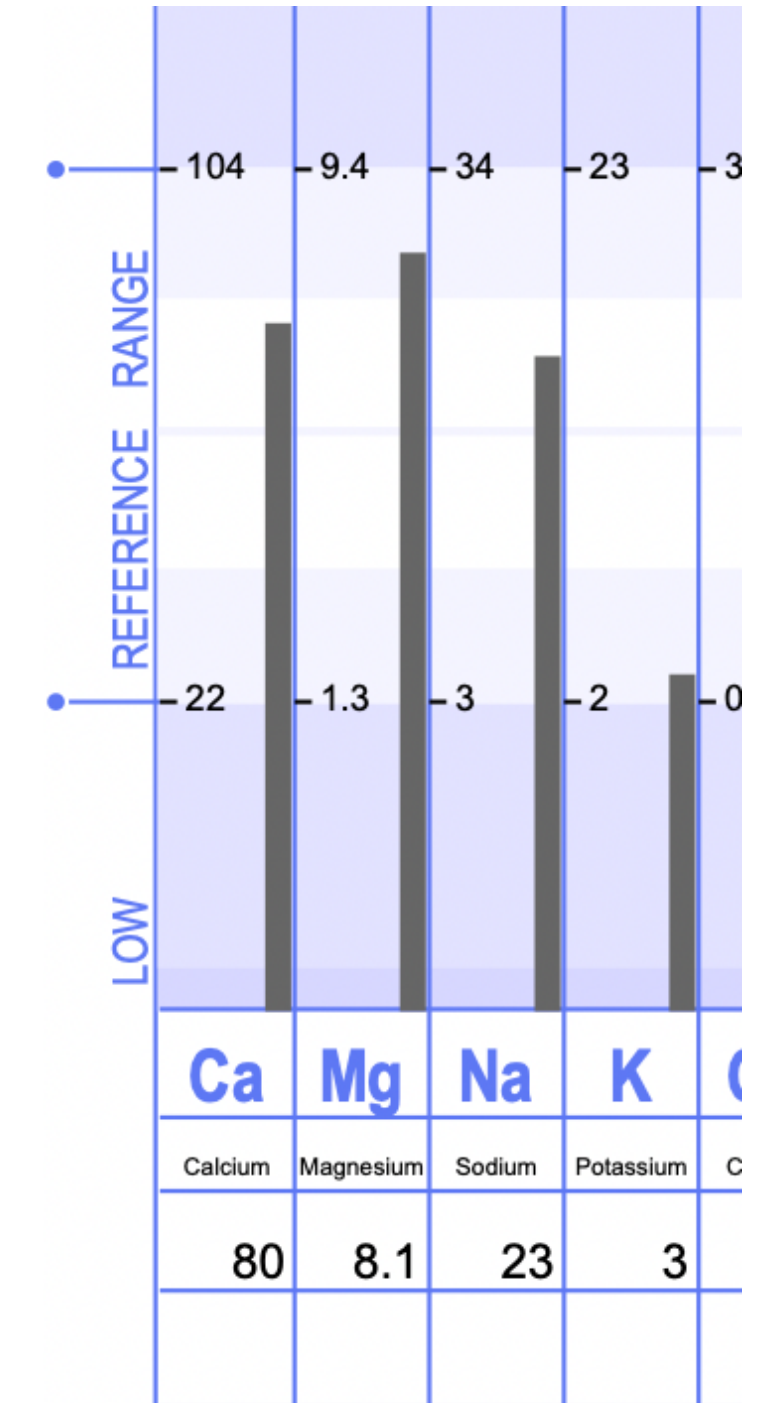
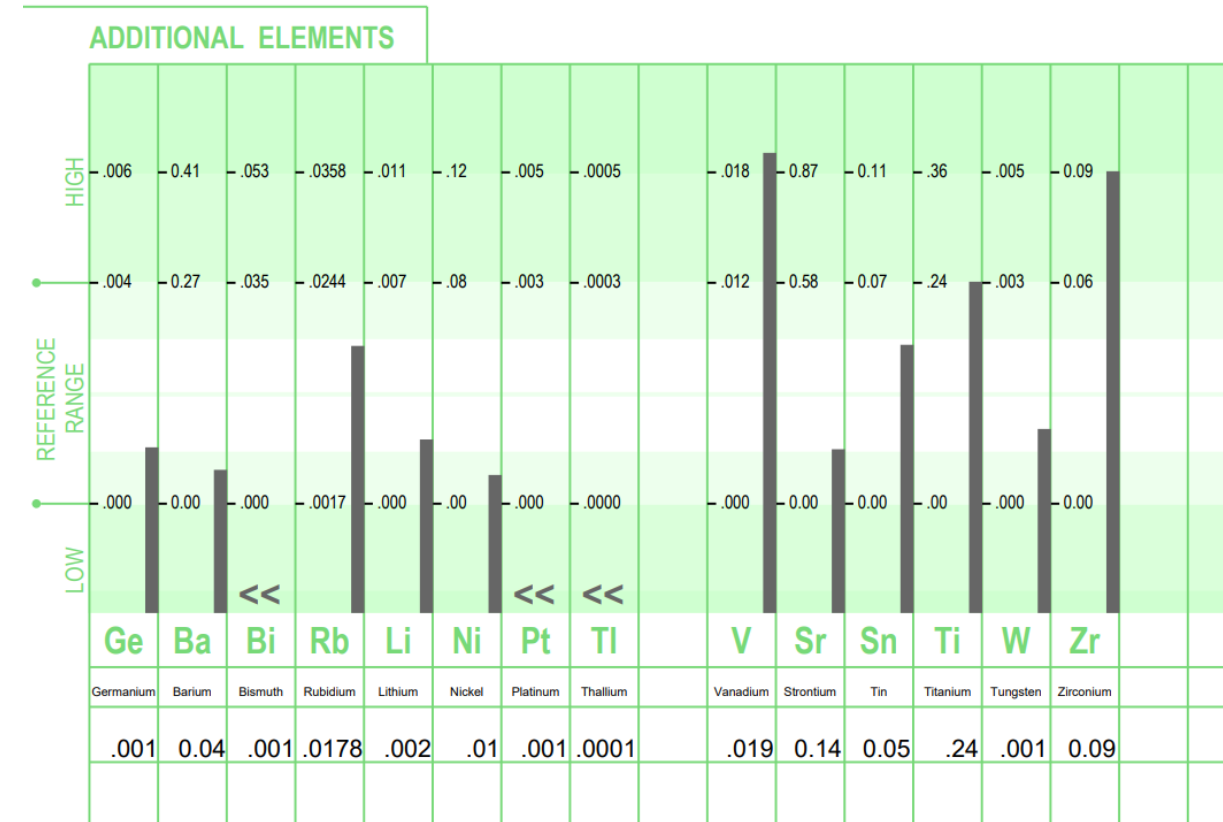
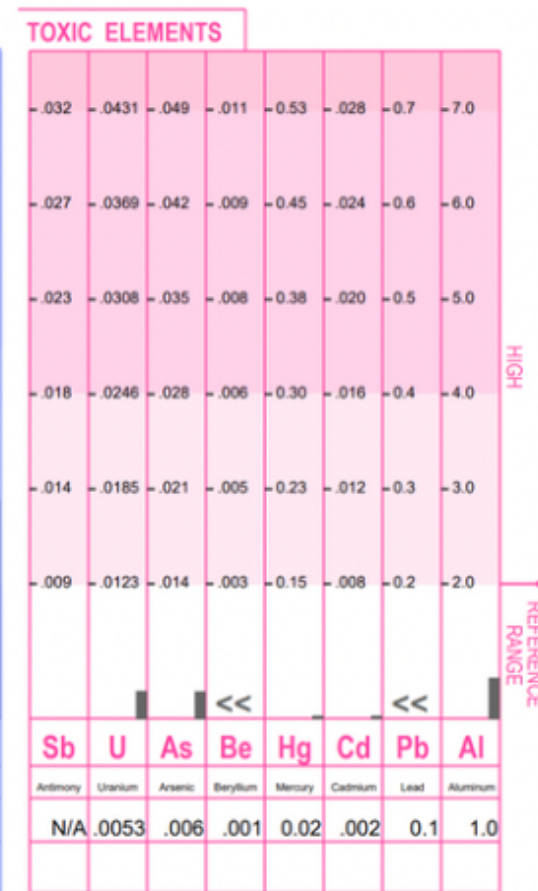
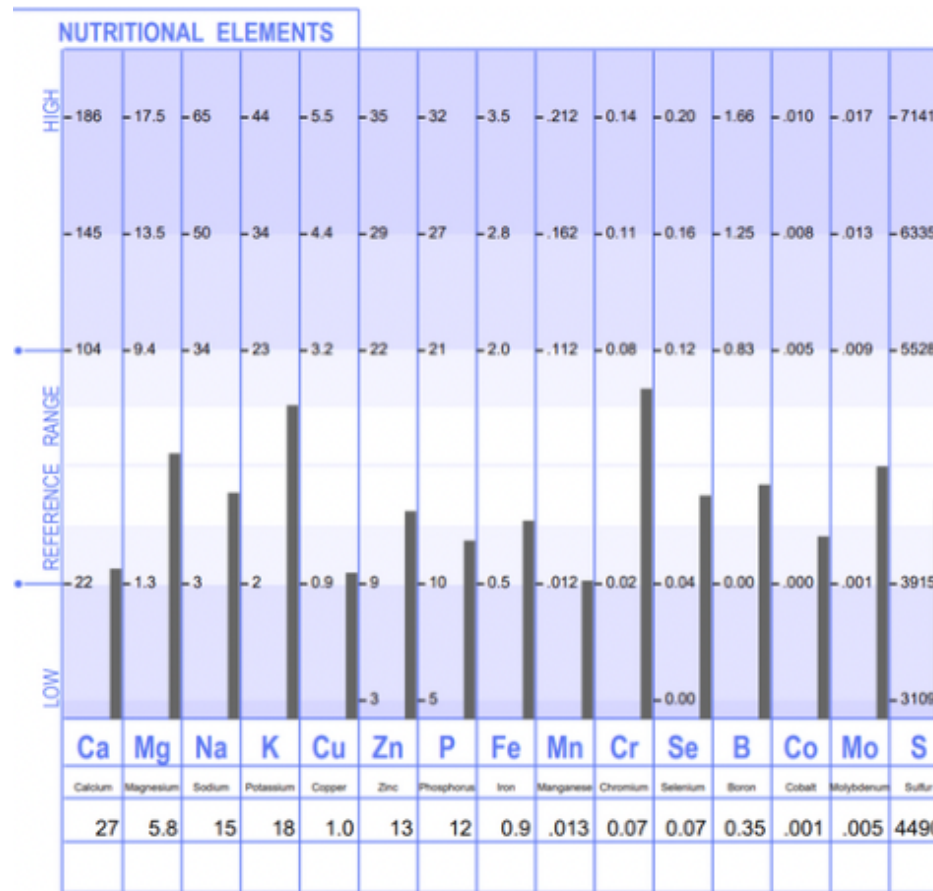
# How are minerals measured?



## Hair Tissue Mineral Analysis:

- atomic absorption spectroscopy - over 75yrs ago
- standard method of environmental mineral testing worldwide
- human HTMA became widely available in the 70s
- Drs. Paul Eck and David Watts are pioneers in this research and went on to found ARL and TEI labs
  - discovered the distinct nutrient patterns on HTMA

# How are minerals measured?



*But what about blood chemistry??*

- Blood is homeostatic and will deposit elements into tissues to remain in balance.
- Blood shows acute snapshots.
- Using both will give a comprehensive picture.



# Important Principle:

- Antagonism and Synergism of Elements:

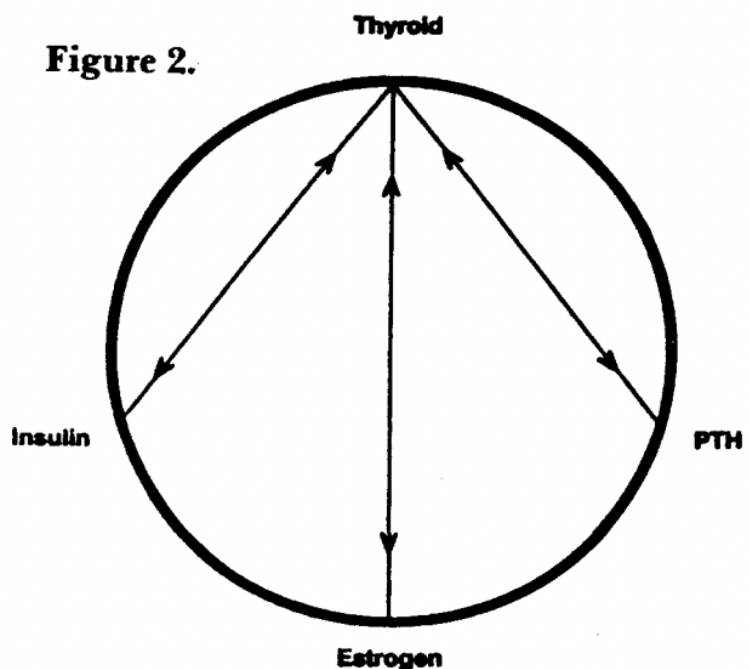
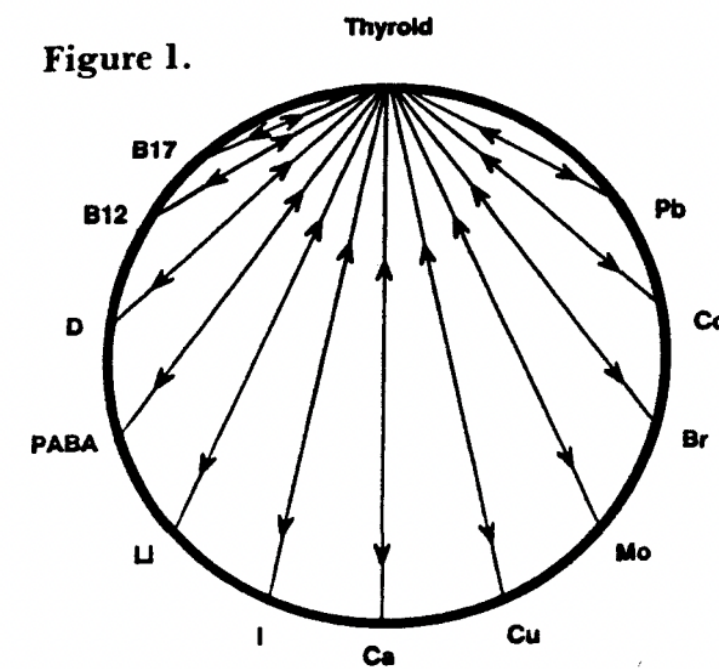
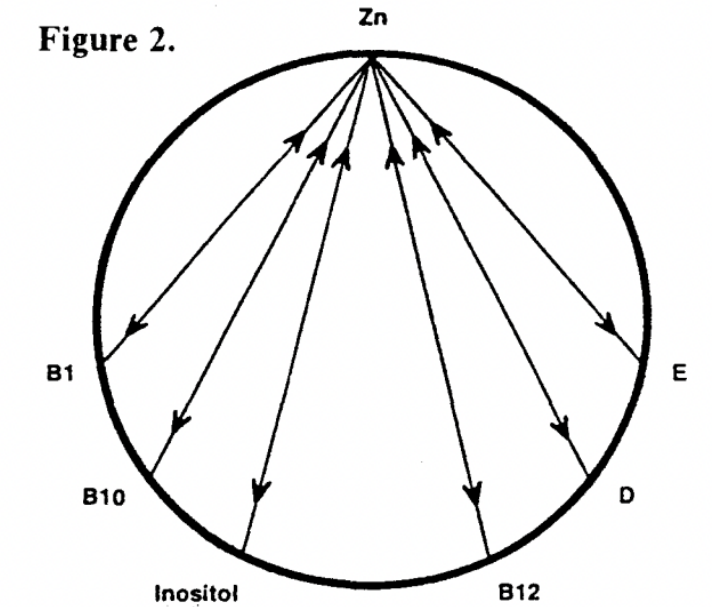
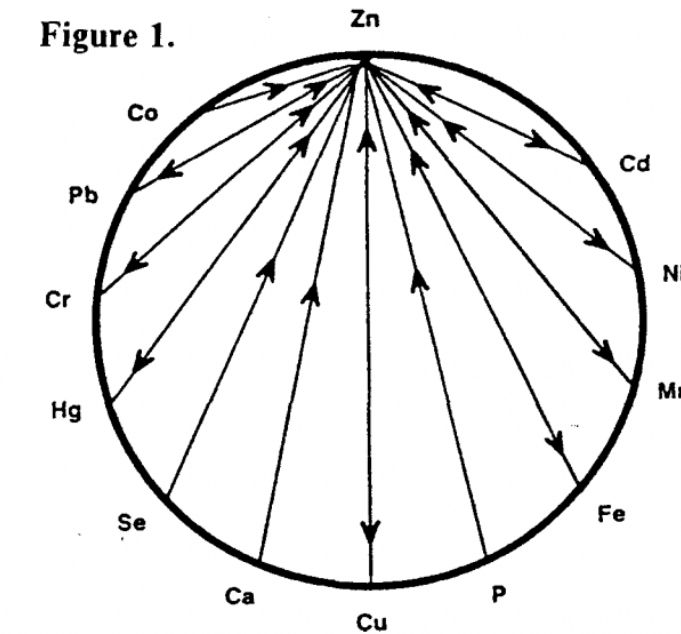
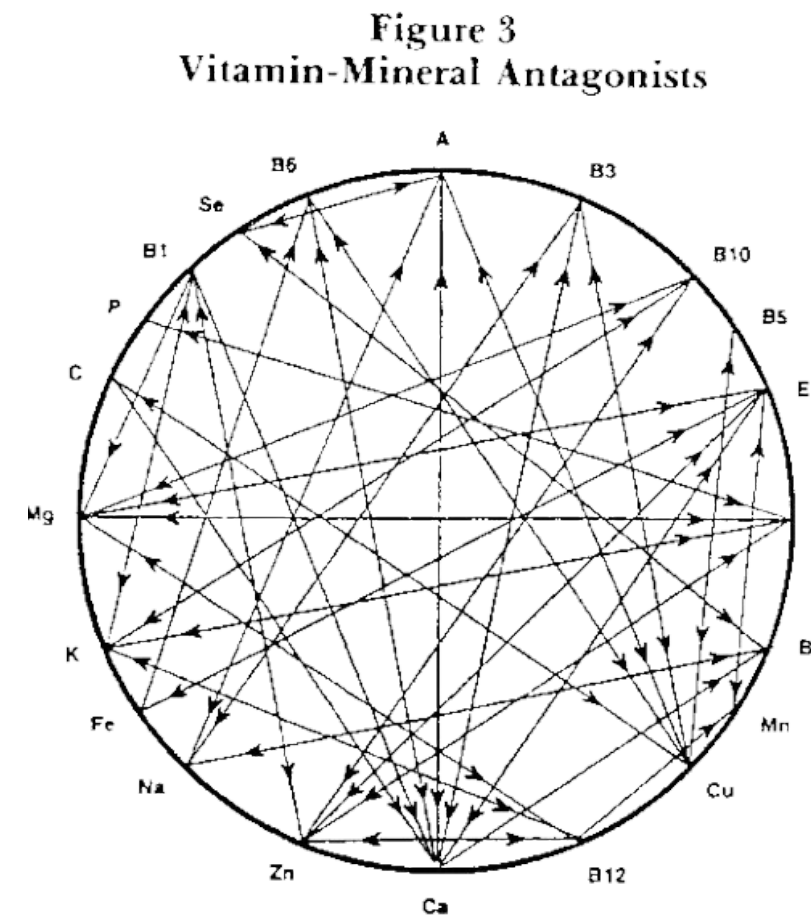
- Minerals and minerals
- Minerals and vitamins
- Minerals and hormones
- Minerals and metals (antagonistic only)

- Antagonistic Examples:

- Cadmium: Ca, Fe, Mn
- Calcium: Pb, Zn, Mg, Fe, P, Mn, Na, K, Cd
- Thyroid hormone: Ca, Cu, Br, Pb, Co
- Chromium: Vitamin B12, Vitamin D, Vitamin B10

- Synergistic Examples:

- Magnesium: Ca, K, Zn, Mn, P, Cr
- Magnesium: Vitamin A, B1, B2, B3, C, E
- Estrogen: Copper
- Testosterone/Progesterone: Zinc



# Calcium

- primary structural element
- over 95% is in the bone and teeth
  - when it is displaced into the tissues, it dysregulates that tissue's/organ's functions
- inhibits thyroid hormone
  - can block iodine receptors and negatively impact your thyroid
- insulin release is dependent on calcium's availability
- controls the nervous system
- responsible for muscle contractions
- maintain the pH of the body
- reduces lactic acid build up



# Magnesium

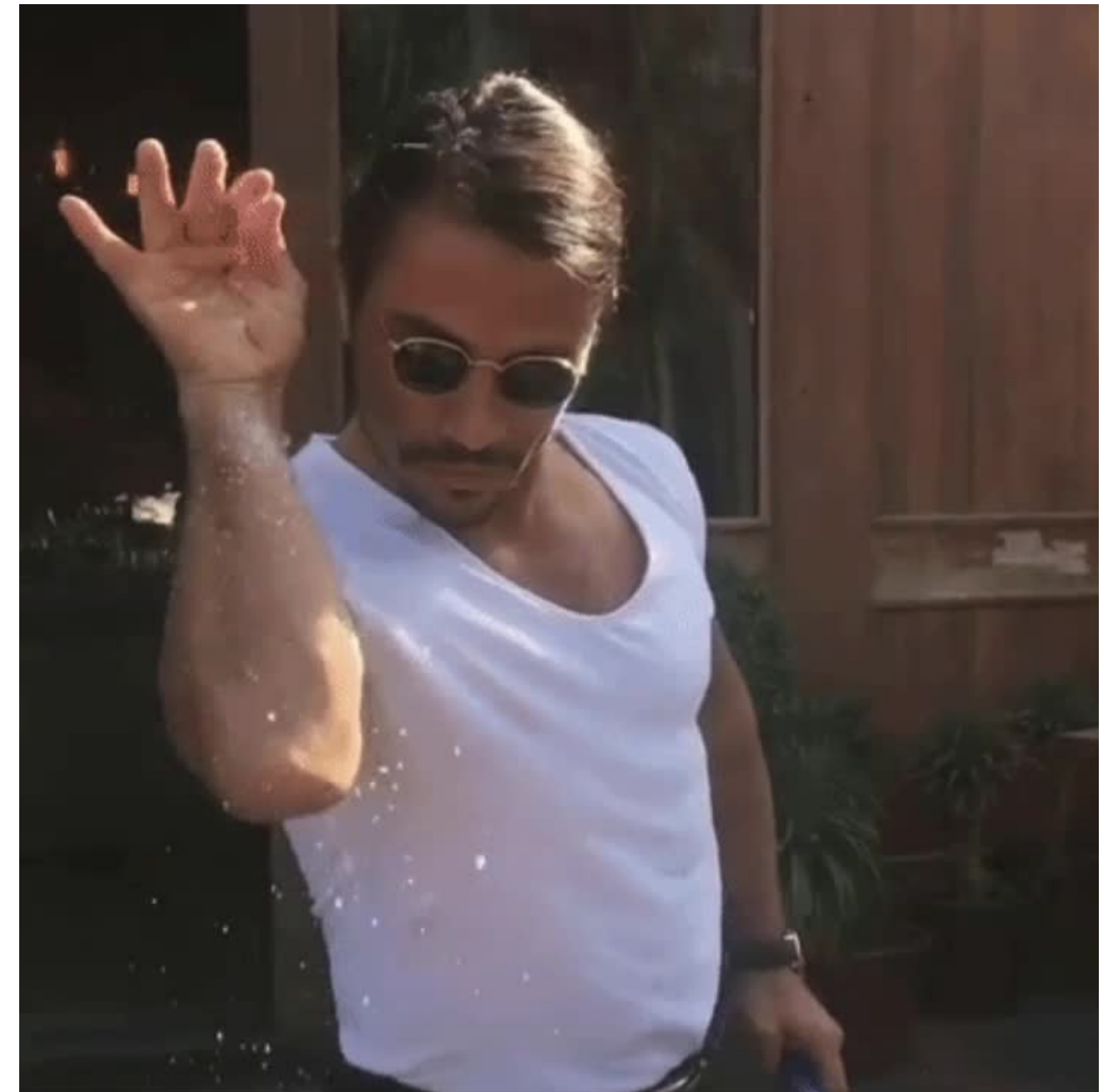
- intracellular mineral
- key element in cellular metabolism
- needed for the creation of ATP (energy)
- needed for over 3,000 enzyme reactions
- regulates sugar metabolism
- highest concentration in muscles, liver, heart, pancreas
- needed for cell membrane permeability
- relaxes muscles
- reduces inflammation
- known as the heart mineral





# Sodium

- primary alkalizer
- regulated by the adrenal glands secretion of aldosterone
- regulates blood pressure
- regulates increased heart rate
- maintains fluid balance
- maintains pH levels
- influences hydrochloric acid levels (stomach acid)
- influences cell membrane permeability
  - sodium-potassium pump

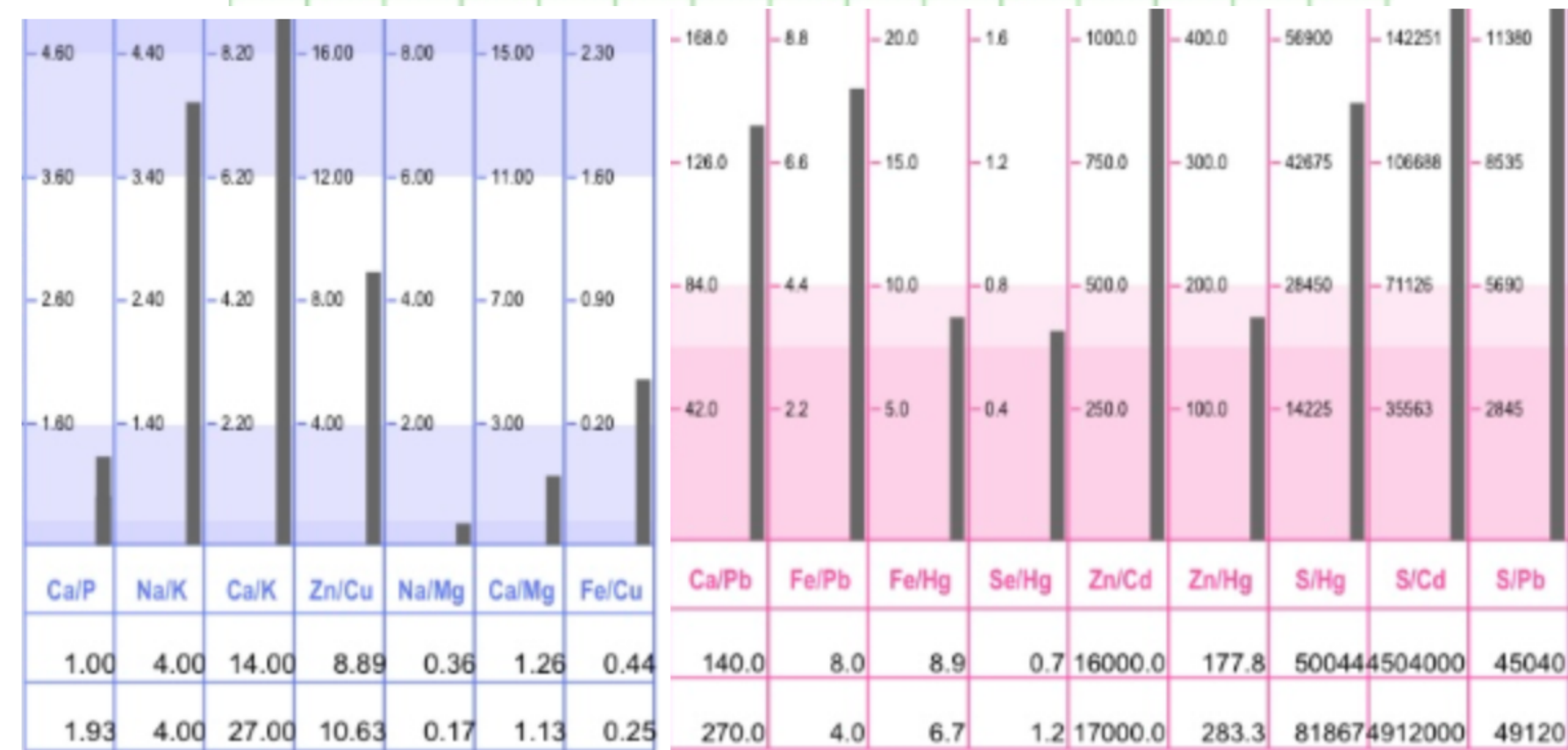
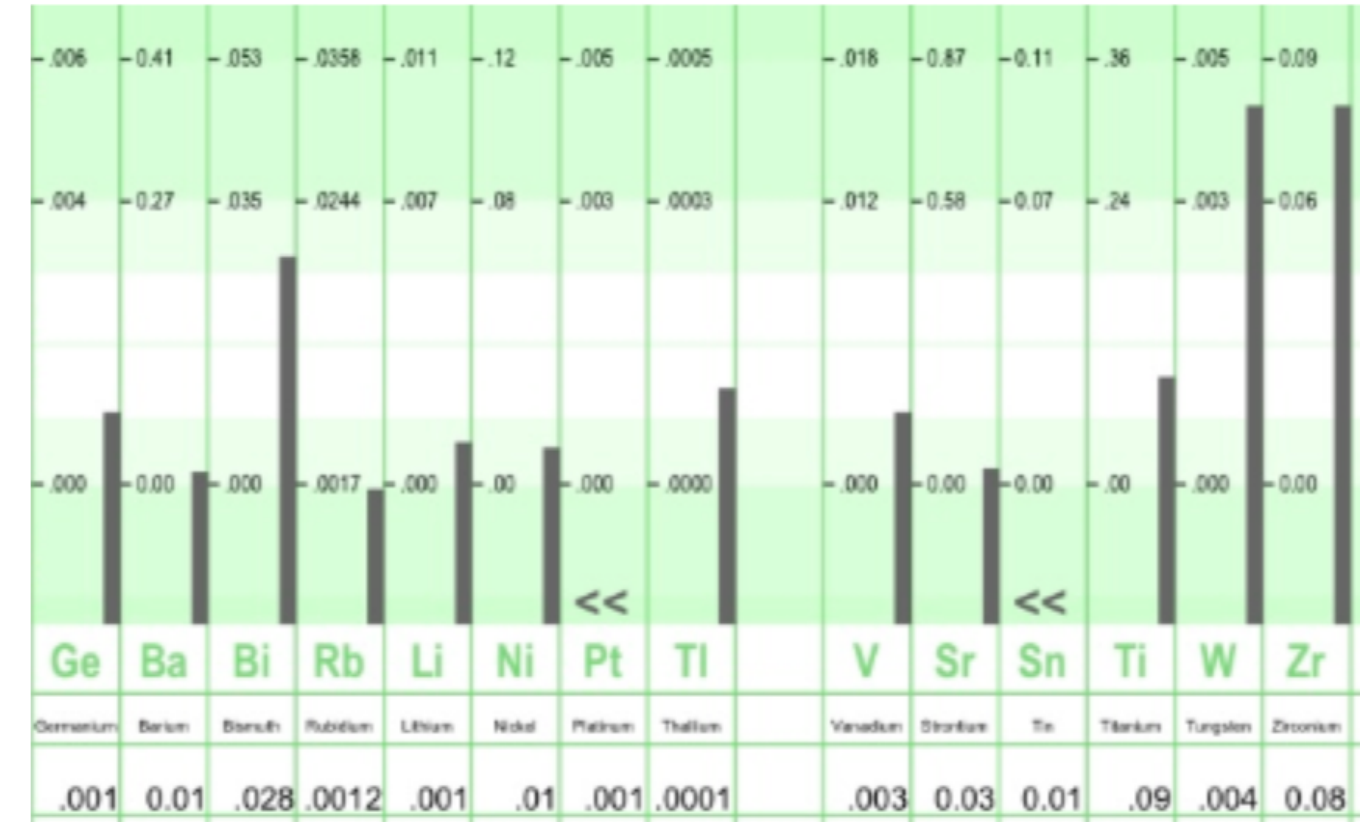
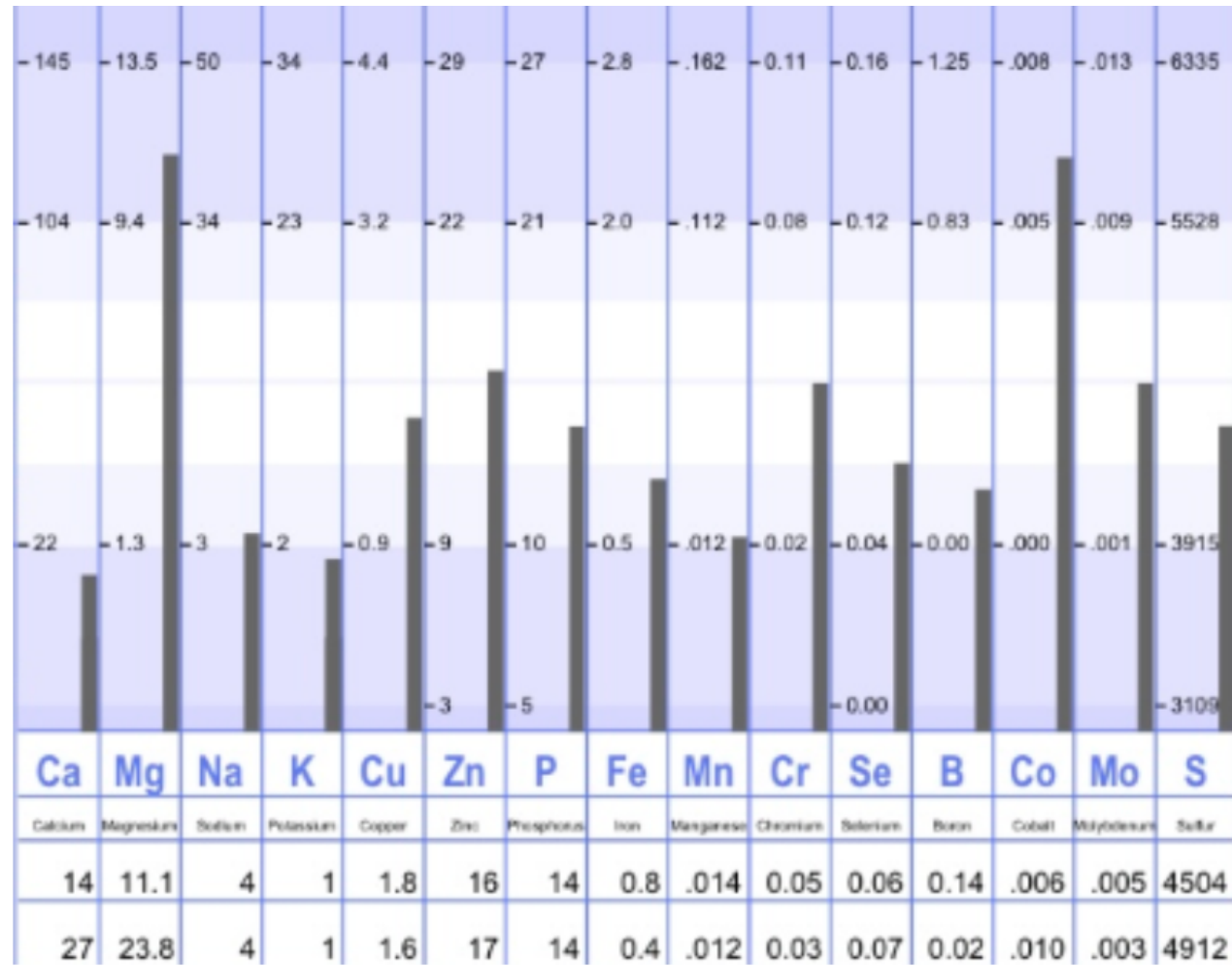


# Potassium

- regulates blood pressure (with sodium)
- maintained fluid pH & pH level of the body
- influences cell membrane permeability
  - sodium-potassium pump
- sensitizes the cell to thyroid hormone
- involved in managements of hormones
  - assists in steroid production/transport in the placenta
- nerve conduction of the heart
- lowers heart rate
- dilates arteries



# Fertility: 35, F

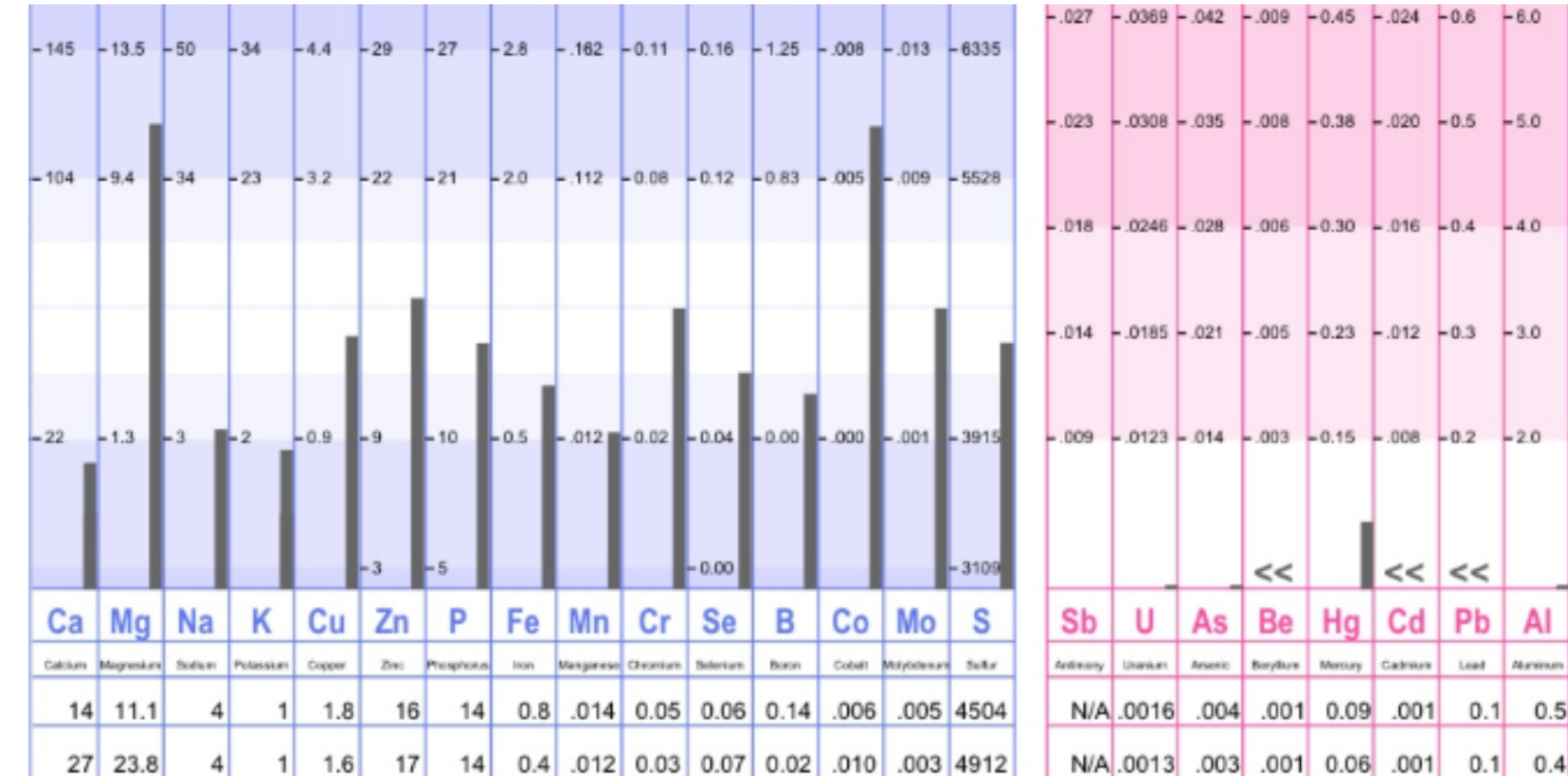


- *Fatigue, digestive issues, returning hair loss, extremely painful period cramps, consistent mild dizziness/low blood pressure. She is working on getting her body in a better place before trying to get pregnant.*



# Fertility: 35, F

- Three Lows - Ca/Na/K
  - overwhelming stress (stress response is beginning to malfunction)
  - blood pressure becomes dysregulated



Review > Biochim Biophys Acta Mol Cell Res. 2018 Nov;1865(11 Pt B):1815-1829.  
doi: 10.1016/j.bbamcr.2018.08.005. Epub 2018 Aug 9.

## Establishing life is a calcium-dependent TRiP: Transient receptor potential channels in reproduction

Katrien De Clercq<sup>1</sup>, Joris Vriens<sup>2</sup>

Affiliations + expand

PMID: 30798946

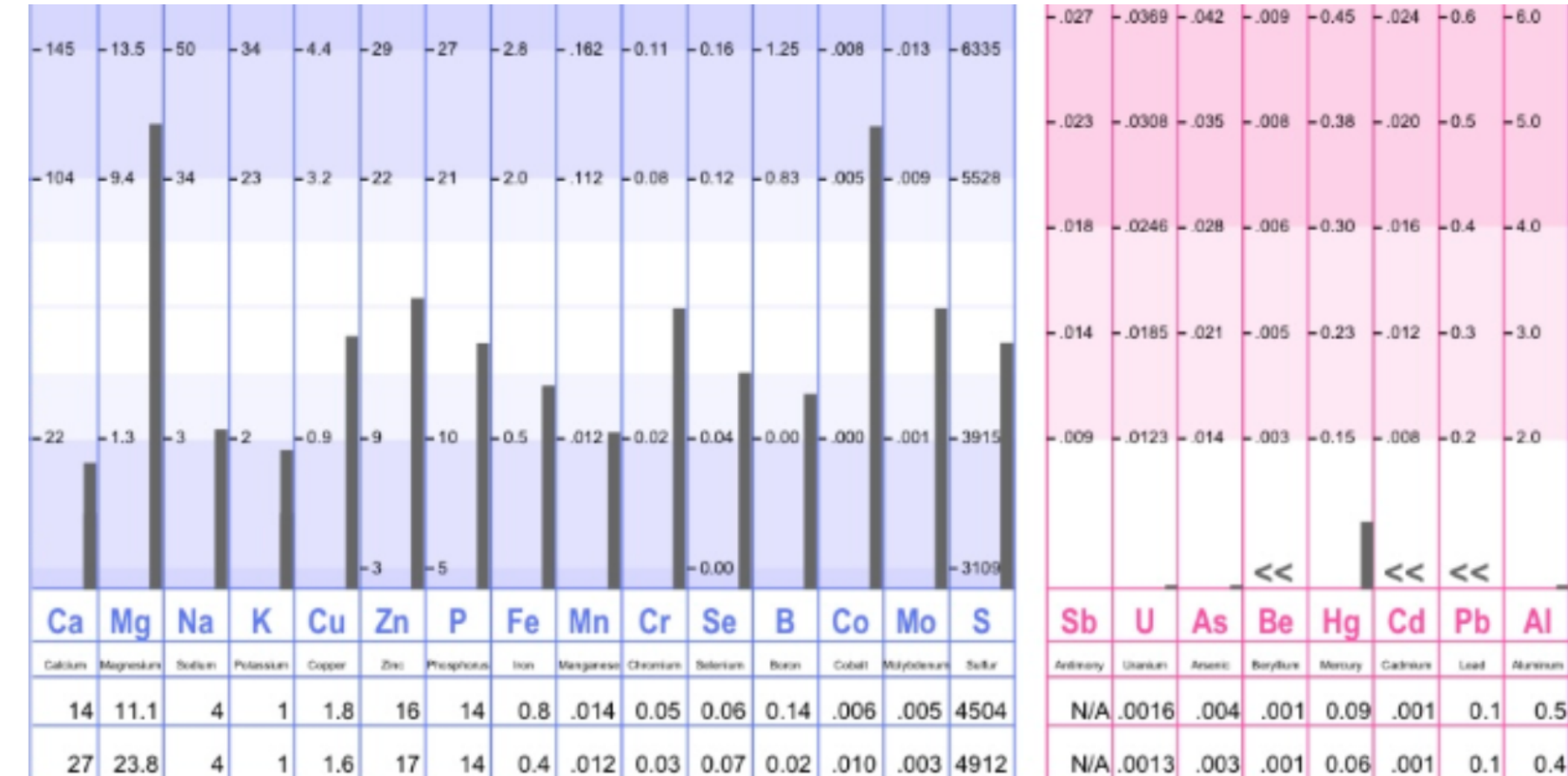
DOI: 10.1016/j.bbamcr.2018.08.005

Free article

- Ca - low: dysregulated BP (usually high), hyperthyroidism, anxiety, Type I insomnia, etc.
  - Fertility: germ cell maturation, placental development, regulates sperm movement/shape, needed for fertilization

# Fertility: 35, F

- Na - low: can lead to low BP, dizziness, fatigue, low HCl, depression, bloating, weakness, poor protein digestion, etc.
  - Fertility: supports BP, decreasing poor prenatal outcomes, decreases risk of endo and PCOS
  - *NOTE: blood chem showed low Na as well*



> BMC Pregnancy Childbirth. 2020 Jan 8;20(1):25. doi: 10.1186/s12884-019-2699-3.

## Pre-conception blood pressure and evidence of placental malperfusion

Jacqueline Atlass<sup>1</sup>, Marie Menke<sup>1</sup>, W Tony Parks<sup>1 2 3 4</sup>, Janet M Catov<sup>5 6 7</sup>

Affiliations + expand

PMID: 31914950

PMCID: [PMC6950980](#)

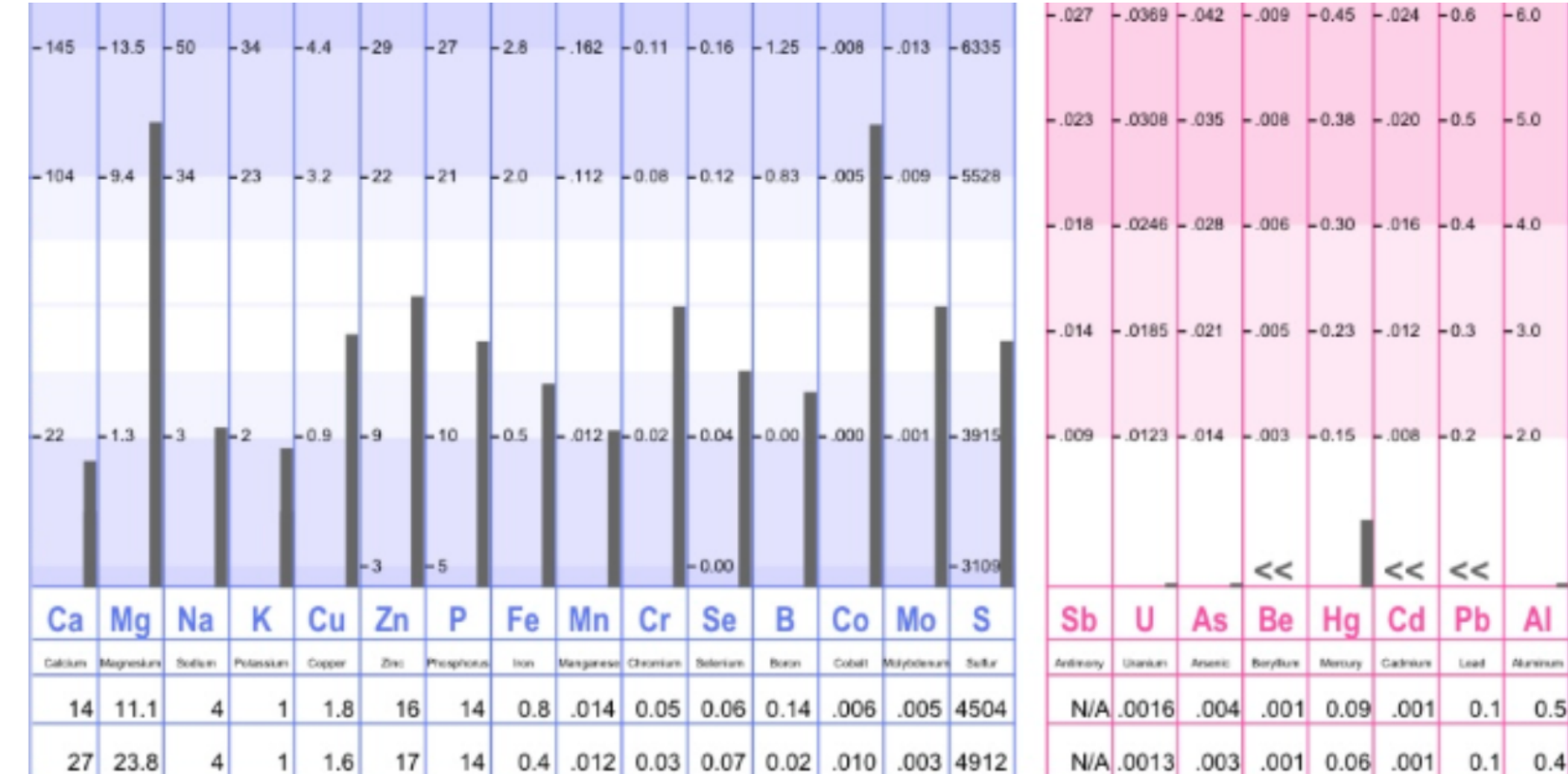
DOI: [10.1186/s12884-019-2699-3](#)

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- K - low: allergies, constipation, fatigue, irregular heartbeats, low BP (or high), water retention, etc.
  - Fertility: regulates BP, decreases risk of stroke, CVD, Insulin Resistance

# Fertility: 35, F

- Mg - high: low BP, confusion, depression, diarrhea, fatigue, lethargy, etc.
  - Fertility: regulates BP, supports inflammatory response, moves waste for detox, supports menses (eliminating PMS; key in endo)



[Biol Trace Elem Res.](#) 2021; 199(10): 3647–3657. Published online 2020 Dec 14.

doi: [10.1007/s12011-020-02513-0](https://doi.org/10.1007/s12011-020-02513-0)

PMCID: PMC8360883 | PMID: [33319331](https://pubmed.ncbi.nlm.nih.gov/33319331/)

## The Role of Magnesium in Pregnancy and in Fetal Programming of Adult Diseases

[Daniela Fanni](#),<sup>1,2</sup> [C. Gerosa](#),<sup>1,2</sup> [V. M. Nurchi](#),<sup>3</sup> [M. Manchia](#),<sup>4</sup> [L. Saba](#),<sup>5</sup> [F. Coghe](#),<sup>6</sup> [G. Crisponi](#),<sup>3</sup> [Y. Gibo](#),<sup>7</sup> [P. Van Eyken](#),<sup>8</sup> [V. Fanos](#),<sup>9</sup> and [G. Faa](#)<sup>1,2,10</sup>

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- “It has been claimed that magnesium supplementation of pregnant women might reduce the risk of IUGR of the fetus, increase birthweight, and reduce by half the incidence of eclampsia.”



# Fertility: 35, F

- Metals:

- Uranium
- Arsenic
- Mercury
- Aluminum
- Bismuth
- Tungsten
- Zirconium

.027	.0369	.042	.009	.045	.024	.06	8.0
.023	.0308	.035	.008	.038	.020	.05	5.0
.018	.0246	.028	.006	.030	.016	.04	4.0
.014	.0185	.021	.005	.023	.012	.03	3.0
.009	.0123	.014	.003	.015	.008	.02	2.0
			<<		<<	<<	
<b>Sb</b>	<b>U</b>	<b>As</b>	<b>Be</b>	<b>Hg</b>	<b>Cd</b>	<b>Pb</b>	<b>Al</b>
Antimony	Uranium	Arsenic	Beryllium	Mercury	Cadmium	Lead	Aluminum
N/A	.0016	.004	.001	0.09	.001	0.1	0.5
N/A	.0013	.003	.001	0.06	.001	0.1	0.4

.006	0.41	.053	.0358	.011	.12	.005	.0005		.018	0.87	0.11	.36	.005	0.09
.004	0.27	.035	.0244	.007	.08	.003	.0003		.012	0.58	0.07	.24	.003	0.06
.000	0.00	.000	.0017	.000	.00	.000	.0000		.000	0.00	0.00	.00	.000	0.00
						<<					<<			
<b>Ge</b>	<b>Ba</b>	<b>Bi</b>	<b>Rb</b>	<b>Li</b>	<b>Ni</b>	<b>Pt</b>	<b>Tl</b>		<b>V</b>	<b>Sr</b>	<b>Sn</b>	<b>Ti</b>	<b>W</b>	<b>Zr</b>
Germanium	Barium	Bismuth	Rubidium	Lithium	Nickel	Platinum	Thallium		Vanadium	Strontium	Tin	Titanium	Tungsten	Zirconium
.001	0.01	.028	.0012	.001	.01	.001	.0001		.003	0.03	0.01	.09	.004	0.08
.001	0.03	.011	.0010	.001	.01	.001	.0001		.002	0.06	0.01	.10	.001	0.02

# Fertility: 35, F

- Common sources of exposure:

- Uranium:

- geographic locations with granite deposits (Colorado, Nevada, etc.) (food grown in soil)
- Phosphate fertilizer
- Nuclear plant run-off's (water)
- Water

- Arsenic:

- rice
- chicken (feed)
- treated wood
- water supply

- Mercury:

- water
- fish
- amalgam fillings
- HFCS

- Aluminum:

- tap water
- antiperspirants
- table salt
- antacids
- bread
- canned foods
- aluminum cookware/foil/containers

- Bismuth:

- tap water/well water
- seaweed
- paint
- soybeans
- insecticide

- Tungsten:

- some water sources
- paint
- waterproof markers
- dyes & ceramics
- jewelry

- Zirconium:

- ceramics & glass
- deodorants
- skin ointments
- nuclear power (run-offs)
- artificial gem stones
- poison ivy treatment

# Fertility: 35, F

- Mercury -
  - menstrual disorders, sterility, spontaneous abortion
  - progesterone decreases; LH is inhibited
  - amount of mature oocytes & follicles decrease
  - Selenium, Iodine, Zinc, Chromium, Manganese oppose Mercury.

Element	Toxicity Level
Sb	0.027
U	0.0369
As	0.042
Be	0.009
Hg	0.45
Cd	0.024
Pb	0.6
Al	6.0

Element	Toxicity Level
Sb	0.023
U	0.0308
As	0.035
Be	0.008
Hg	0.38
Cd	0.020
Pb	0.5
Al	5.0

Element	Toxicity Level
Sb	0.018
U	0.0246
As	0.028
Be	0.006
Hg	0.30
Cd	0.016
Pb	0.4
Al	4.0

Element	Toxicity Level
Sb	0.014
U	0.0185
As	0.021
Be	0.005
Hg	0.23
Cd	0.012
Pb	0.3
Al	3.0

Element	Toxicity Level
Sb	0.009
U	0.0123
As	0.014
Be	0.003
Hg	0.15
Cd	0.008
Pb	0.2
Al	2.0

Element	Toxicity Level
Sb	N/A
U	0.0016
As	0.004
Be	0.001
Hg	0.09
Cd	0.001
Pb	0.1
Al	0.5

Element	Toxicity Level
Sb	N/A
U	0.0013
As	0.003
Be	0.001
Hg	0.06
Cd	0.001
Pb	0.1
Al	0.4

Review > Basic Clin Pharmacol Toxicol. 2019 Oct;125(4):317-327. doi: 10.1111/bcpt.13264.

Epub 2019 Aug 8.

## Mercury exposure and its effects on fertility and pregnancy outcome

Geir Bjørklund<sup>1</sup>, Salvatore Chirumbolo<sup>2 3</sup>, Maryam Dadar<sup>4</sup>, Lyudmila Pivina<sup>5 6</sup>, Ulf Lindh<sup>7</sup>, Monica Butnariu<sup>8 9</sup>, Jan Aaseth<sup>10 11</sup>

Affiliations + expand

PMID: 31136080 DOI: 10.1111/bcpt.13264

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> J Reprod Infertil. 2019 Jul-Sep;20(3):195-197.

## Exposure to Environmental Organic Mercury and Impairments in Human Fertility

Geir Bjørklund<sup>1</sup>, Jan Aaseth<sup>2 3</sup>, Maryam Dadar<sup>4</sup>, Monica Butnariu<sup>5 6</sup>, Salvatore Chirumbolo<sup>7</sup>

Affiliations + expand

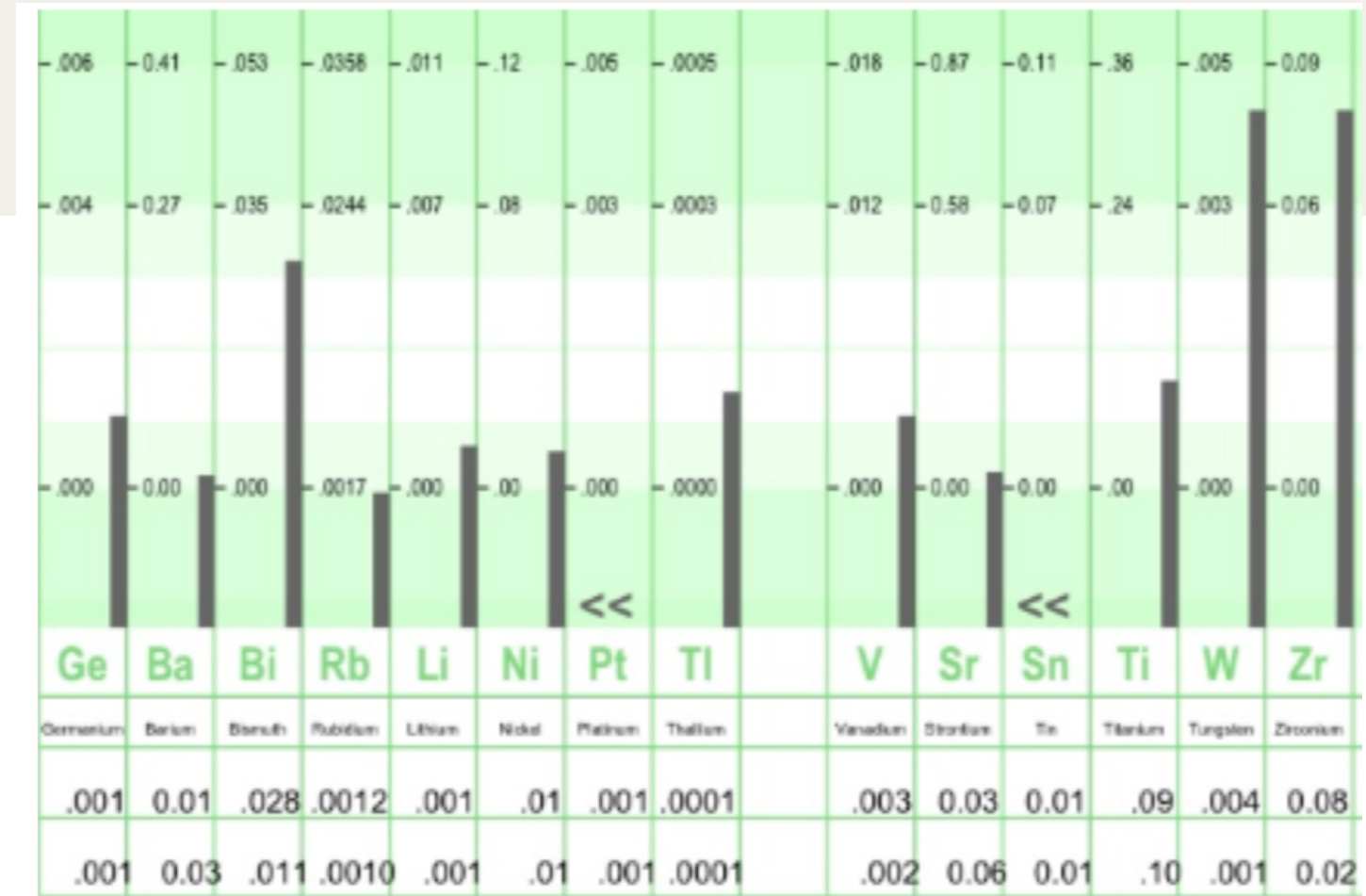
PMID: 31423423 PMCID: PMC6670267

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# Fertility: 35, F

- Tungsten -
  - Tungsten oxide was used for permanent male sterilization in animals
  - low stored Vitamin D was associated with detection of Tungsten in comparison to controls
  - Tungsten has a direct correlation with Chronic Kidney Disease (a direct effect on blood pressure), blood sugar regulation, and detox.
  - Molybdenum opposes Tungsten.



> [Environ Res.](#) 2021 Aug;199:111351. doi: 10.1016/j.envres.2021.111351. Epub 2021 May 19.

## A prospective study of maternal 25-hydroxyvitamin D (25OHD) in the first trimester of pregnancy and second trimester heavy metal levels

Anne Marie Z Jukic<sup>1</sup>, Stephani S Kim<sup>2</sup>, John D Meeker<sup>3</sup>, Scott T Weiss<sup>4</sup>, David E Cantonwine<sup>5</sup>, Thomas F McElrath<sup>5</sup>, Kelly K Ferguson<sup>2</sup>

Affiliations + expand

PMID: 34022229 PMCID: [PMC8308798](#) DOI: [10.1016/j.envres.2021.111351](#)

[Free PMC article](#)

> [Environ Res.](#) 2021 Apr;195:110710. doi: 10.1016/j.envres.2021.110710. Epub 2021 Jan 15.

## Urine tungsten and chronic kidney disease in rural Colorado

Jacob Fox<sup>1</sup>, Francesca Macaluso<sup>2</sup>, Camille Moore<sup>3</sup>, Elise Mesenbring<sup>4</sup>, Richard J Johnson<sup>5</sup>, Richard F Hamman<sup>6</sup>, Katherine A James<sup>7</sup>

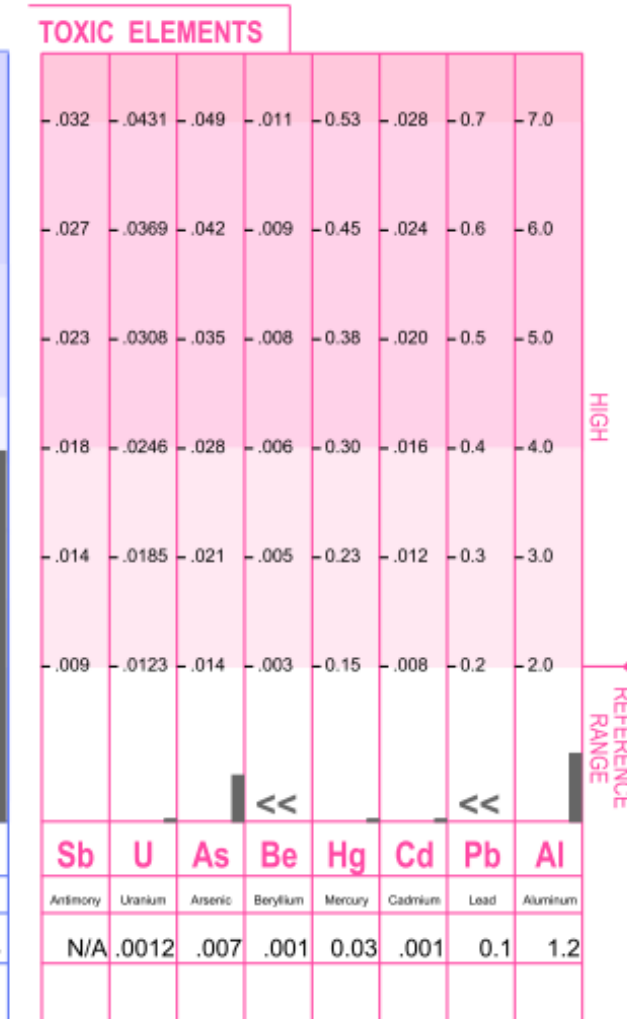
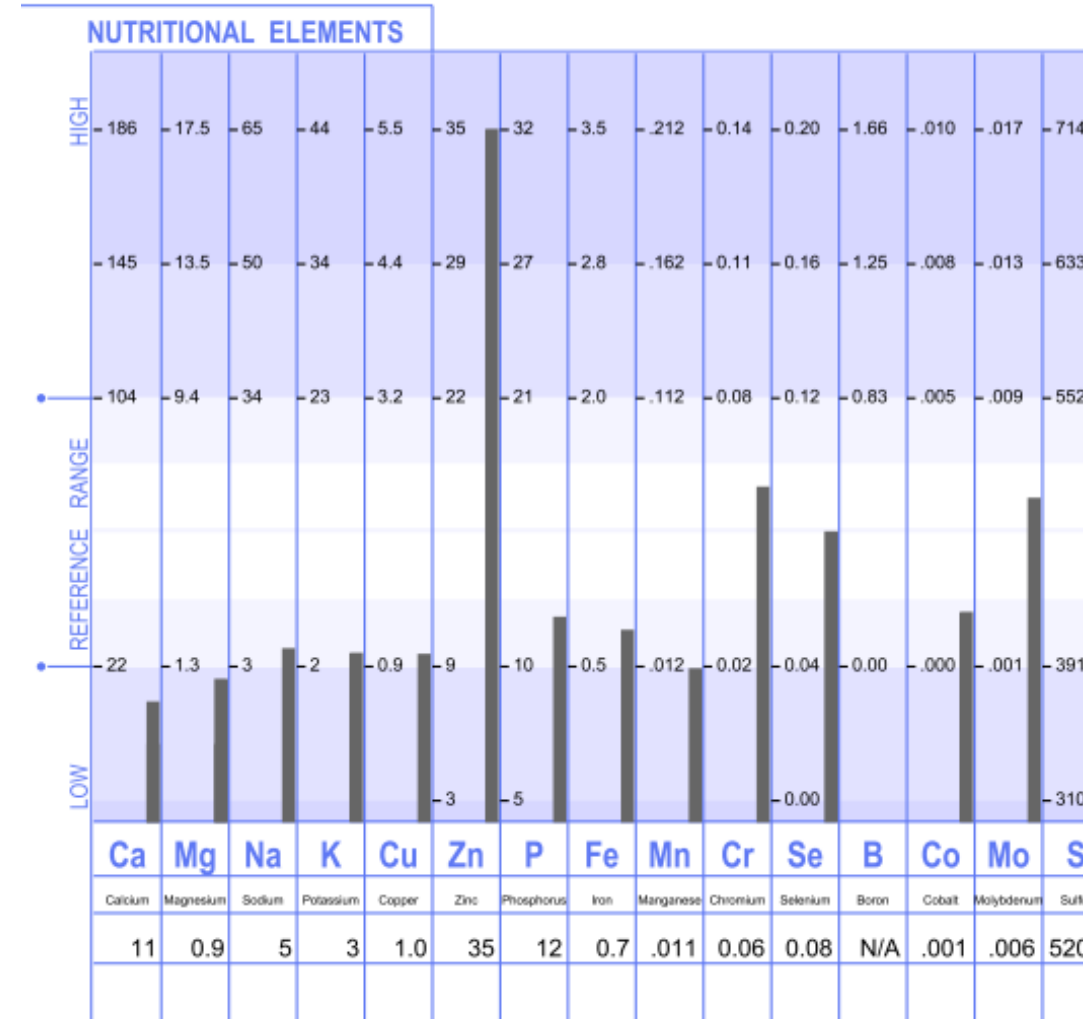
Affiliations + expand

PMID: 33460634 PMCID: [PMC7987874](#) DOI: [10.1016/j.envres.2021.110710](#)

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**Note: Next is an eczema case with a photo of a bloody flare.**

# Eczema: 2, M

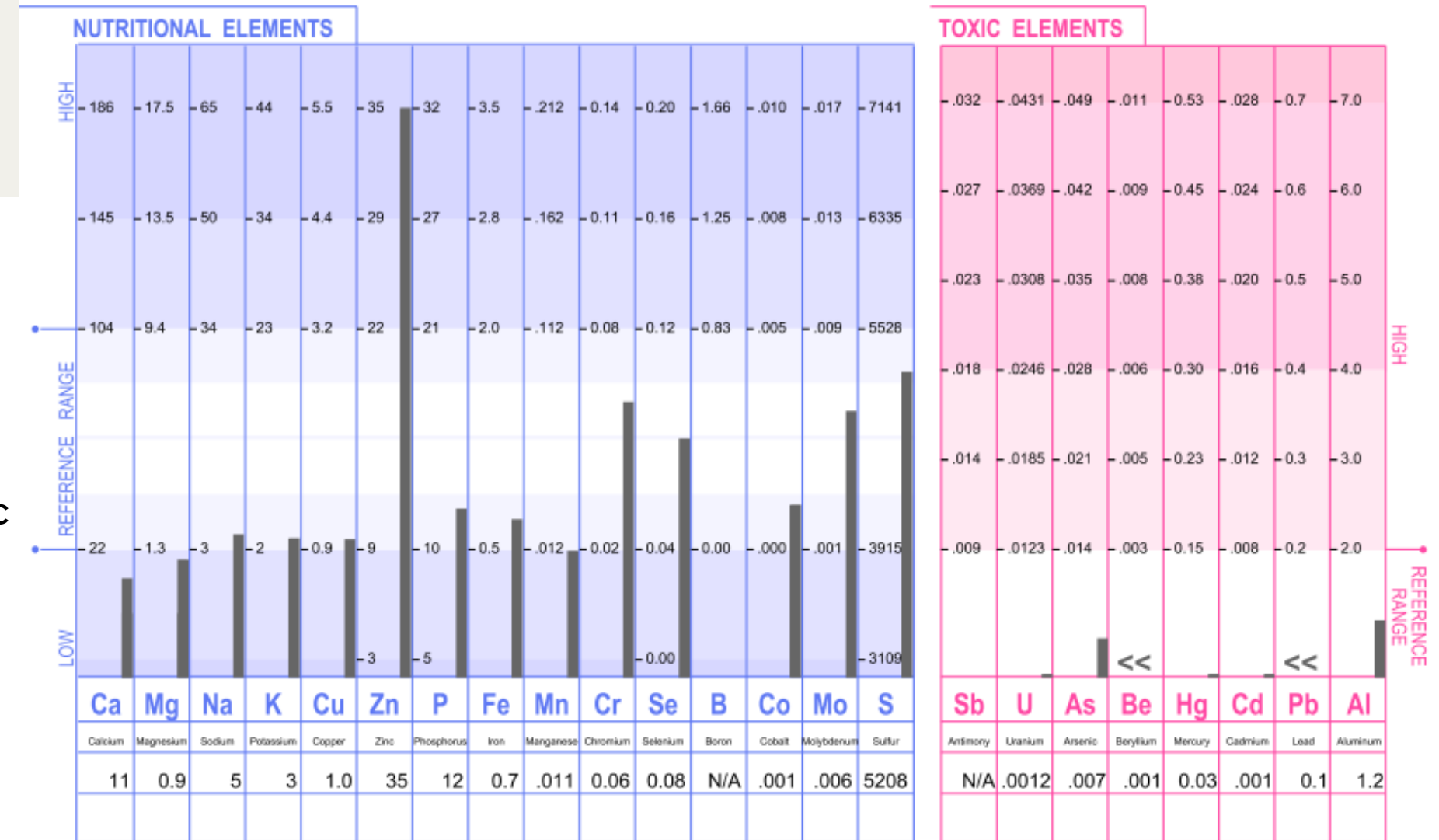


- Mom's (obvious) concern is her son's eczema rash. Nothing parents have done is helping it. Parents are now using a steroid cream to help.



# Eczema: 2, M

- Four Lows pattern - stress response has malfunctioned; poor absorption
  - Most minerals are low
- Zinc - high:
  - infection, high cholesterol, anemia (antagonized Cu)
- First study: “Low zinc and copper levels are commonly found in pediatric skin diseases and their significance needs to be determined.”
- Some heavy metals
  - 2nd study notes arsenic and mercury as potential culprits
- Other testing showed: fungal overgrowth, severe microbial dysbiosis, low serum Zn and Cu



> [Pediatr Allergy Immunol.](#) 2010 Aug;21(5):831-6. doi: 10.1111/j.1399-3038.2010.01022.x. Epub 2010 Mar 19.

## Serum levels of heavy metals in childhood eczema and skin diseases: friends or foes

Kam-Lun E Hon <sup>1</sup>, Shuxin Susan Wang, Emily C W Hung, Hugh S Lam, Heike H K Lui, Chung-Mo Chow, Gary K W Ching, Tai-Fai Fok, Pak-Cheung Ng, Ting-Fan Leung

Affiliations + expand

PMID: 20337961 DOI: [10.1111/j.1399-3038.2010.01022.x](#)

> [Iran J Allergy Asthma Immunol.](#) 2012 Sep;11(3):230-5.

## Fish consumption, fish atopy and related heavy metals in childhood eczema

Kam Lun Hon <sup>1</sup>, Heike Lui, Shuxin Susan Wang, Hugh Simon Lam, Ting Fan Leung

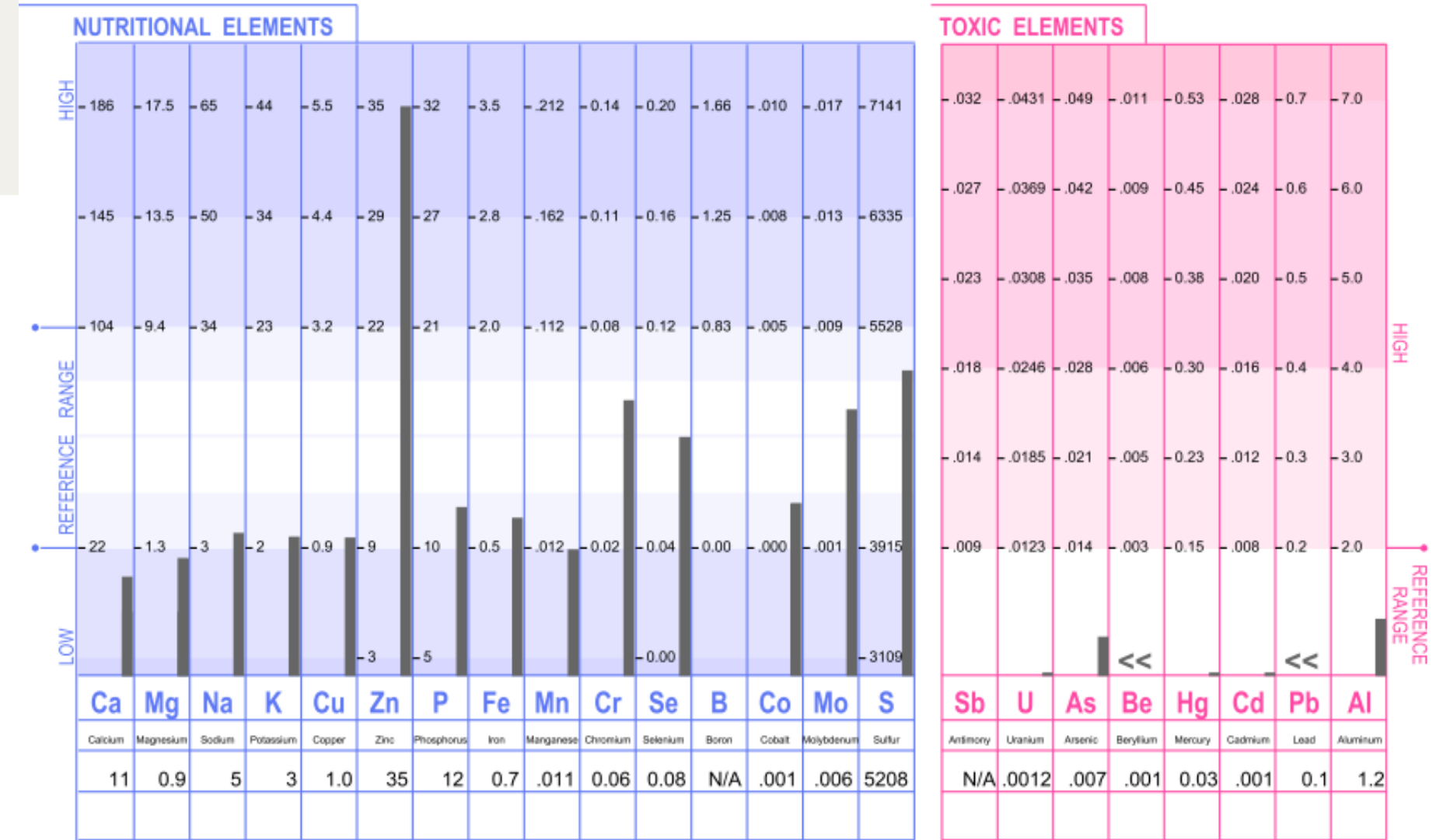
Affiliations + expand

PMID: 22947908

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# Eczema: 2, M

- First study notes the importance of zinc status in skin conditions
- Second study notes various micronutrients for consideration with atopic dermatitis:
  - Zinc, Vitamin D, and Selenium
- Protocol: mineral balancing with Zn, Vitamin C, omega-3s, digestive enzymes, probiotics, and then moving into an eradication protocol for fungal overgrowth and dysbiosis



Review > [Nutrients](#). 2018 Feb 16;10(2):219. doi: 10.3390/nu10020219.

## The Role of the Slc39a Family of Zinc Transporters in Zinc Homeostasis in Skin

Bum-Ho Bin <sup>1</sup>, Shintaro Hojyo <sup>2</sup>, Juyeon Seo <sup>3</sup>, Takafumi Hara <sup>4</sup>, Teruhisa Takagishi <sup>5</sup>, Kenji Mishima <sup>6</sup>, Toshiyuki Fukada <sup>7 8 9</sup>

Affiliations + expand

PMID: 29462920 PMCID: [PMC5852795](#) DOI: [10.3390/nu10020219](#)

[Free PMC article](#)

> [J Altern Complement Med](#). 2019 Jun;25(6):567-577. doi: 10.1089/acm.2018.0363. Epub 2019 Mar 26.

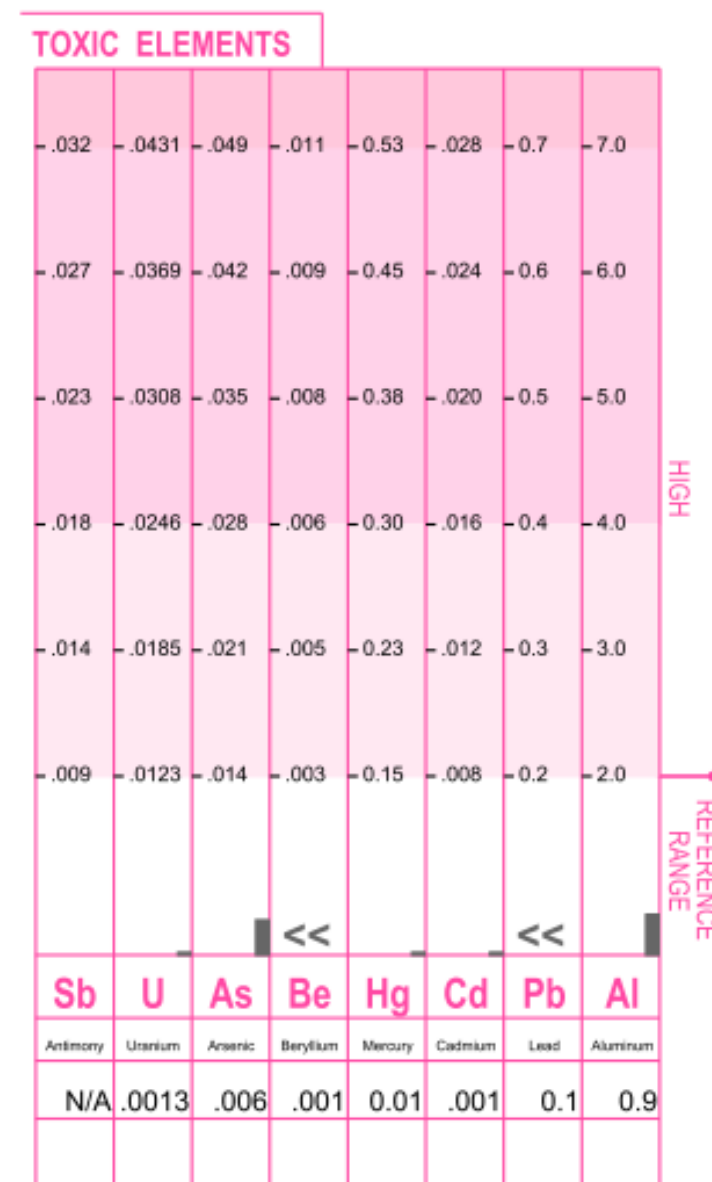
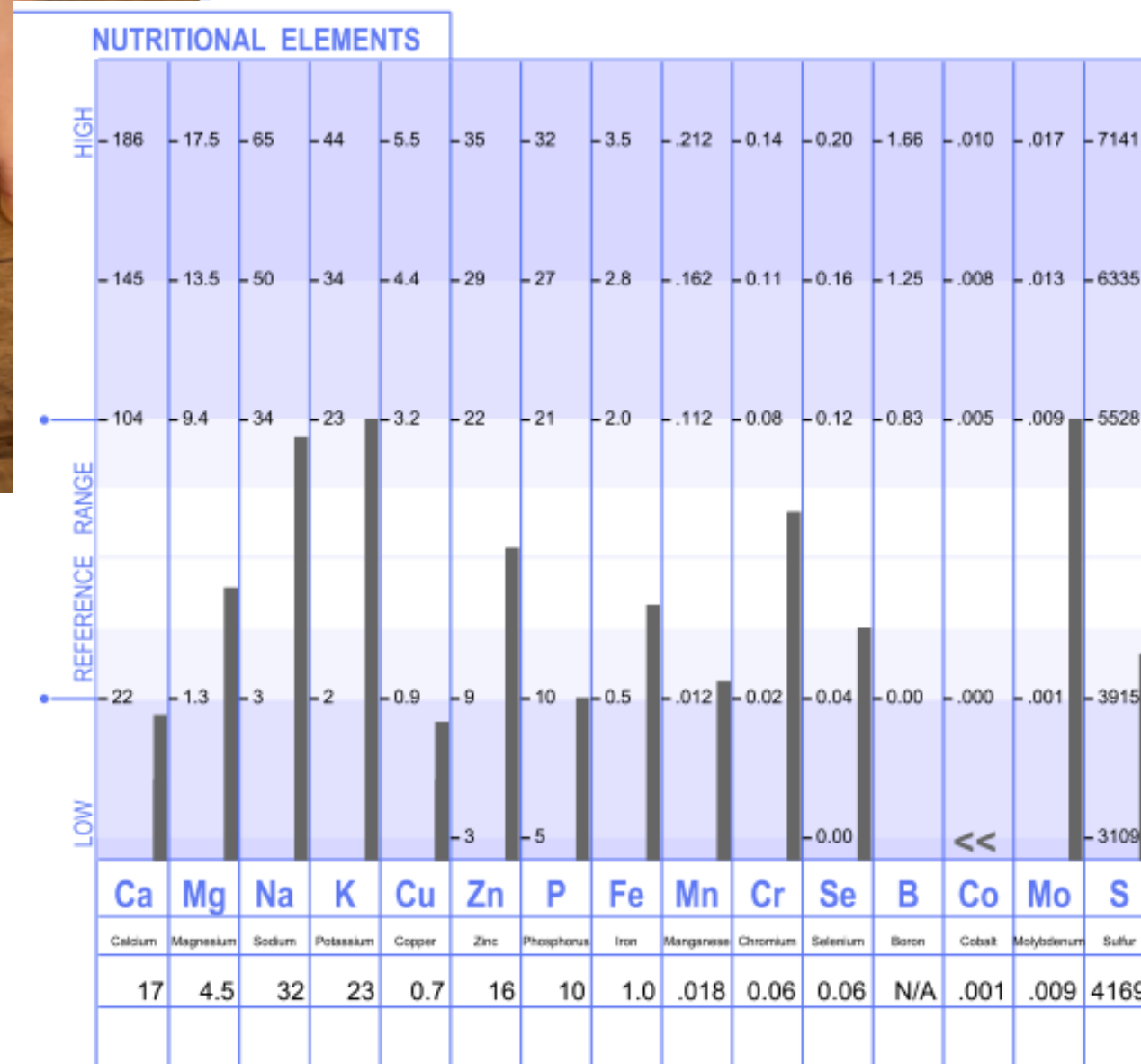
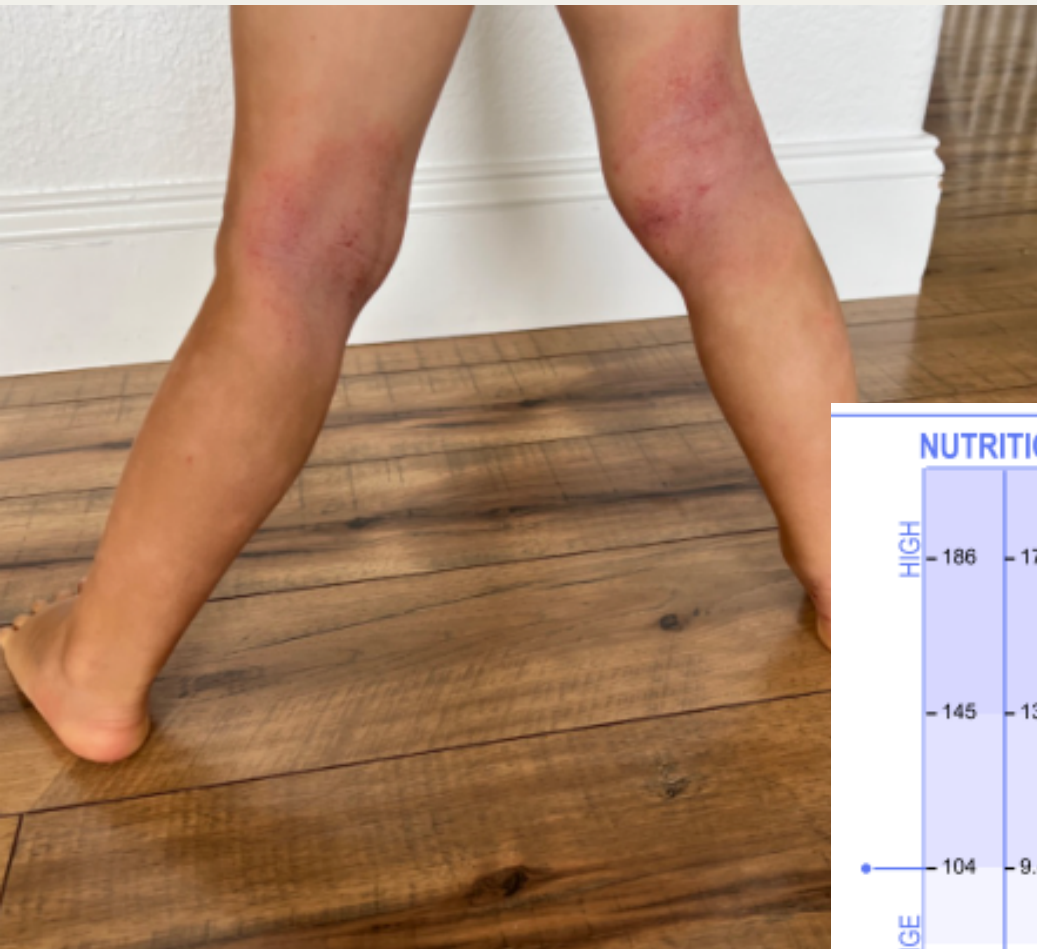
## Micronutrients in Atopic Dermatitis: A Systematic Review

Alexandra R Vaughn <sup>1</sup>, Negar Foolad <sup>2</sup>, Melody Maarouf <sup>3</sup>, Khiem A Tran <sup>3</sup>, Vivian Y Shi <sup>4</sup>

Affiliations + expand

PMID: 30912673 DOI: [10.1089/acm.2018.0363](#)

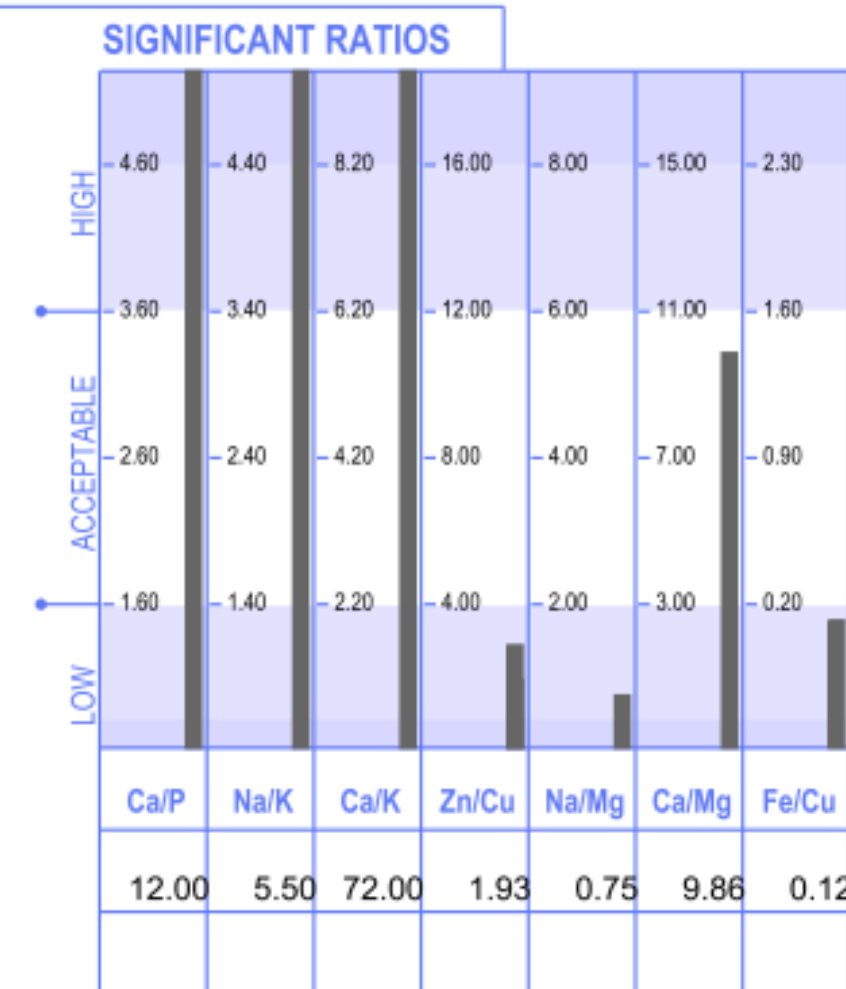
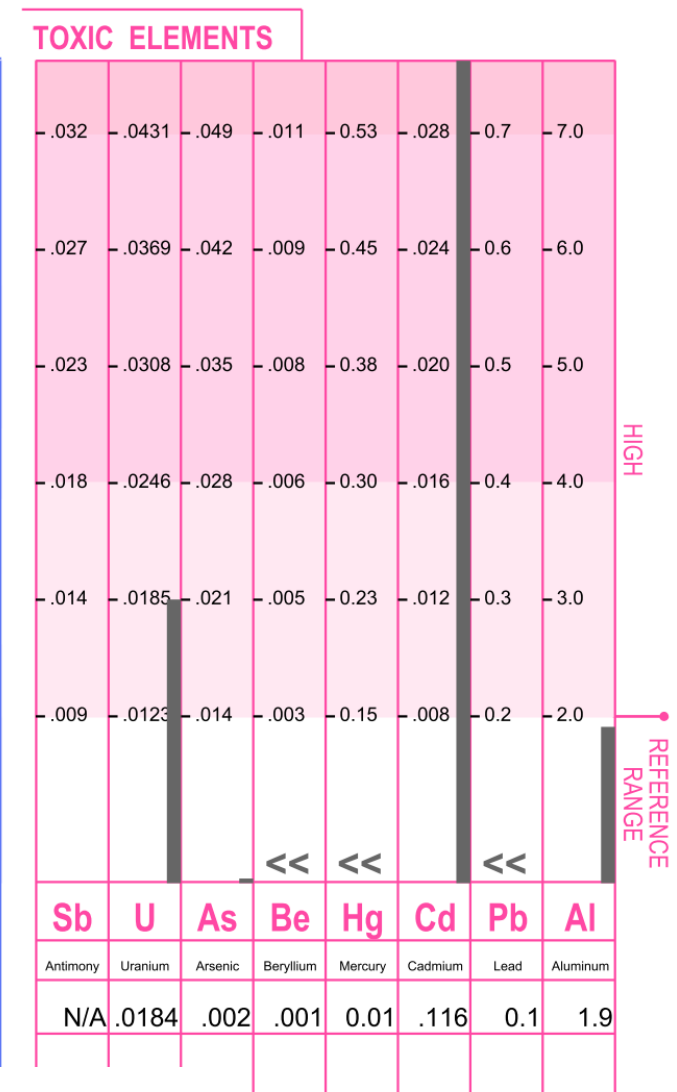
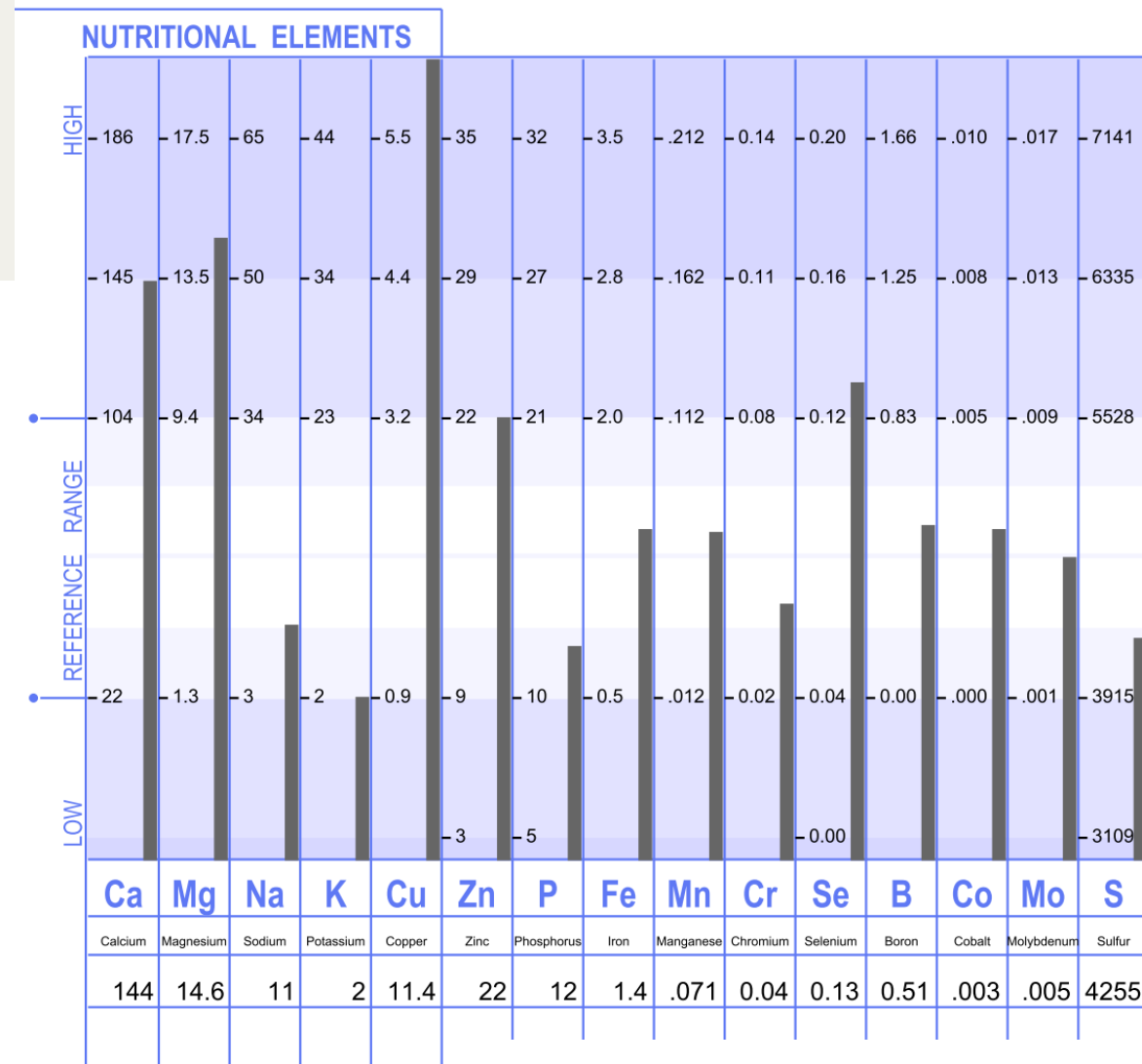
# Eczema: 2, M





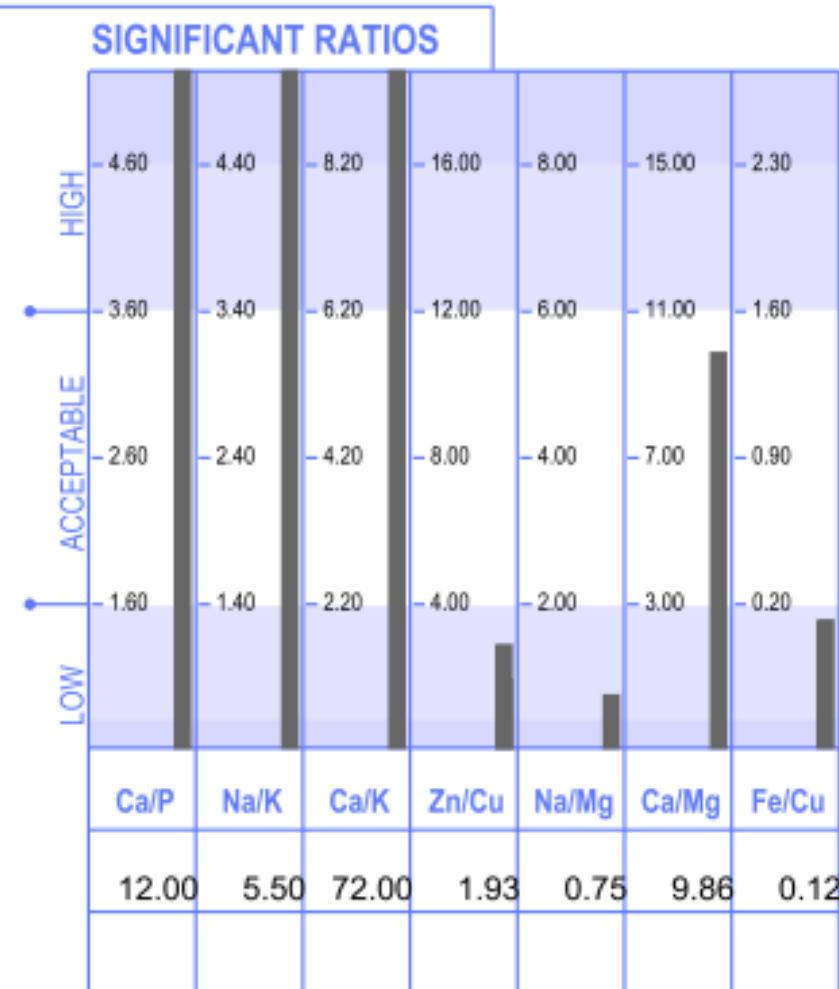
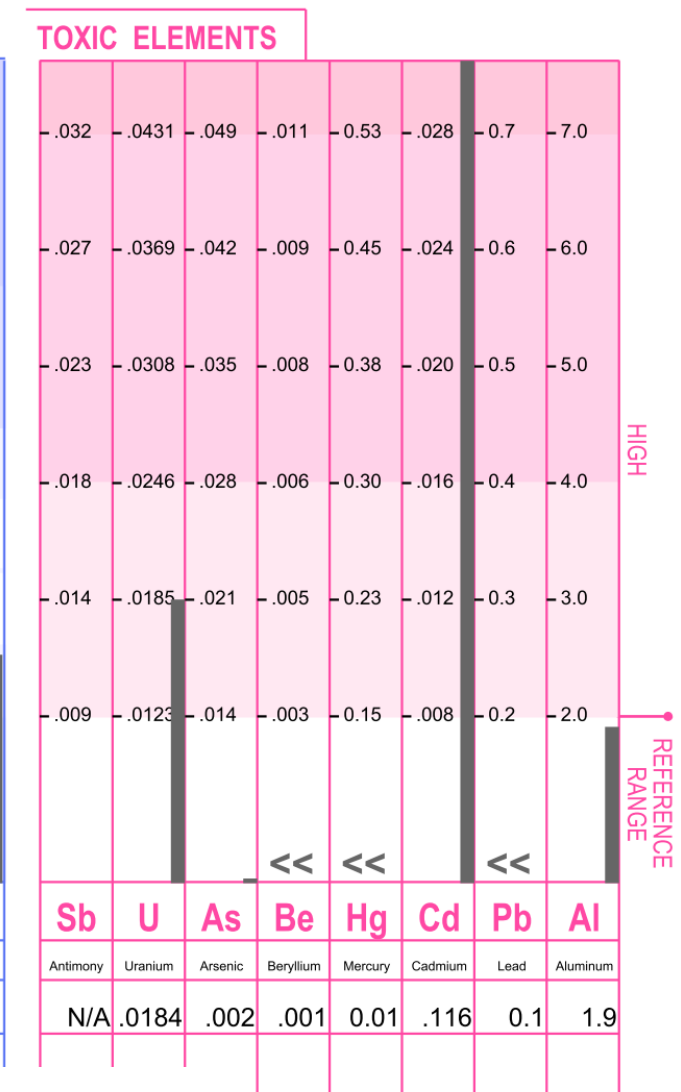
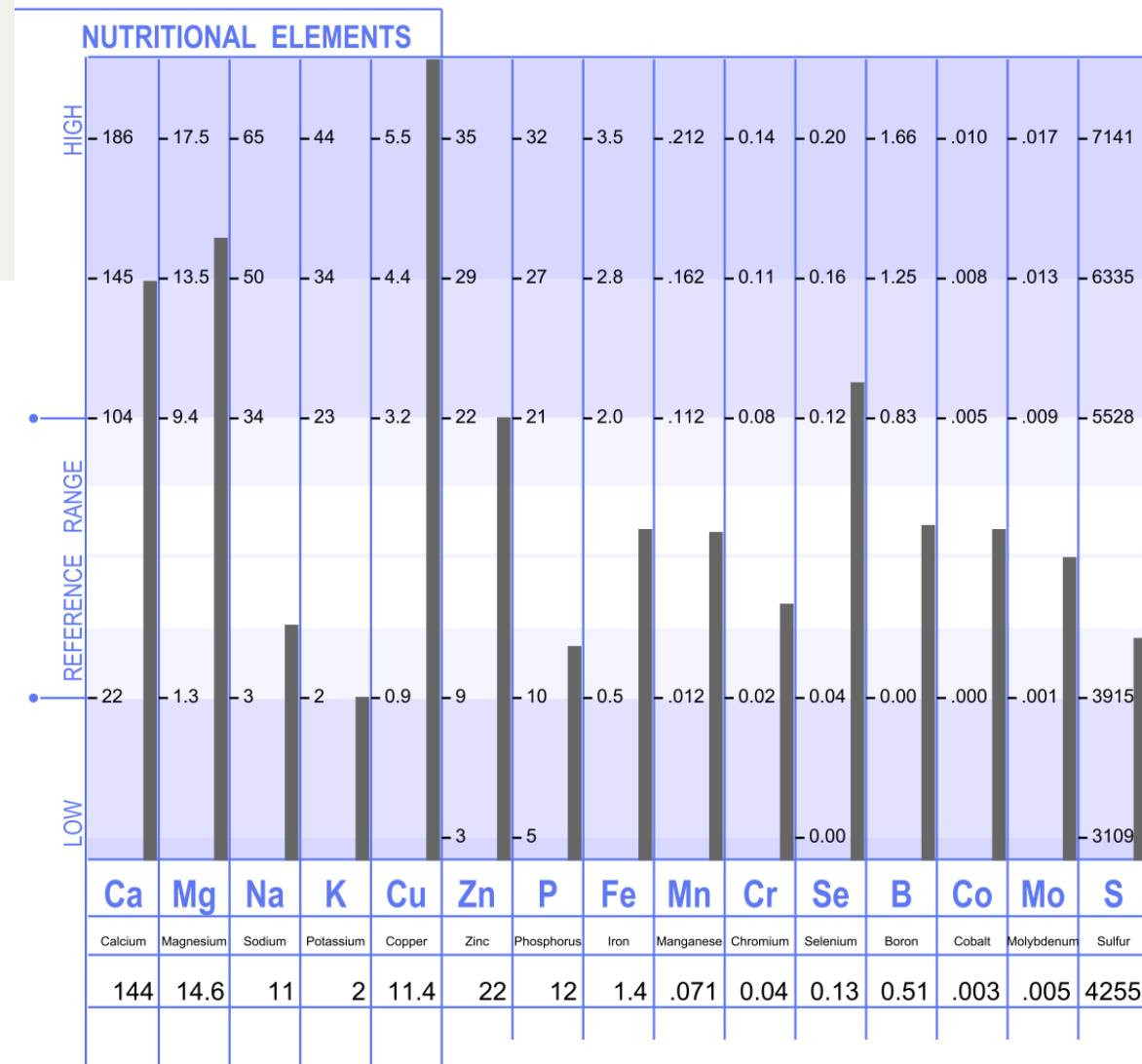
# PANDAS: 9, F

- Diagnosed at 6yr old
- First strep infection was at 4yr old
- Mom's (and daughter's) concerns:
  - OCD
  - emotional regulation
  - anxiety
- on the verge of a Calcium Shell
- overt copper toxicity
- heavy metal toxicity
  - Uranium can lead to immune system disorders
- Four main concerns with PANDAS:
  - inflammation (brain, gut, systemic)
  - microbiome/infections
  - immune system
  - reinforcements/prevention



# PANDAS: 9, F

- One of the factors in OCD is neurotransmitter production, particularly serotonin.
  - Serotonin is a neurotransmitter involved in many aspects of human behavior and function.
  - Needs tryptophan (amino acid)
    - Phosphorus is low - which we would get easily from protein
  - Iron deficiency relative to Copper can result in imbalances with serotonin production (blood chemistry reveals elevated iron with very low ferritin)
    - low Na/Mg ratio indicates poor adrenal function/mitochondrial dysfunction - and this is key in regulating copper
  - Thyroid hormone increases the brain content of serotonin
    - high Ca/K ratio indicates poor thyroid hormone production/function; blood chem showed lowered thyroid function with elevated antibodies



# PANDAS: 9, F

Comparative Study > J Pineal Res. 1998 Jan;24(1):15-21.

doi: 10.1111/j.1600-079x.1998.tb00361.x.

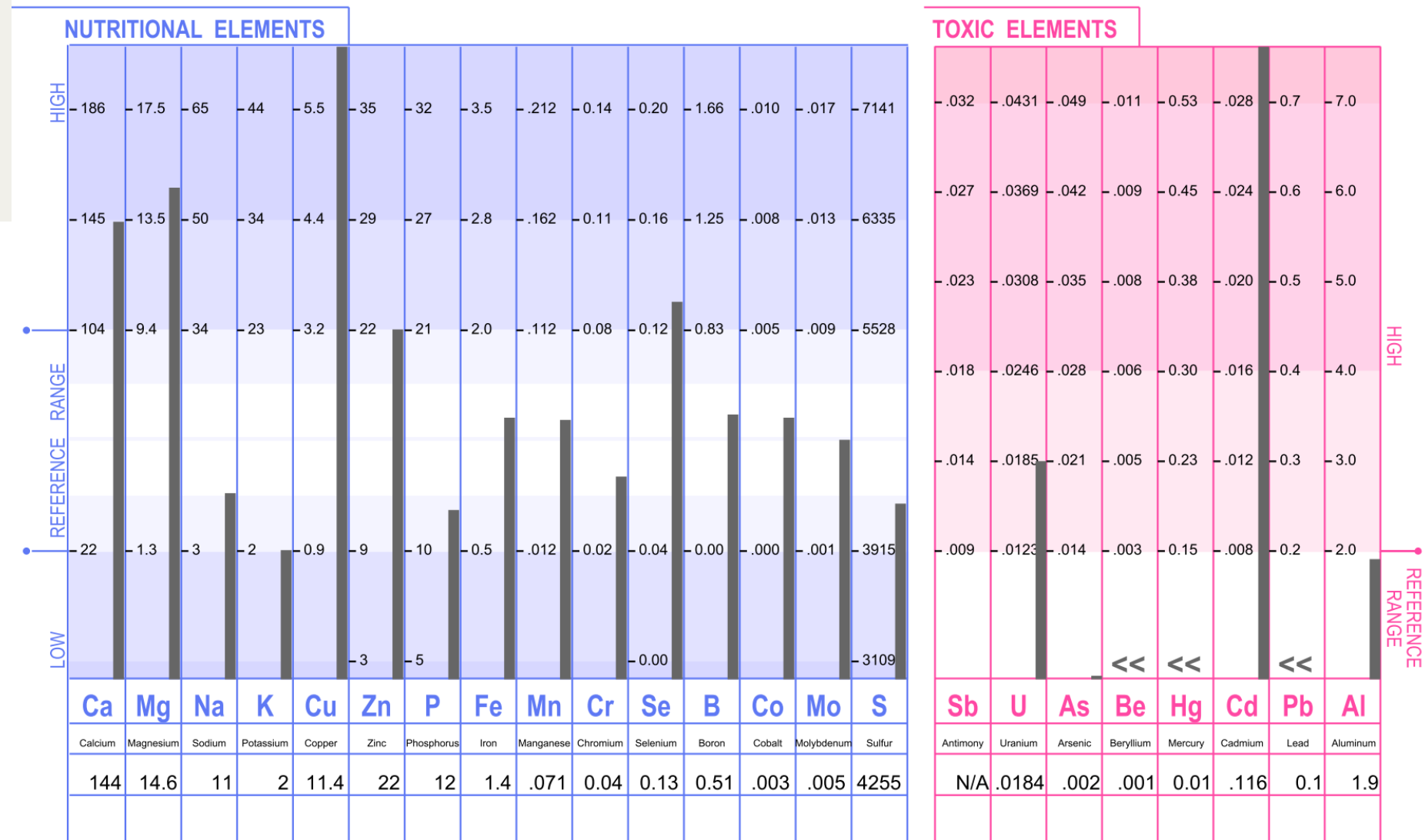
## The interaction of melatonin and its precursors with aluminium, cadmium, copper, iron, lead, and zinc: an adsorptive voltammetric study

J Limson<sup>1</sup>, T Nyokong, S Daya

Affiliations + expand

PMID: 9468114

DOI: 10.1111/j.1600-079x.1998.tb00361.x



- Metal complexes that were formed:
  - “Aluminium with melatonin, tryptophan, and serotonin; cadmium with melatonin and tryptophan; copper with melatonin and serotonin; iron with melatonin and serotonin; lead with melatonin, tryptophan, and serotonin; and zinc with melatonin and tryptophan.”



# PANDAS: 9, F

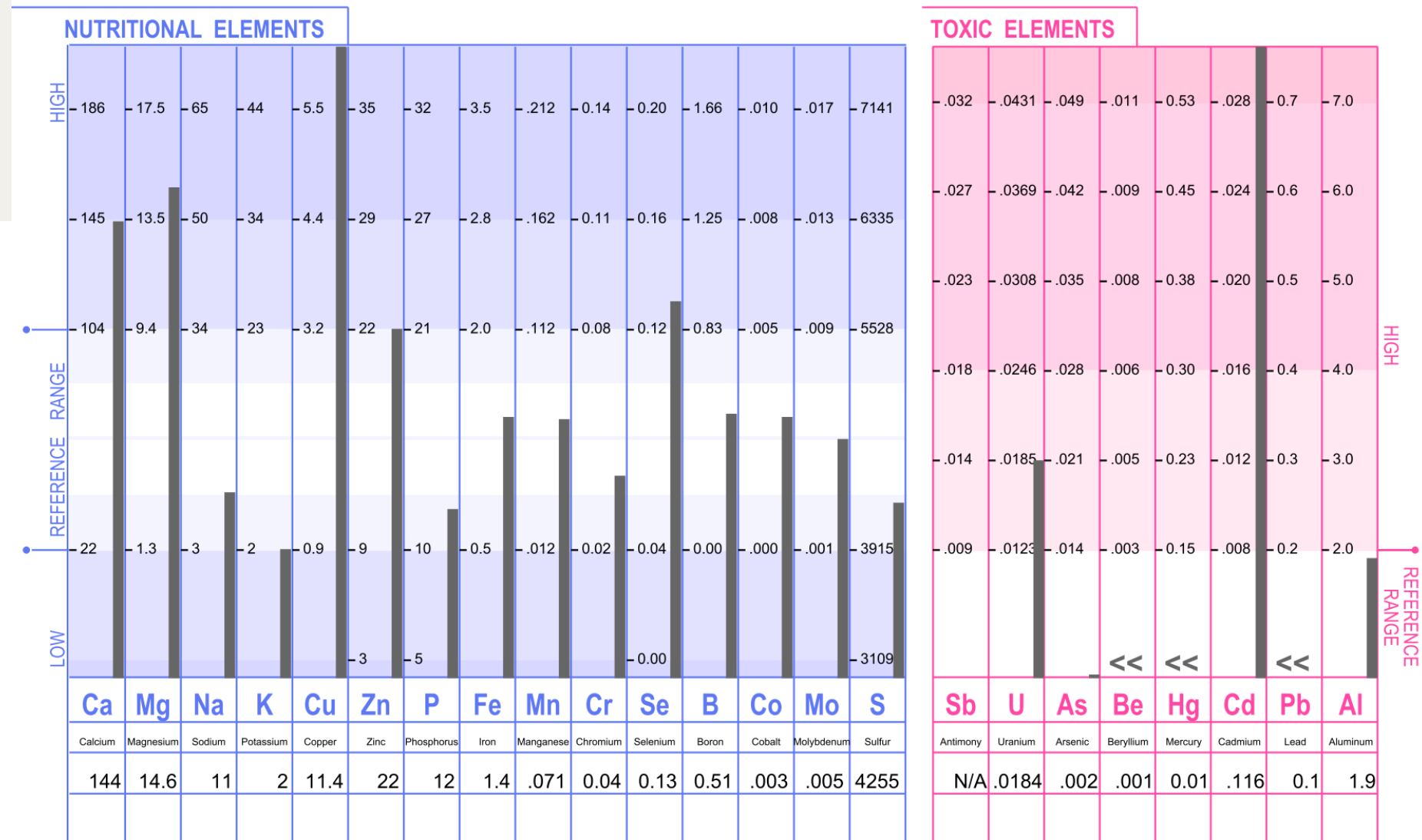
> Biol Trace Elem Res. 2012 Sep;148(3):275-80. doi: 10.1007/s12011-012-9371-3. Epub 2012 Mar 2.

## Alterations of serum zinc, copper, manganese, iron, calcium, and magnesium concentrations and the complexity of interelement relations in patients with obsessive-compulsive disorder

Hasanuzzaman Shohag<sup>1</sup>, Ashik Ullah, Shalahuddin Qusar, Mustafizur Rahman, Abul Hasnat

Affiliations + expand

PMID: 22383079 DOI: 10.1007/s12011-012-9371-3

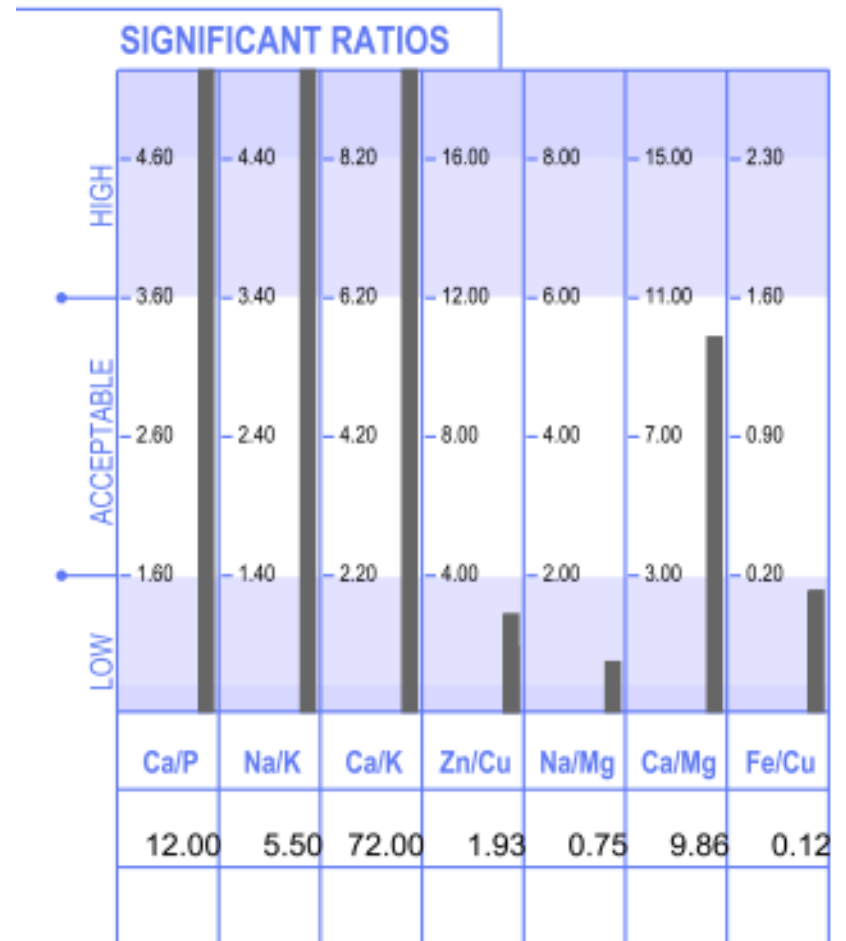
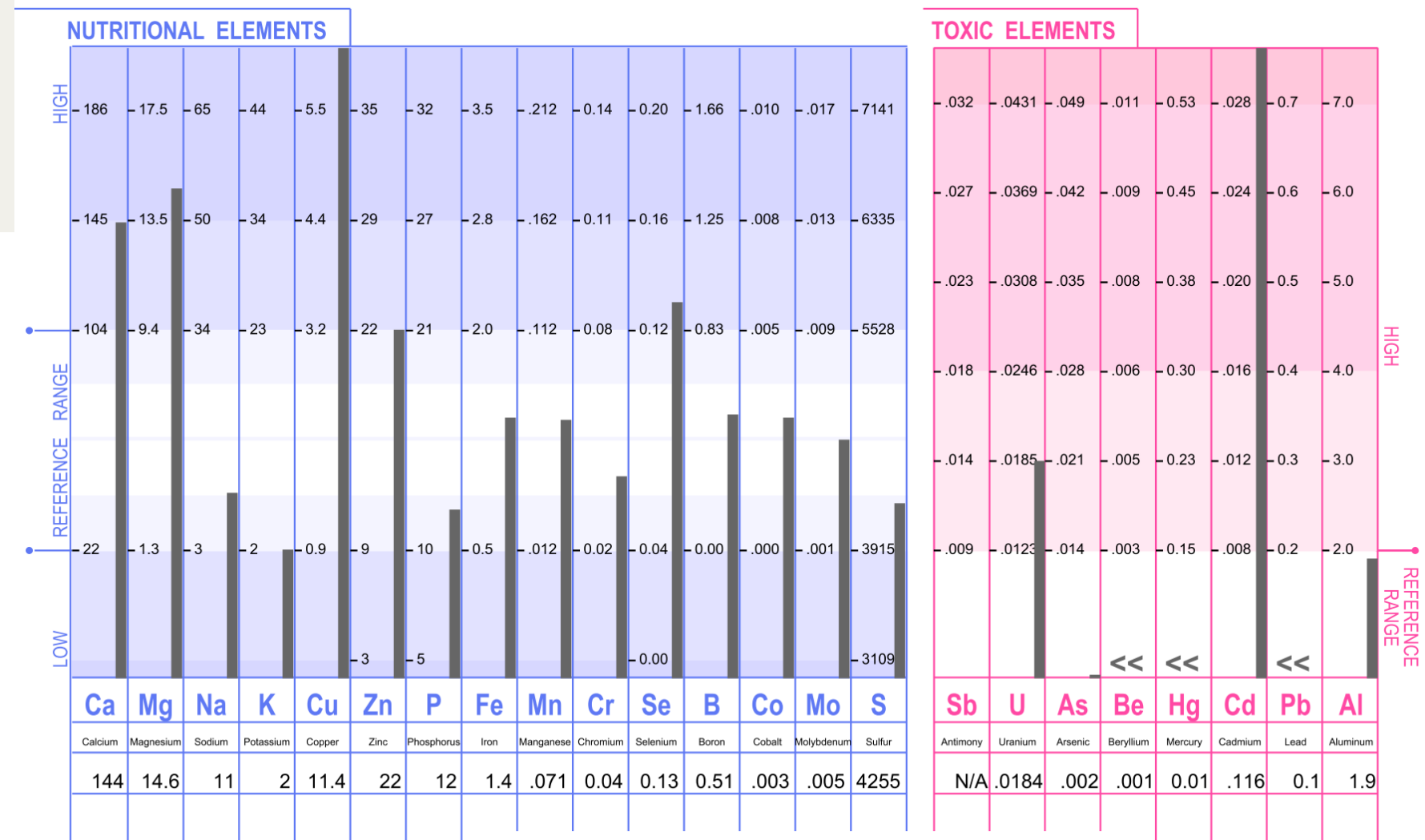


- “ In patients' serum, zinc, iron, and magnesium concentrations decreased significantly ( $p < 0.05$ ) compared to the controls. Serum manganese and calcium concentrations were significantly higher ( $p < 0.05$ ) in patients compared to the controls. These data showed a definite imbalance in the interelement relations in obsessive-compulsive disorder patients compared to controls and therefore suggest a disturbance in the element homeostasis.”

# PANDAS: 9, F

## • Copper Toxicity

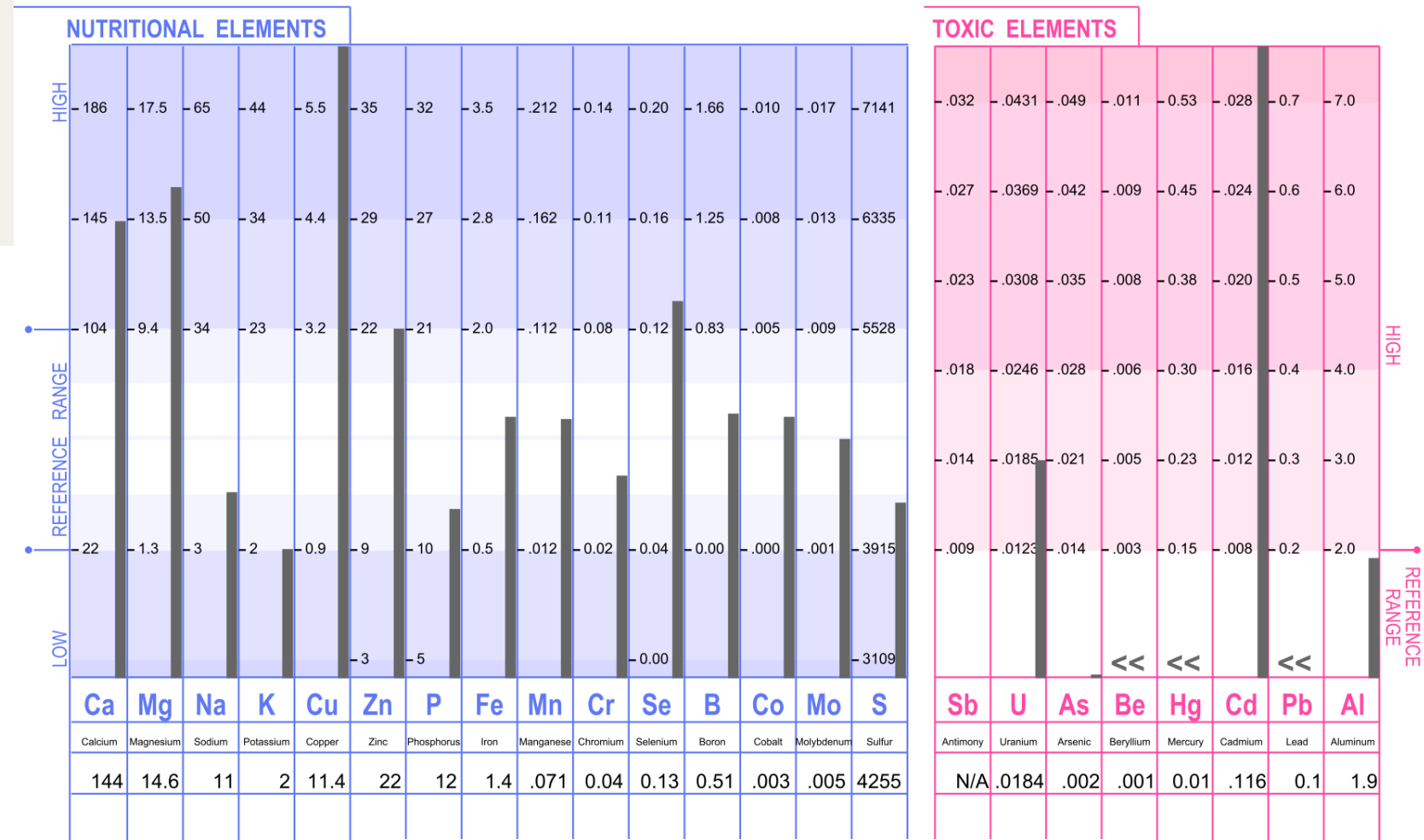
- Cu's roles: electron transport chain, hemoglobin synthesis, neurotransmitter activity, immune system health, cardiovascular health, synthesis of collagen and elastin, iron availability, anti-fungal, anti-mold, and-bacterial.
- highest levels of copper are in liver then the brain
- HTMA optimal measurement is 2.2
- excessive levels of Cu can cause physical and mental dysfunction
- body needs Ceruloplasmin for the regulation of copper
  - adrenals aid in the liver producing this glycoprotein that transports copper for usage
  - poor liver/adrenal function leads to decreased Ceruloplasmin
- bile flow is key for Cu elimination
- copper stimulates adrenaline - leading to anxiety and panic



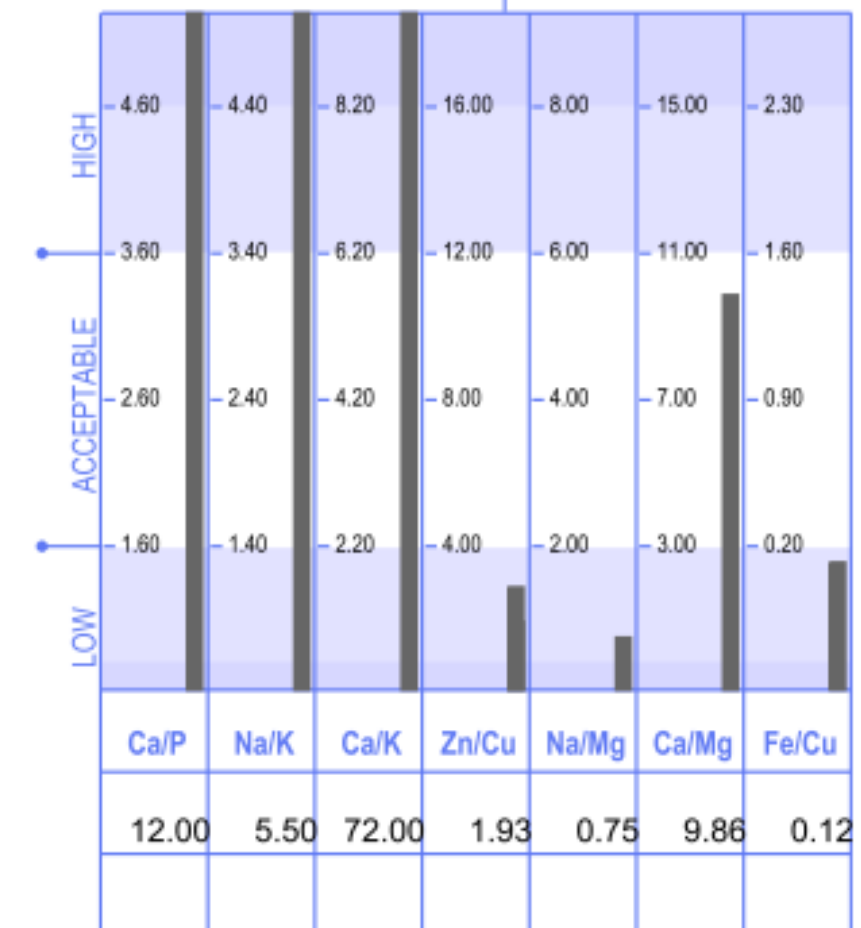
# PANDAS: 9, F

## Copper toxicity may be involved in the dysregulation of serotonin.

“...there is the possibility that unbound copper is available to interact with extracellular components. Our data show that the interaction between copper and important neurotransmitter, 5-HT [serotonin], is toxic to undifferentiated PC12 cells. This appears to be copper specific as iron and zinc had little effect.”



### SIGNIFICANT RATIOS



> [J Neurochem.](https://doi.org/10.1111/j.1471-4159.2007.04602.x) 2007 Aug;102(4):1035-43. doi: 10.1111/j.1471-4159.2007.04602.x.

## Copper induced oxidation of serotonin: analysis of products and toxicity

Christopher E Jones<sup>1</sup>, Clare K Underwood, Elizabeth J Coulson, Paul J Taylor

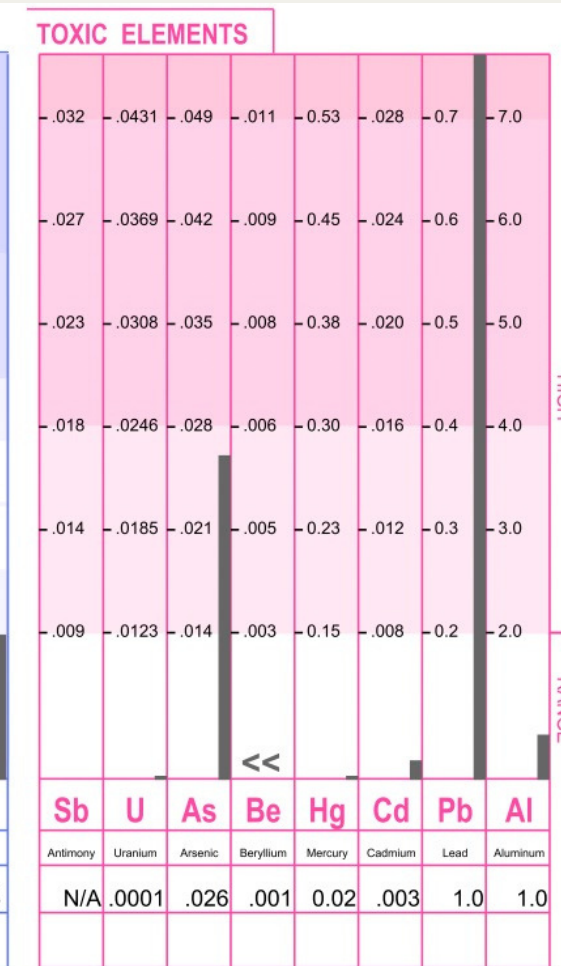
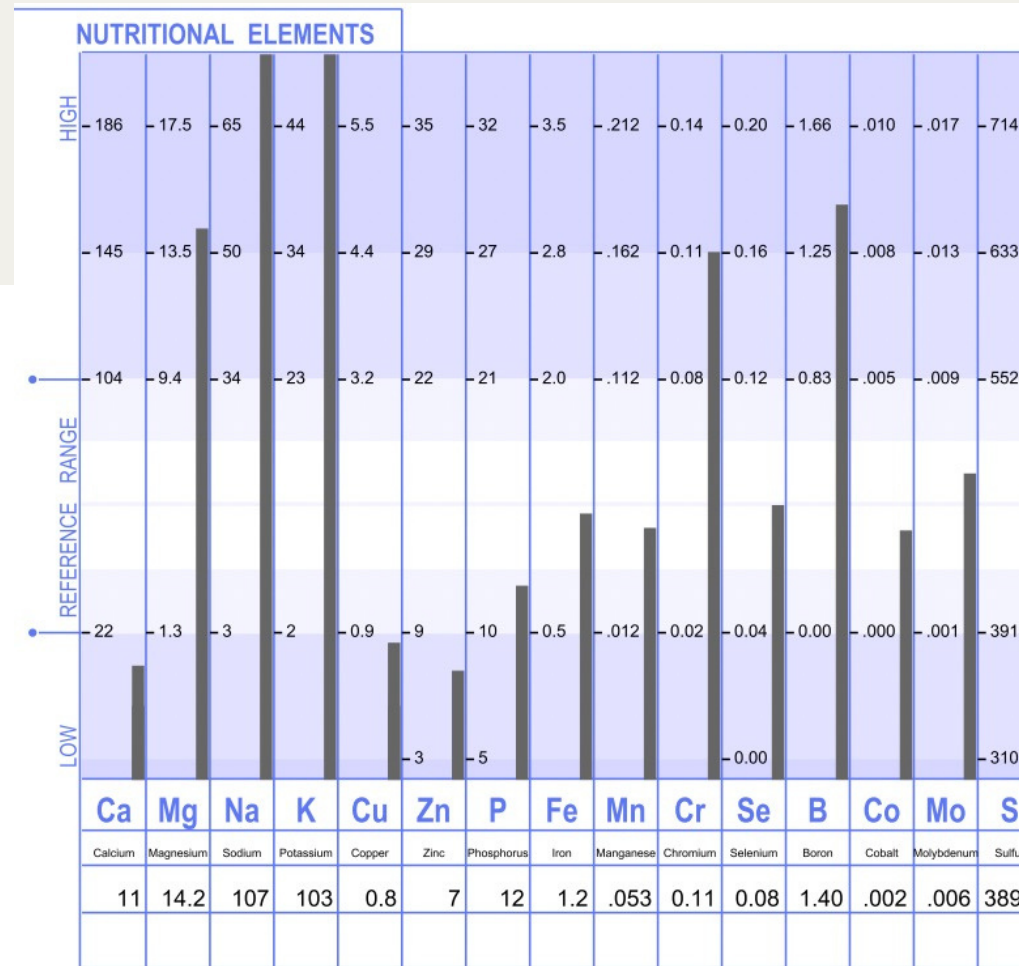
Affiliations + expand

PMID: 17663749 DOI: 10.1111/j.1471-4159.2007.04602.x



# Autism: 5, M

- Mom's concerns:
  - supporting a neurodivergent brain
    - diagnosed as "low" on the spectrum
  - allergies
  - behavior
- Top 5 things:
  - Heavy metal toxicity
  - Nutrient deficiency
  - Fungal infection
  - Genetic SNPs/methylation issues
  - Poor blood sugar regulation
- What do we see?
  - Three highs (Ca is the low macromineral)
  - Low Cu and Zn - immune stress, possible fungal infection
    - Zinc is a key nutrient in speech development
  - Heavy metal toxicity
  - High Cr and V - poor blood glucose regulation

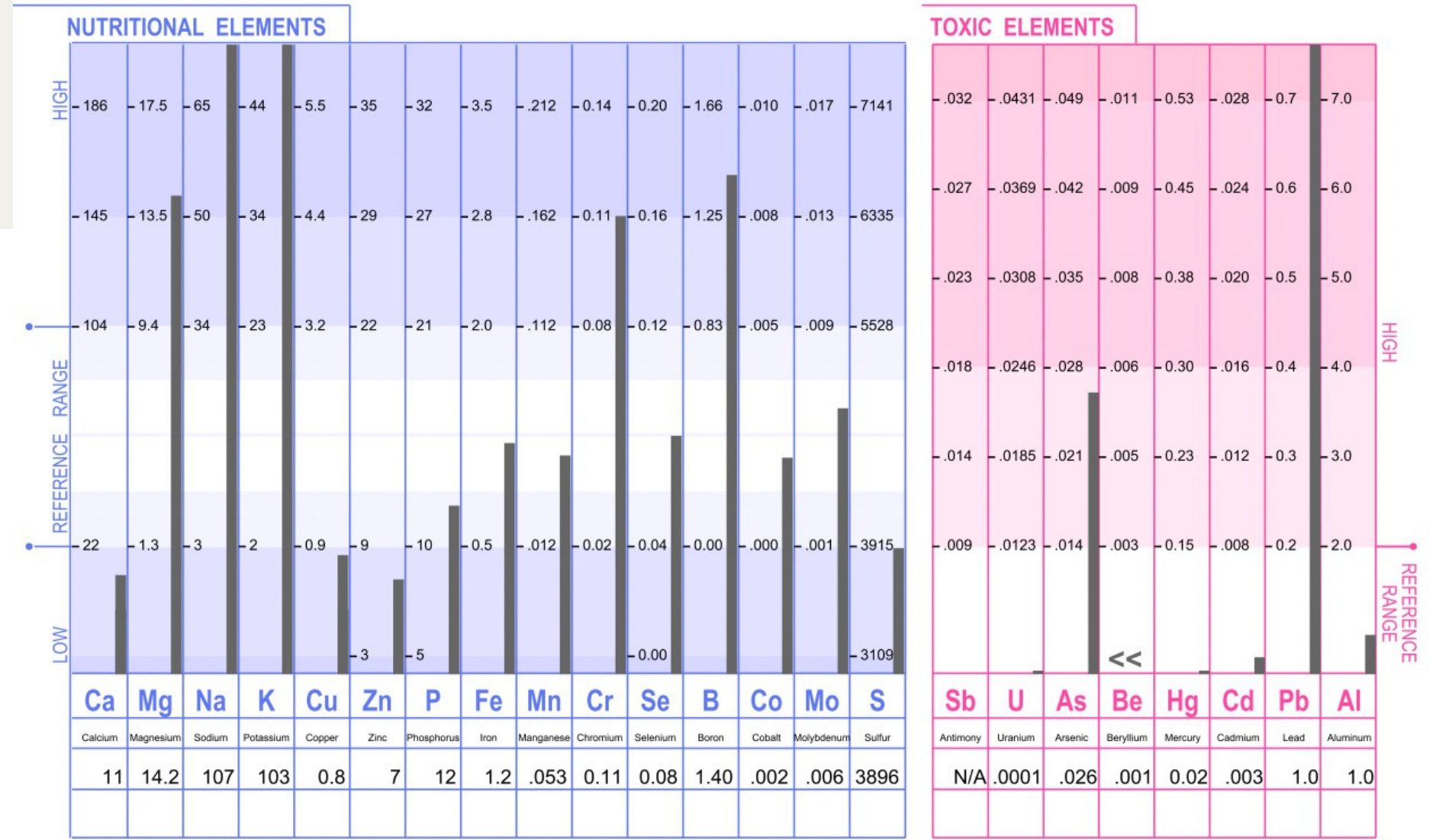


- High Boron - needed for adrenal function; can lead to:
  - irritability, noise sensitivity, fears
  - chronic overload can cause poor appetite, nausea, weight loss
- Low Sulfur - detoxification (sulfation) impaired
- Ca/Mg/Zn - calm the CNS

# Autism: 5, M

## Autism and Heavy Metals Toxicity:

- Study notes connection between various metals:
  - “We got high associations and significant values between of lead, mercury and cadmium concentrations and ASD. Study results indicate that there are significant differences of hair essential trace elements concentrations in children with autism spectrum disorder comparing with healthy children group. The result obtained also showed high contamination to heavy metals such as lead, mercury and cadmium in ASD children compared to healthy ones.”
  - Children with genetic problems, malnourished children, children from families with social problems were excluded from the study.

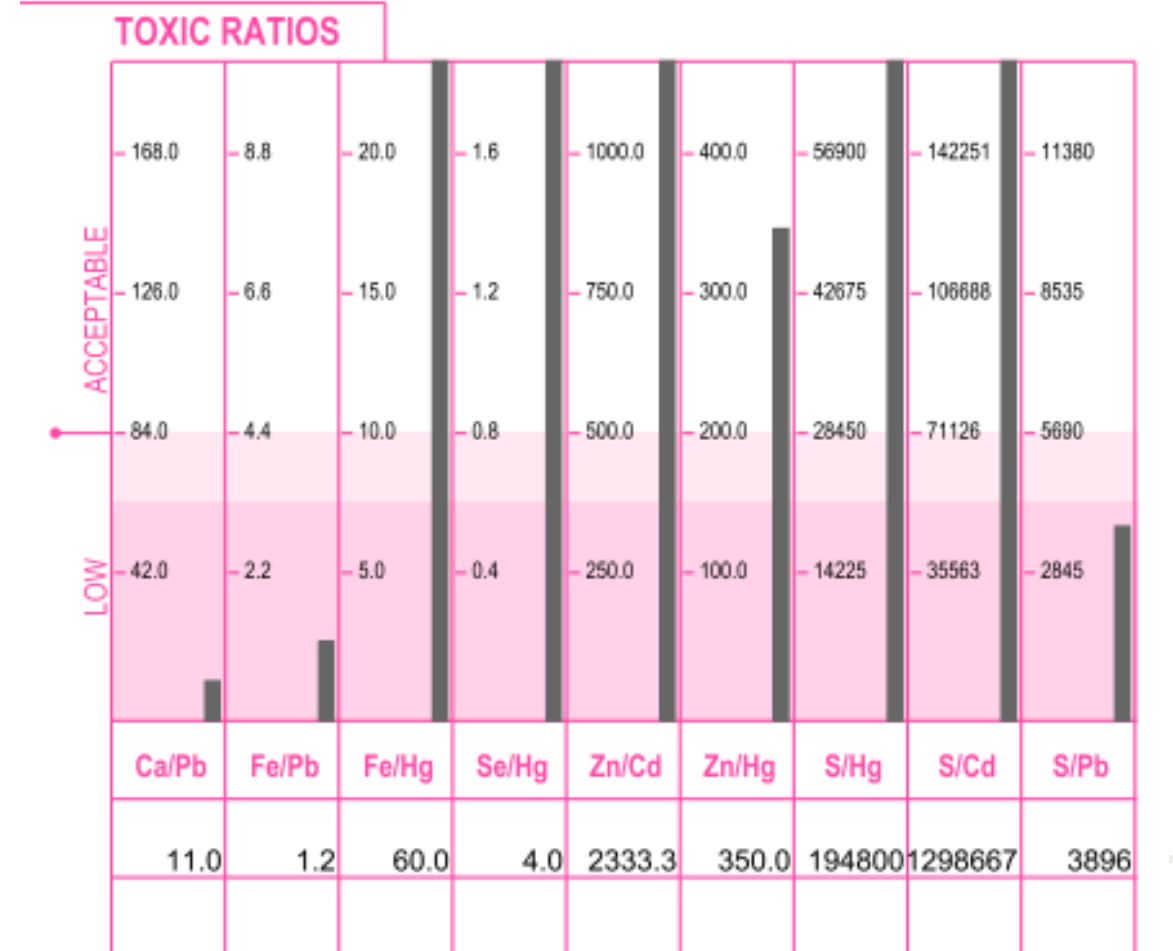


> [Georgian Med News](#). 2015 Nov:(248):77-82.

## HAIR HEAVY METAL AND ESSENTIAL TRACE ELEMENT CONCENTRATION IN CHILDREN WITH AUTISM SPECTRUM DISORDER

T Tabatadze <sup>1</sup>, L Zhorzholiani <sup>1</sup>, M Kherkheulidze <sup>1</sup>, E Kandelaki <sup>1</sup>, T Ivanashvili <sup>1</sup>

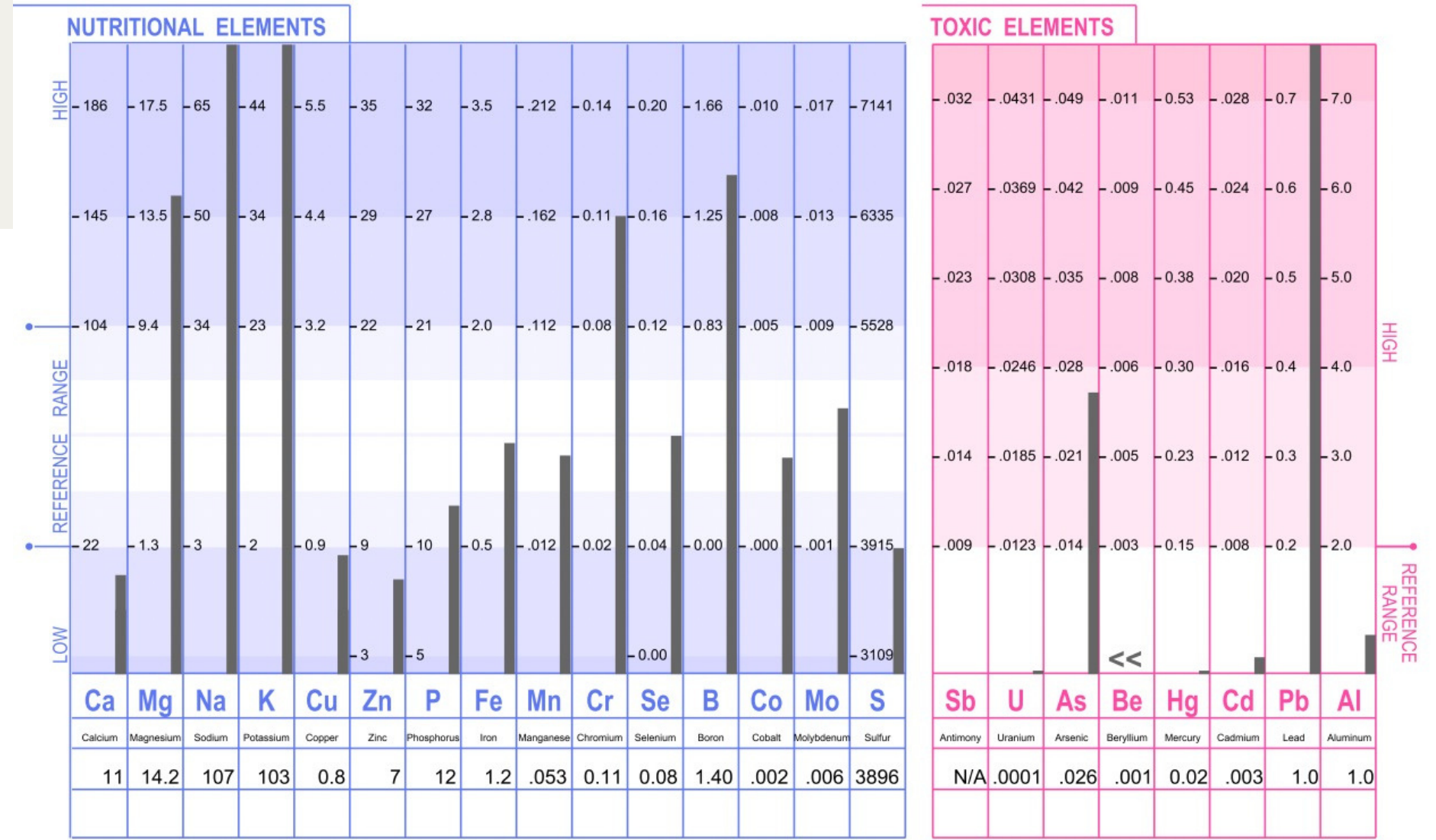
Affiliations + expand  
PMID: 26656556





# Autism: 5, M

- The contaminations to heavy metals were detected in case of lead (78% and 16%), mercury (43% and 10%) and cadmium (38% and 8%)
- The study statistical results indicated, that deficient concentrations of trace elements such as zinc, manganese, molybdenum and selenium in hair significantly linked with ASD

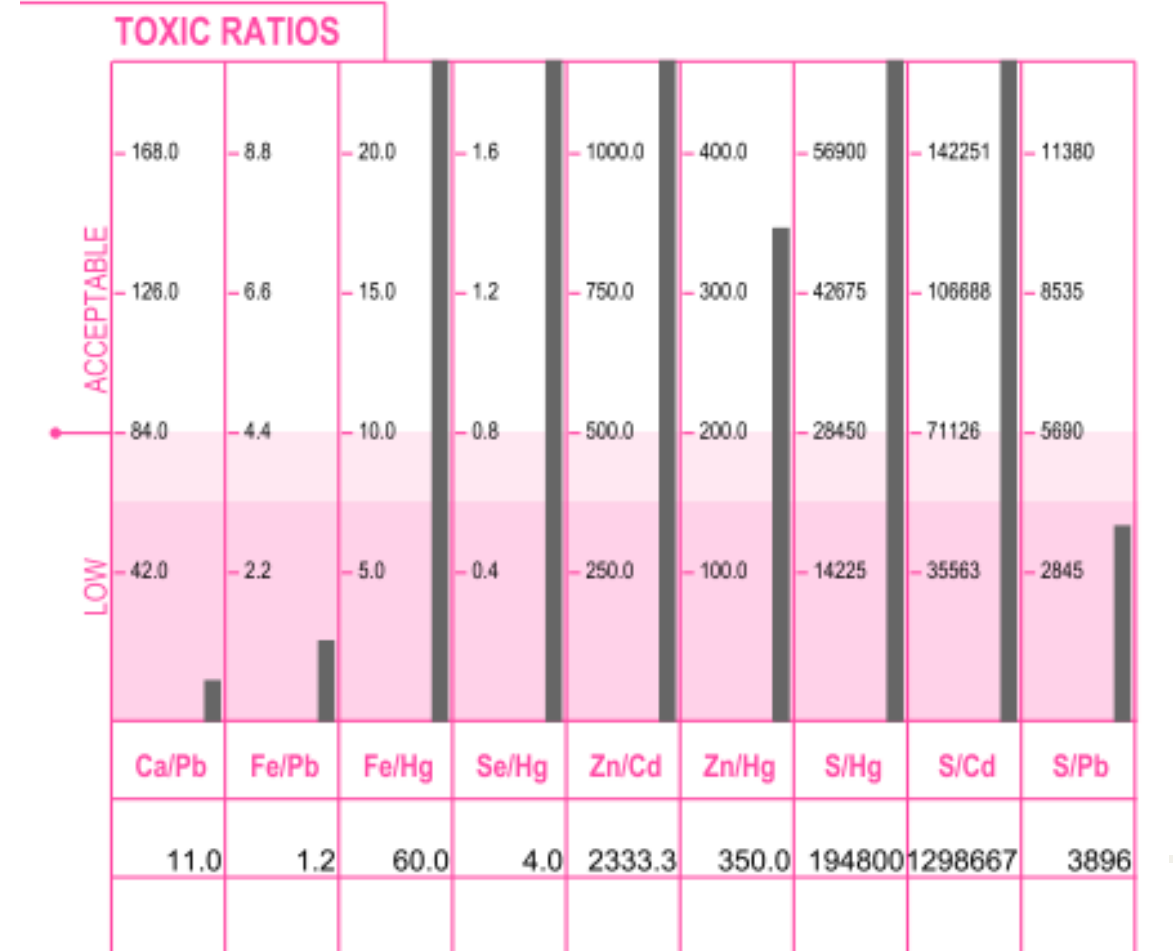


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Affiliations + expand  
PMID: 26656556





# An important consideration:

> [Environ Int.](#) 2021 Jul;152:106468. doi: 10.1016/j.envint.2021.106468. Epub 2021 Mar 22.

## **Metal and essential element concentrations during pregnancy and associations with autism spectrum disorder and attention-deficit/hyperactivity disorder in children**

[Thea S Skogheim](#)<sup>1</sup>, [Kjell Vegard F Weyde](#)<sup>2</sup>, [Stephanie M Engel](#)<sup>3</sup>, [Heidi Aase](#)<sup>2</sup>, [Pål Surén](#)<sup>2</sup>, [Merete G Øie](#)<sup>4</sup>, [Guido Biele](#)<sup>2</sup>, [Ted Reichborn-Kjennerud](#)<sup>5</sup>, [Ida H Caspersen](#)<sup>6</sup>, [Mady Hornig](#)<sup>7</sup>, [Line S Haug](#)<sup>8</sup>, [Gro D Villanger](#)<sup>2</sup>

Affiliations + expand

PMID: 33765546 DOI: [10.1016/j.envint.2021.106468](#)

[Free article](#)

“...several associations between levels of metals and elements during gestation and ASD and ADHD in children. The most notable ones involved arsenic, cadmium, copper, mercury, manganese, magnesium, and lead. Our results suggest that even population levels of these compounds may have negative impacts on neurodevelopment. As we observed mainly similarities among the metals' and elements' impact on ASD and ADHD, it could be that the two disorders share some neurochemical and neurodevelopmental pathways.”

# An important consideration:

[PLoS Med.](#) 2008 May; 5(5): e101. Published online 2008 May 27.

doi: [10.1371/journal.pmed.0050101](https://doi.org/10.1371/journal.pmed.0050101)

PMCID: PMC2689664 | PMID: [18507497](https://pubmed.ncbi.nlm.nih.gov/18507497/)

## Association of Prenatal and Childhood Blood Lead Concentrations with Criminal Arrests in Early Adulthood

[John Paul Wright](#),<sup>1</sup> [Kim N Dietrich](#),<sup>2,\*</sup> [M. Douglas Ris](#),<sup>3</sup> [Richard W Hornung](#),<sup>3</sup>  
[Stephanie D Wessel](#),<sup>2</sup> [Bruce P Lanphear](#),<sup>3</sup> [Mona Ho](#),<sup>3</sup> and [Mary N Rae](#)<sup>2</sup>

John Balmes, Academic Editor

- “The objective of this study was to determine if prenatal and childhood blood lead concentrations are associated with arrests for criminal offenses.”
- “Prenatal and postnatal blood lead concentrations are associated with higher rates of total arrests and/or arrests for offenses involving violence.”
- This study did not assess all criminal behavior as not all lead to an arrest.

# Autism: 5, M

[Environ Health](#). 2016; 15: 23. Published online 2016 Feb 16. doi: [10.1186/s12940-016-0122-3](https://doi.org/10.1186/s12940-016-0122-3)

PMCID: PMC4756504 | PMID: [26884052](https://pubmed.ncbi.nlm.nih.gov/26884052/)

## The relationship between atmospheric lead emissions and aggressive crime: an ecological study

[Mark Patrick Taylor](#),<sup>✉</sup> [Miriam K. Forbes](#), [Brian Opeskin](#), [Nick Parr](#), and [Bruce P. Lanphear](#)

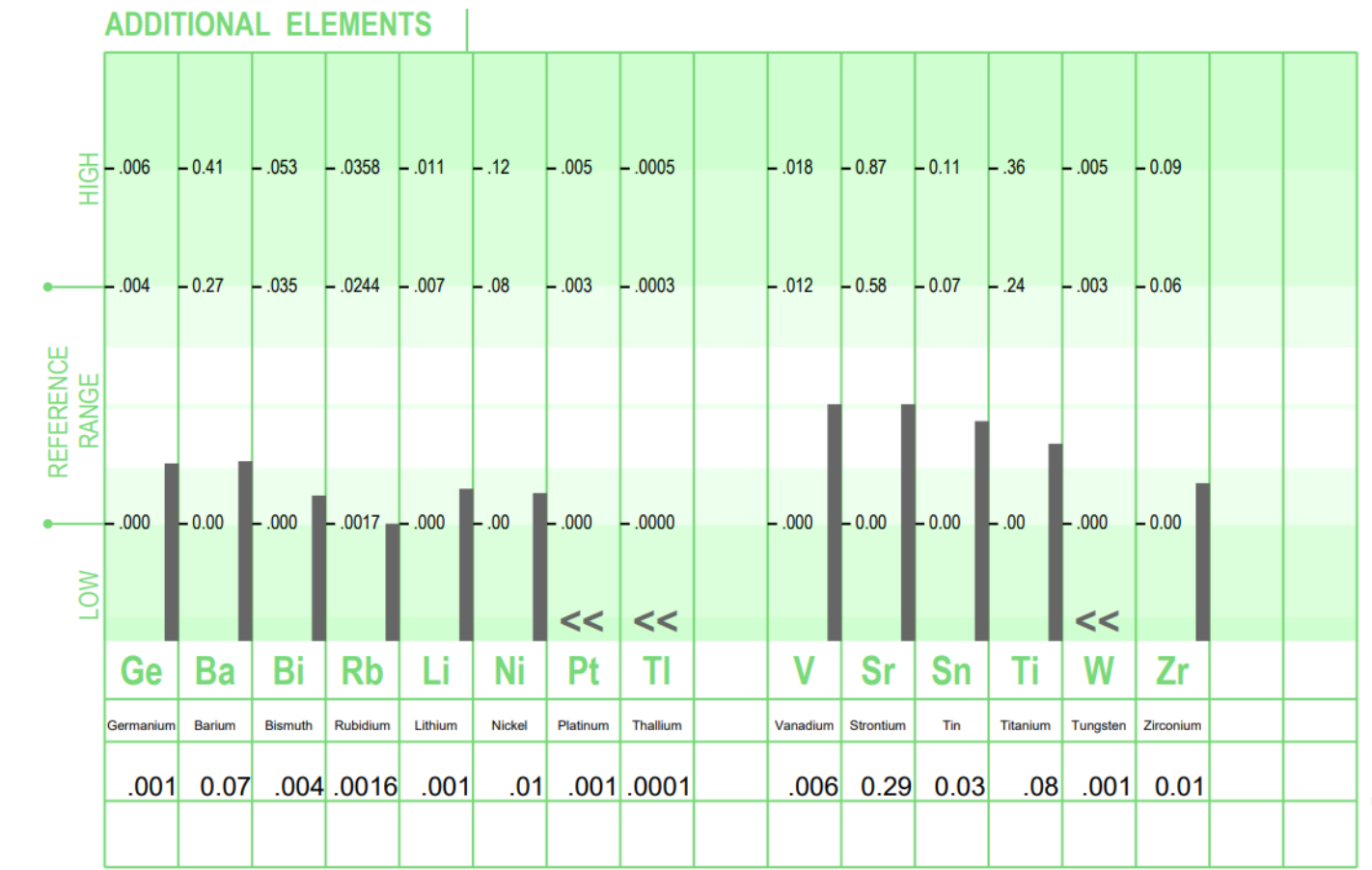
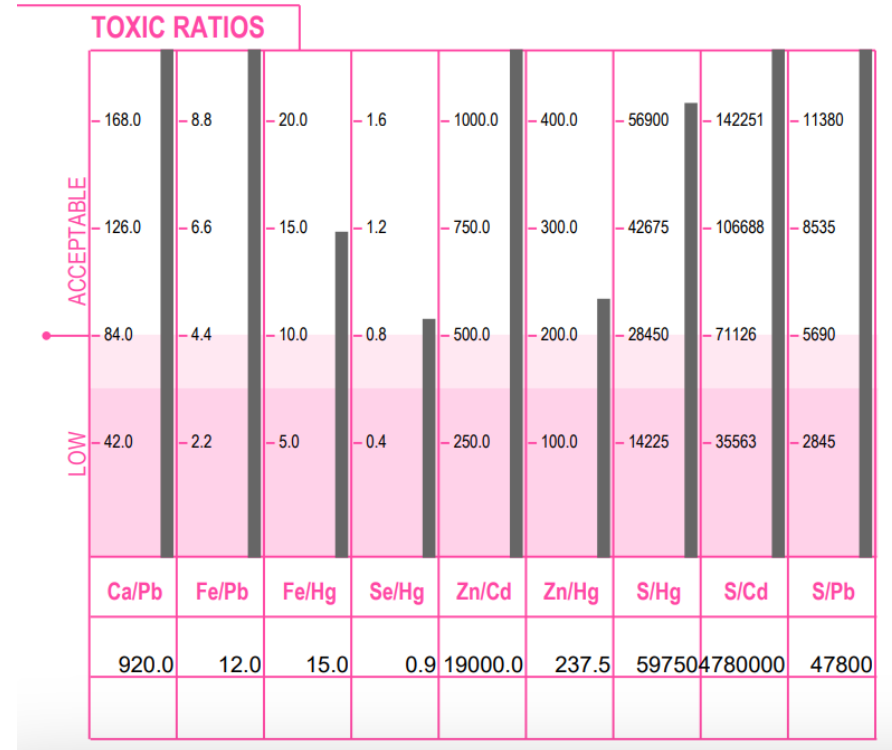
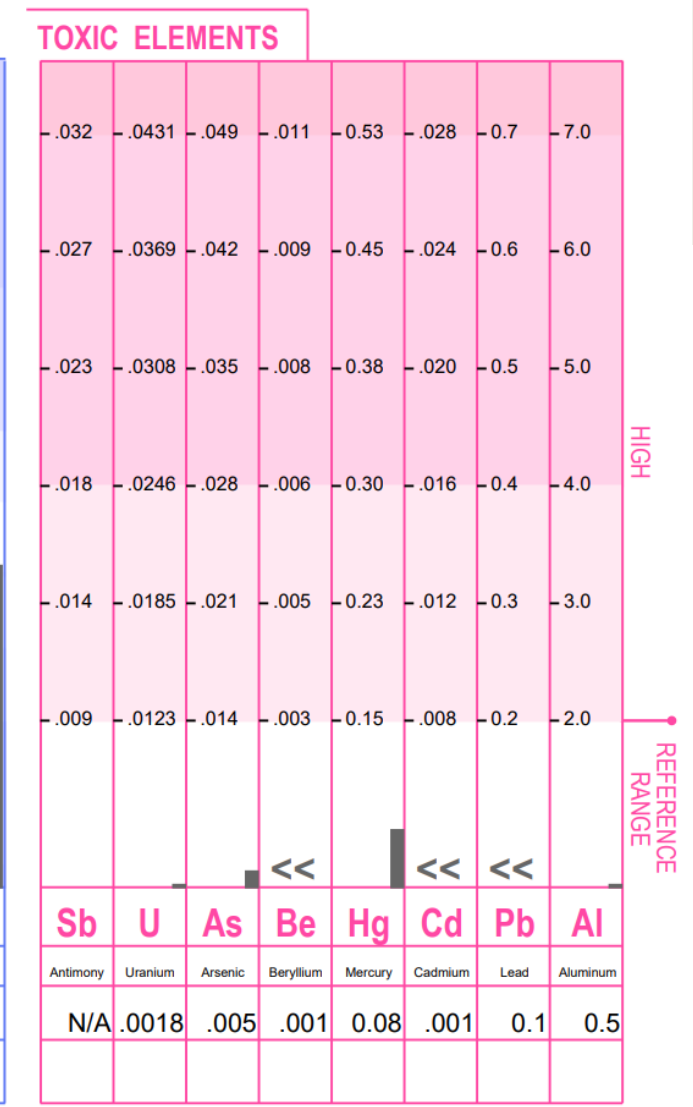
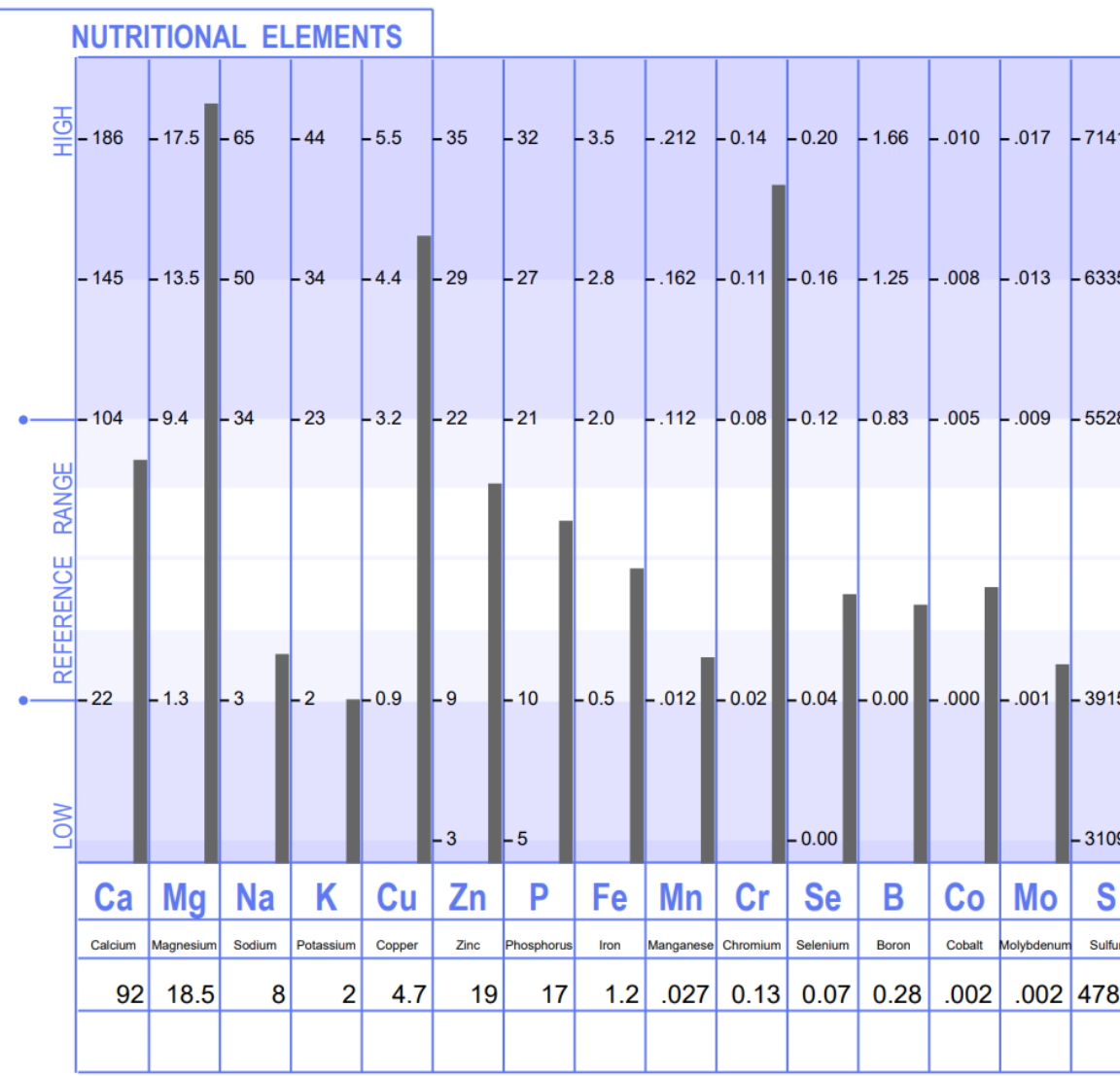
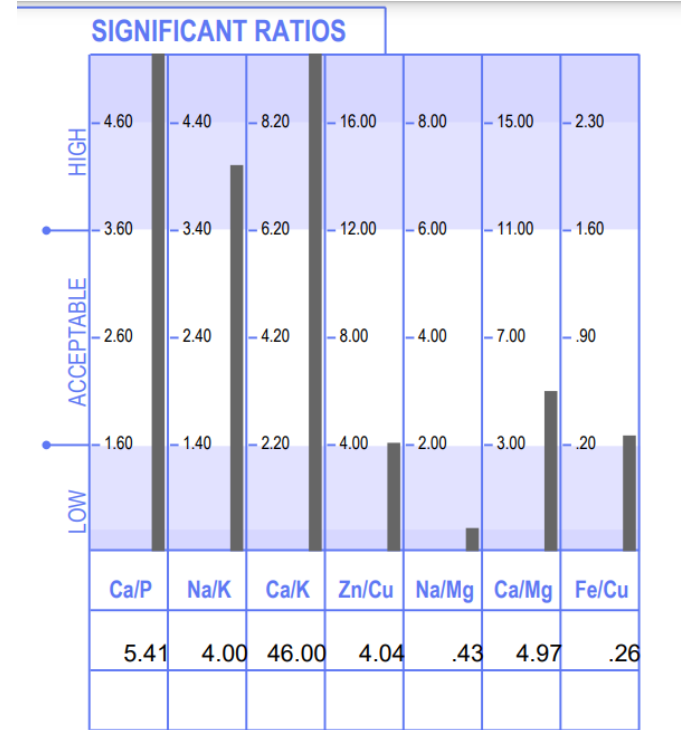
▶ [Author information](#) ▶ [Article notes](#) ▶ [Copyright and License information](#) [PMC Disclaimer](#)

- “Accounting for socio-demographic covariates, lead in air remained a strong predictor of assault rates.”
- “Lead in air was the strongest predictor in the model, accounting for 29.8 % of the variance in assault rates 21 years later. By comparison, the proportion of the population aged 15–24 accounted for 5.4 % of the variance, and the proportion of the population who completed secondary school accounted for 5.0 %. Median income was not a significant predictor in the model.”



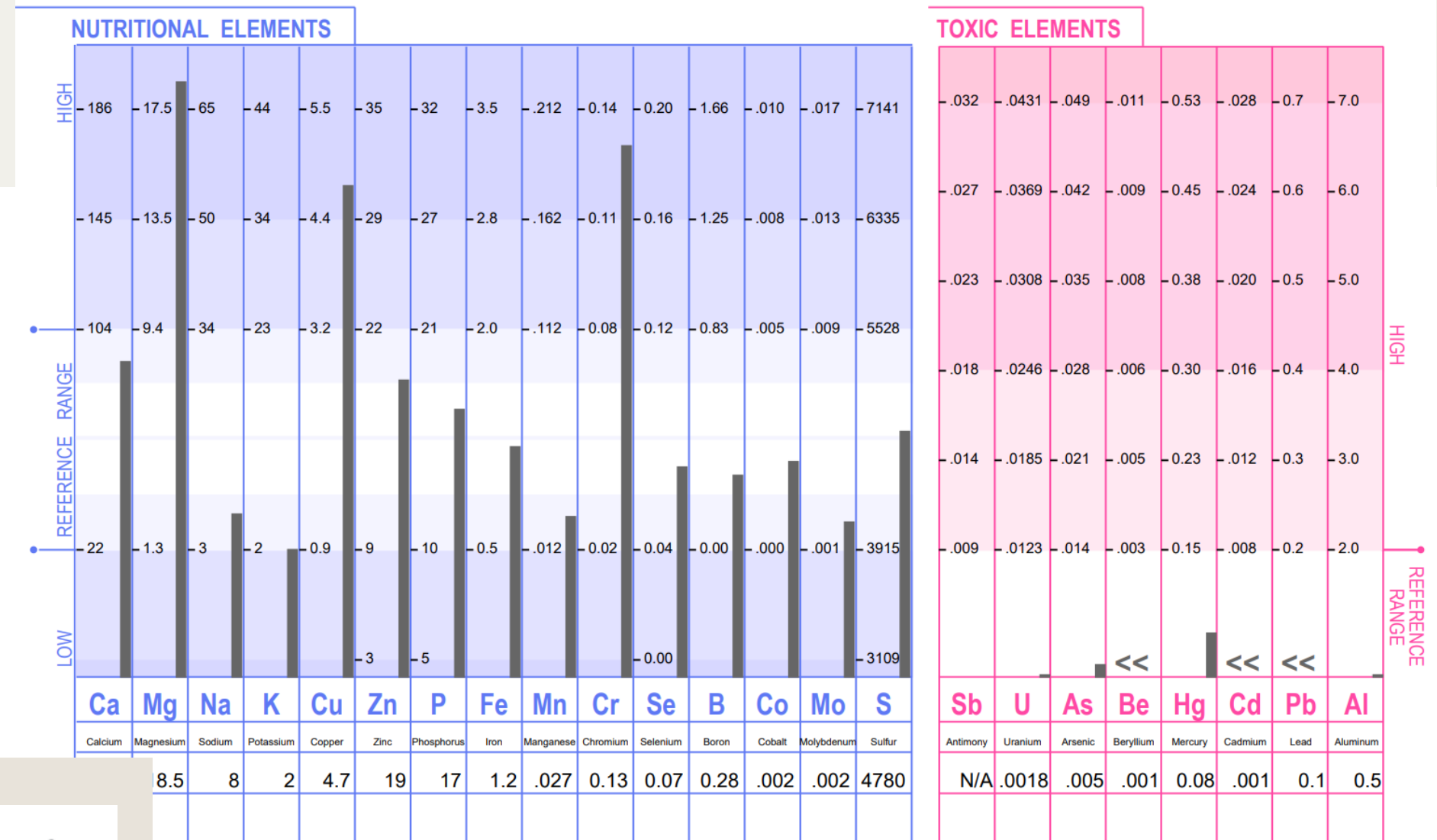
# Pregnancy: 36, F

- 7wks pregnant
- Concerns:
  - nausea
  - liver support
  - blood sugar regulation
  - thyroid dysfunction
  - anxiety
- What do we see:
  - Ca - elevated
  - Na and K - low
  - High Cu
  - High Zn
  - Low Mn
  - High Cr
  - Low Mo
  - Low Lithium



# Pregnancy: 36, F

- High Copper:
  - Study: Pregnancy causes an increase in Cu levels (estrogen), which can lead to:
    - premature birth, low birth weight, vomiting, diarrhea, gestational diabetes.
    - this client had a past of birth control use (8yrs)
  - “Increased copper accumulation in the mother can lead to inherited copper toxicity in the children” (Dr. Watts).



Review > Biomolecules. 2020 Aug 12;10(8):1176. doi: 10.3390/biom10081176.

## The Role of Fe, Zn, and Cu in Pregnancy

Konrad Grzeszczak <sup>1</sup>, Sebastian Kwiatkowski <sup>2</sup>, Danuta Kosik-Bogacka <sup>3</sup>

Affiliations + expand

PMID: 32806787

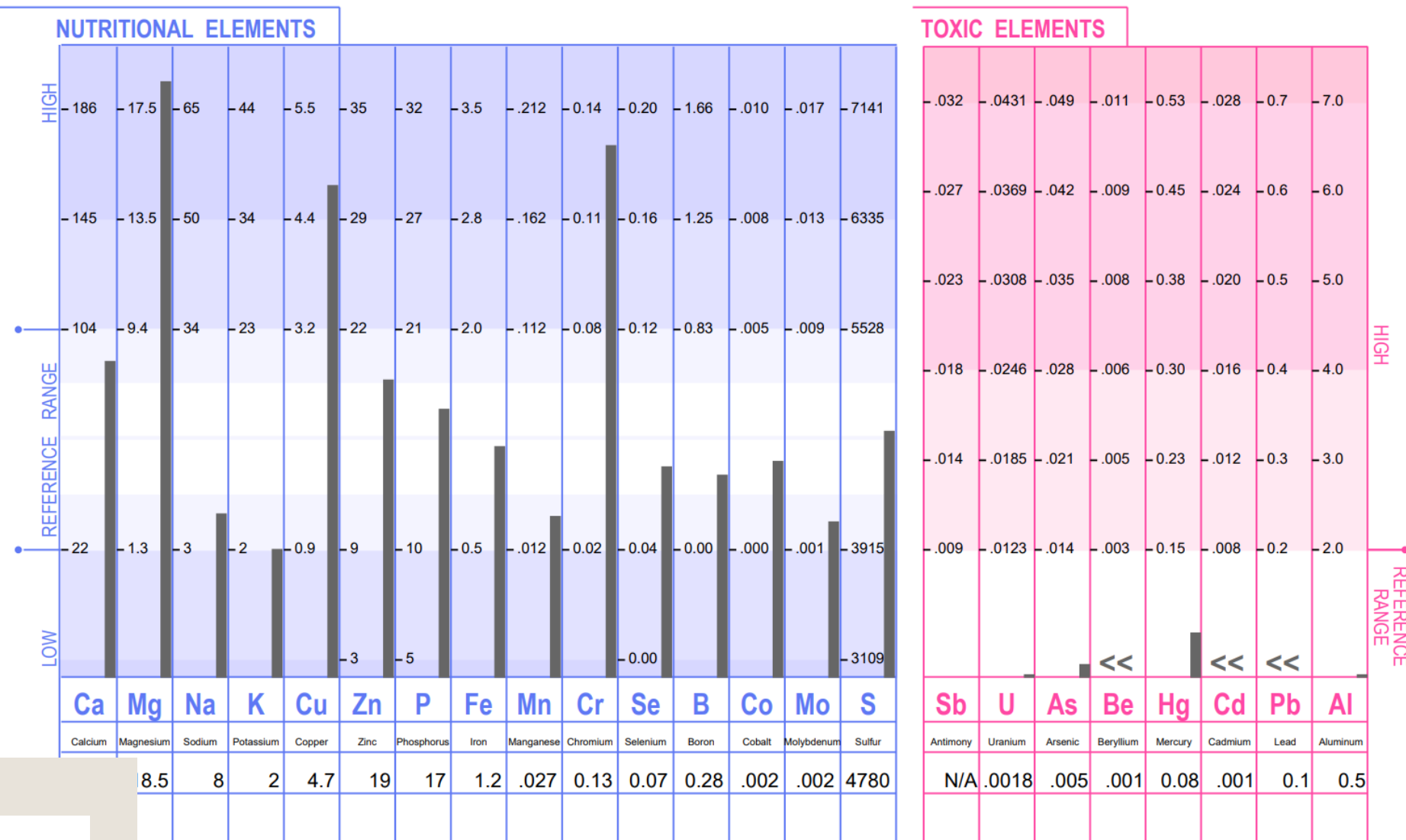
PMCID: [PMC7463674](https://pubmed.ncbi.nlm.nih.gov/PMC7463674/)

DOI: [10.3390/biom10081176](https://doi.org/10.3390/biom10081176)

- Dr. Watts of Trace Elements notes in his book, “Copper can also affect thyroid function through the actions of insulin. Elevated tissue copper increases tissue retention of calcium, which triggers an increase in insulin secretion by the pancreas. Since zinc is required for the storage of insulin, it is possible that the zinc-copper antagonism could be responsible for flooding insulin in the blood.”

# Pregnancy: 36, F

- High Chromium: can lead to nausea, vomiting, allergies, fatigue
- High Mg: can lead to confusion, depression, diarrhea, fatigue, lethargy, low BP, muscle weakness
- Mg and Cr are synergistic minerals



Observational Study > Med Sci Monit. 2021 Sep 12;27:e932032. doi: 10.12659/MSM.932032.

## Ratio of Serum Calcium to Magnesium Levels on Pregnancy with and without Preeclampsia

Gatot N Adhipurnawan Winarno <sup>1</sup>, Adhi Pribadi <sup>1</sup>, Henry Jerikho Maruli <sup>1</sup>, Eppy Darmadi Achmad <sup>1</sup>, Ruswana Anwar <sup>1</sup>, Johanes Cornelius Mose <sup>1</sup>, Aisyah Shofiatun Nisa <sup>1</sup>, Nurvita Trianasari <sup>2</sup>

Affiliations + expand

PMID: 34510157 PMCID: PMC8444707 DOI: 10.12659/MSM.932032

- study: patients with preeclampsia had higher levels of magnesium and calcium than patients without preeclampsia; same patients also demonstrated significantly lower Ca/Mg ratios than those without preeclampsia.



# Pregnancy: 36, F

## Multicenter Study

> J Clin Endocrinol Metab. 2019 Oct 1;104(10):4295-4303.  
doi: 10.1210/jc.2019-00109.

## A Prospective Study of Early Pregnancy Essential Metal(loid)s and Glucose Levels Late in the Second Trimester

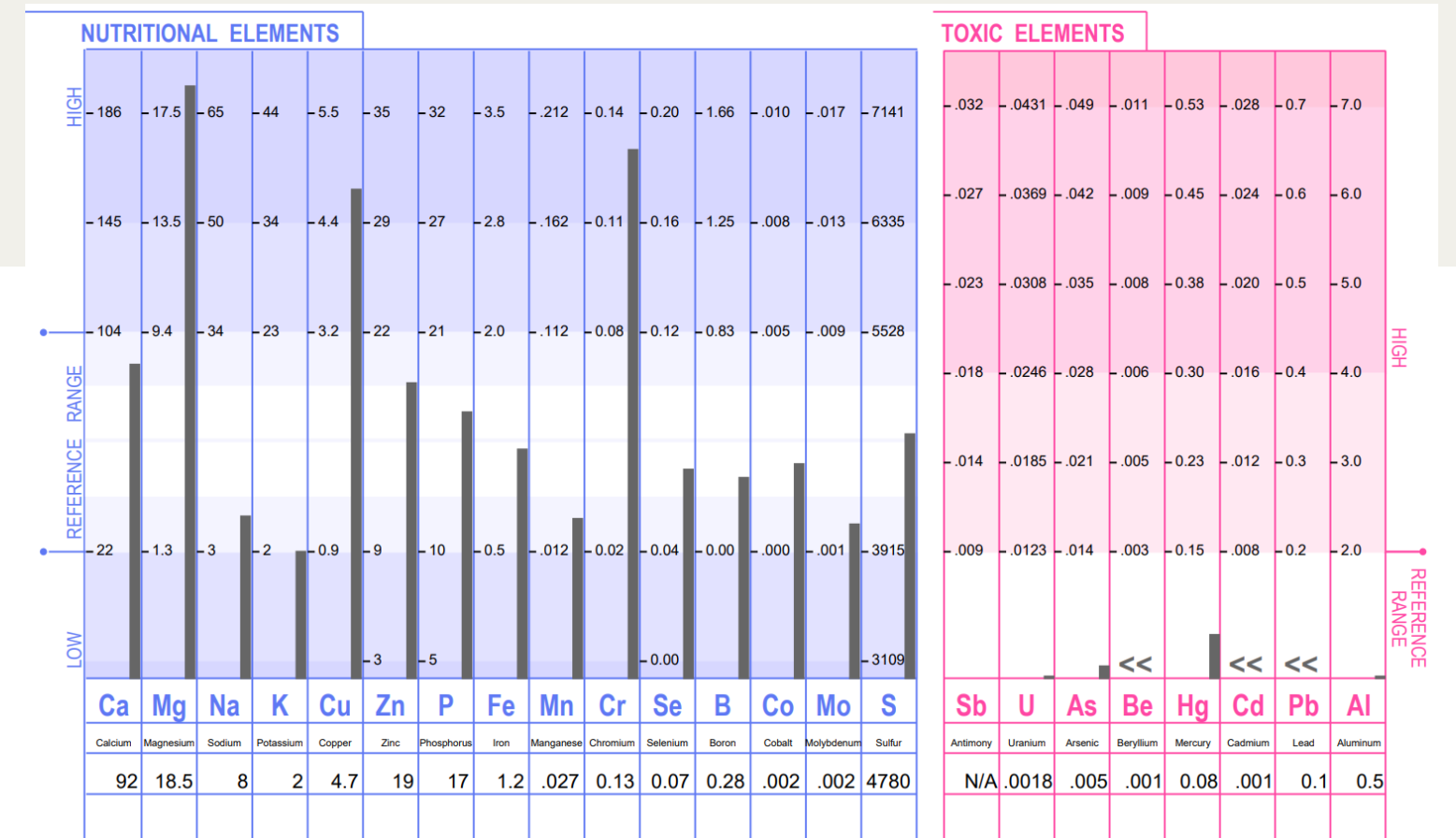
Yinnan Zheng <sup>1</sup>, Cuilin Zhang <sup>2</sup>, Marc Weisskopf <sup>1 3</sup>,  
Paige L Williams <sup>3 4</sup>, Patrick J Parsons <sup>5 6</sup>,  
Christopher D Palmer <sup>5 6</sup>, Germaine M Buck Louis <sup>7</sup>,  
Tamarra James-Todd <sup>1 3</sup>

Affiliations + expand

PMID: 31095302

PMCID: [PMC6736048](#)

DOI: [10.1210/jc.2019-00109](#)

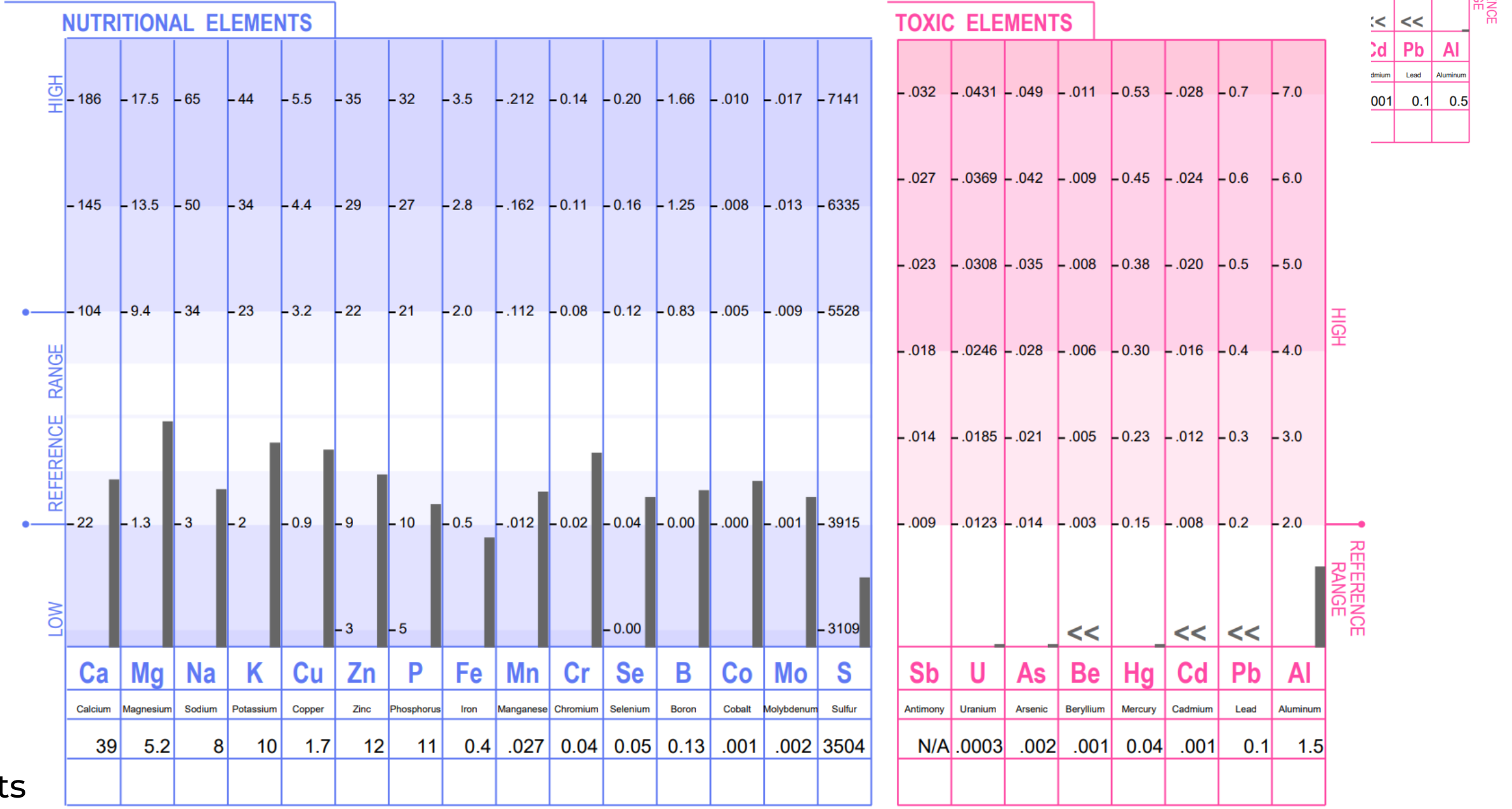
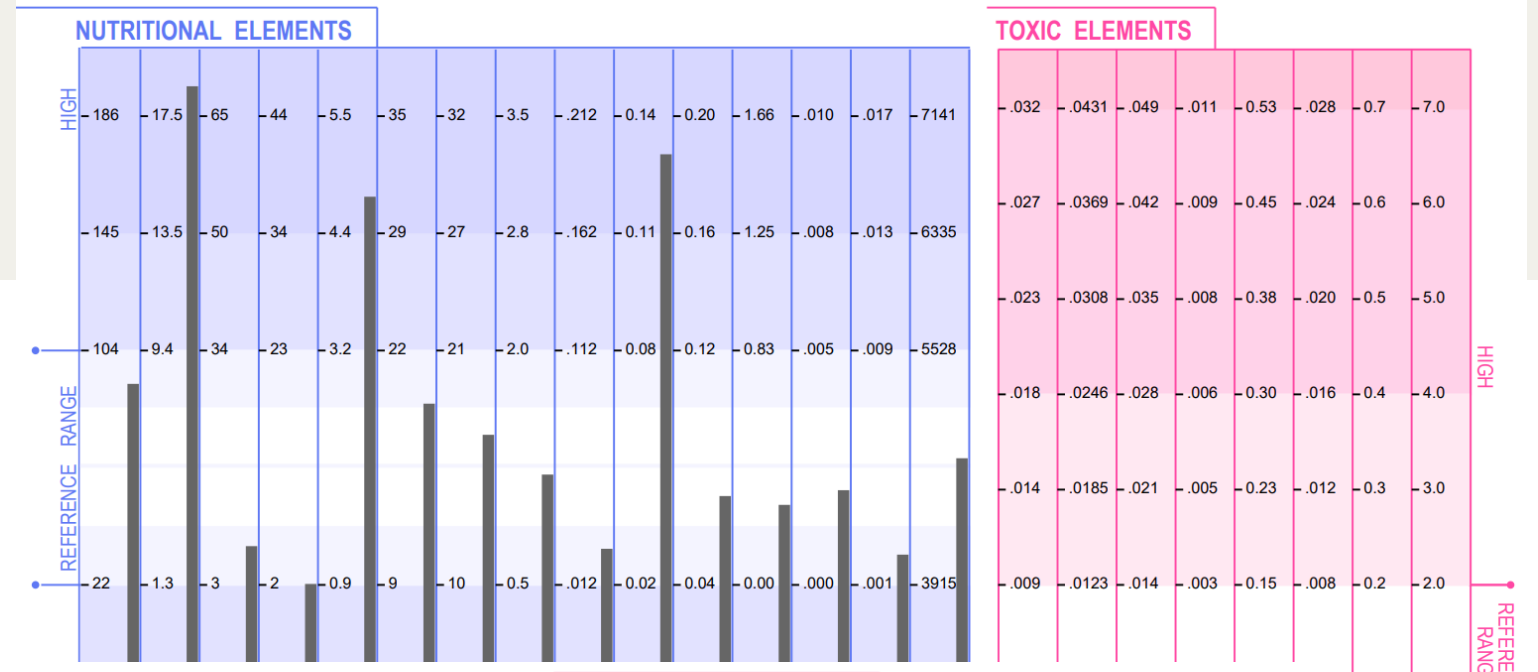


- Low Mn: deficiency can be related to copper toxicity and dental decay
- study: higher copper and lower molybdenum concentrations could increase the risk of glucose dysregulation during pregnancy, with women at higher risk of gestational diabetes mellitus potentially affected to a greater extent.
  - every increase in molybdenum concentration measured during the 1st trimester was associated with 1.2mg/dL lower mean glucose level.

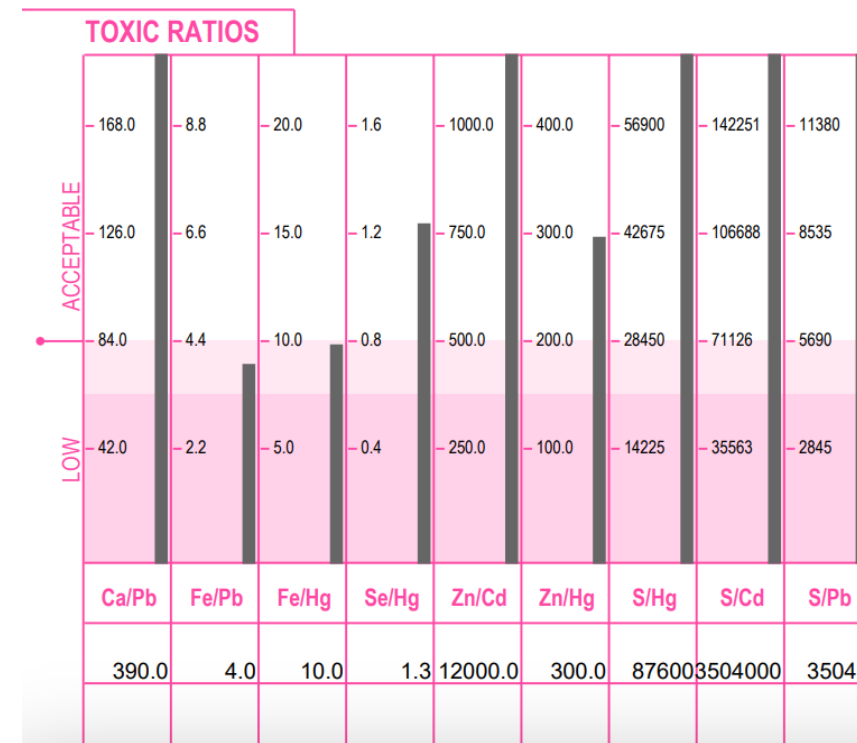
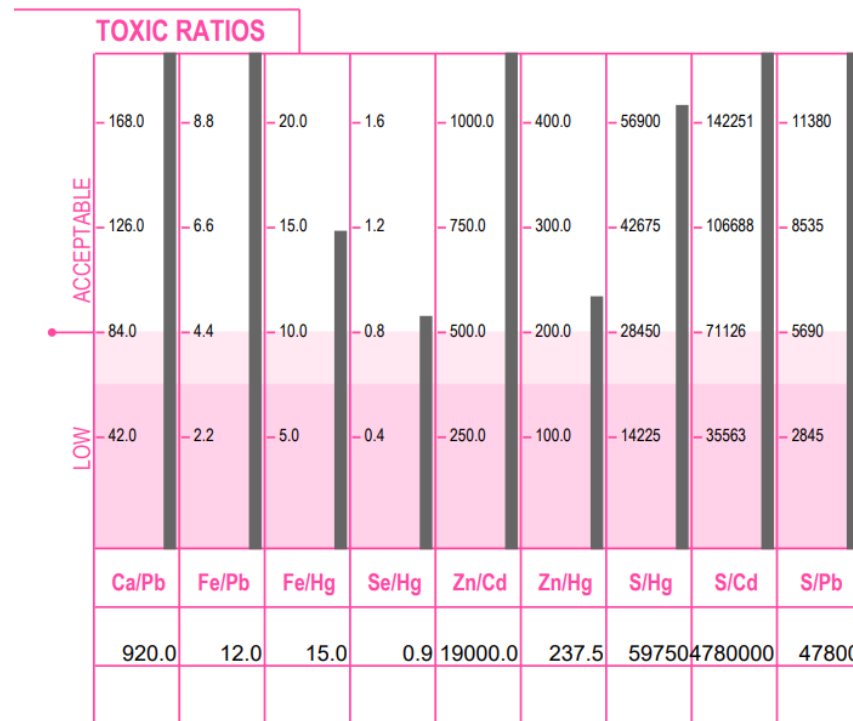
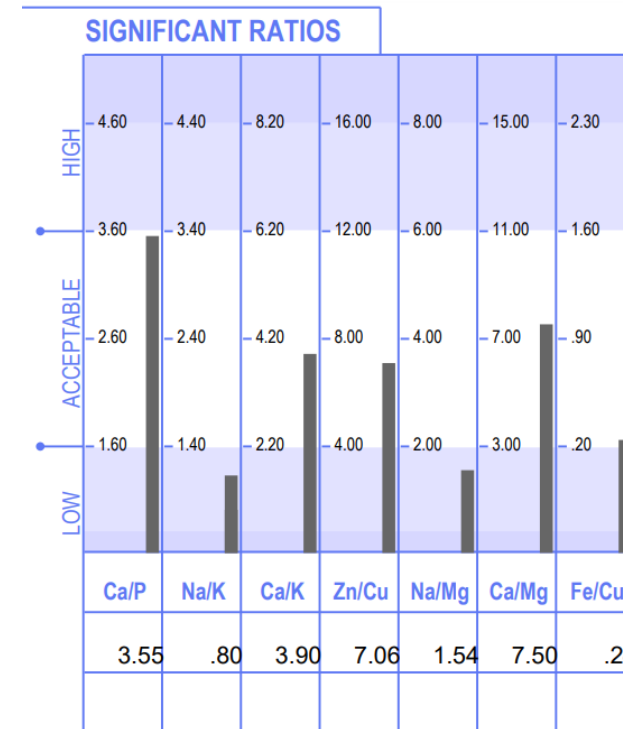
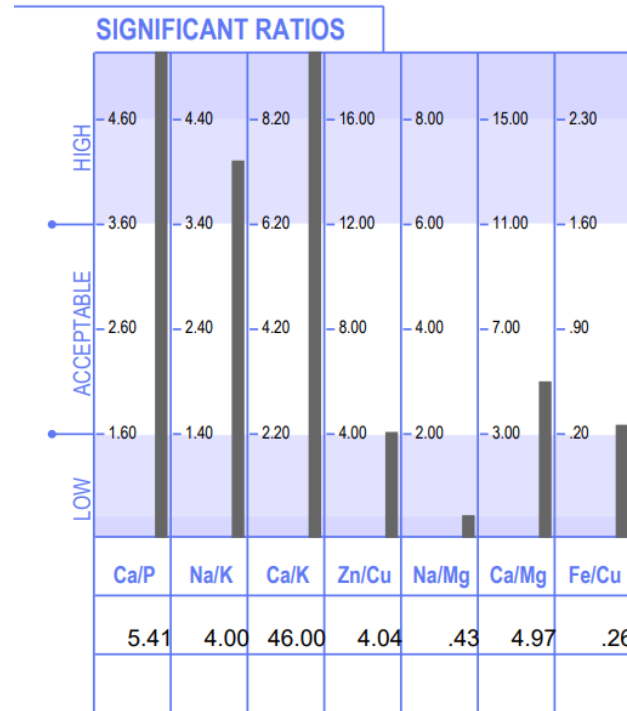
# Pregnancy: 36, F

- Recommendations:

- digestive supports based on GIMAP
- personalized mineral supplement with vitamin cofactors
  - Mg glycinate, Mg Malate
  - Sea salt
  - Potassium gluconate
  - Selenium
  - Boron
  - Vitamin E
  - Vitamin K2
  - Vitamin B1
  - Vitamin B3
  - Vitamin B6
  - Vitamin A
  - Vitamin C
- pregnancy safe binder
- liver and gallbladder homeopathic supports



# Pregnancy: 36, F



- Metabolism in better place
  - better balanced Ca/P ratio
- Body exhausted - common with depletion of nutrients in pregnancy
  - low Na/K ratio
- better thyroid function
  - balanced Ca/K ratio
- excess copper gone
  - could be binder and mineral support, could also be that excess copper was passed to baby in-utero
- adrenals are more responsive/better mitochondrial health
  - Na/Mg ratio increased
- blood sugar regulated
  - balanced Ca/Mg ratio



# How do we address our mineral levels?

- Food first; always food first.
- Test, don't guess. :)
  - hair tissue mineral analysis (paired with appropriate blood chemistry)
- After food, supplement with key nutrients.

***Let's look at some examples of how:***

# Food First: Calcium

PREGNANCY - LACTATION: 1000mg/day to 1200 mg/day



**SPROUTED ALMONDS**



**CHIA SEEDS**



**SALMON**



**RAW MILK**



**KEFIR**



**SOAKED WHITE BEANS**



**SARDINES**



**CHEESE**



**YOGURT**



# Herbs: Calcium



**BASIL**

**MARJORAM**



**SAGE**



**DILL**



**CHERVIL**



**PARSLEY**

**THYME**



**MINT**



**OREGANO**





# Calcium: Meeting the Minimum



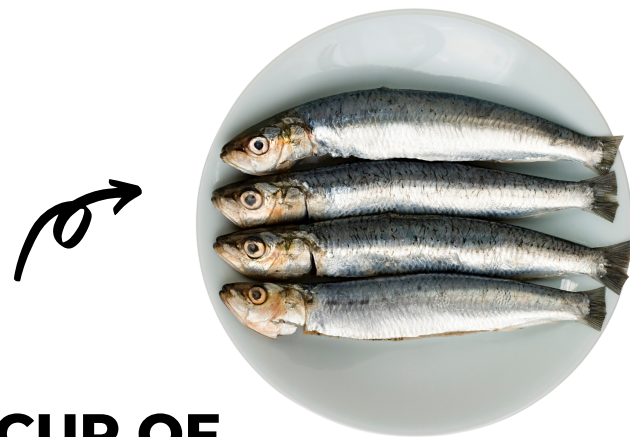
**4 TBSP OF ALMONDS**



**4 OZ OF SALMON**



**1 CUP OF WHOLEMILK**



**1/2 CUP OF SARDINES**



**2 TBSP OF CHIA SEEDS**



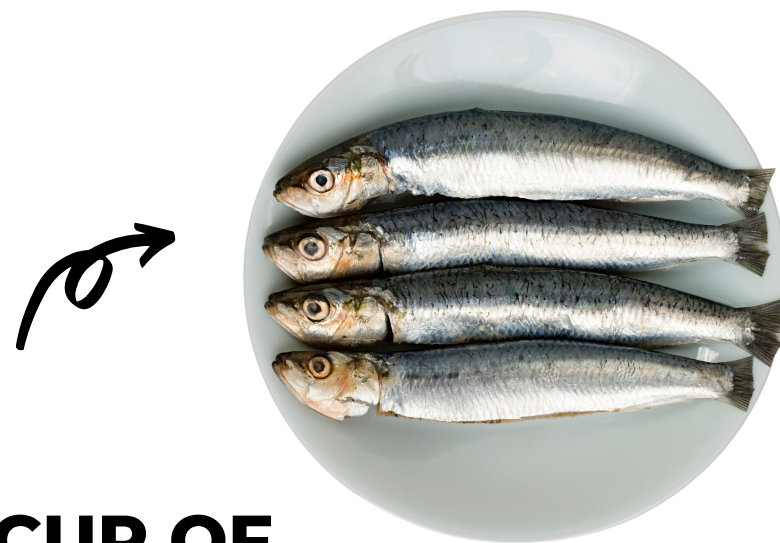
**1 CUP OF YOGURT**



**1/2 CUP of COTTAGE CHEESE**

# Calcium: Meeting the Minimum

**1/2 CUP OF  
SARDINES**



**1 QUART OF  
WHOLE MILK**



1387.5 mg of Calcium



# Food First: Magnesium

PREGNANCY + LACTATION: 300 mg/day



**COOKED LEAFY GREENS**

**DAIRY**



**CHICKEN LIVER**



**BEEF**

**CACAO**



**EPSOM SALT**



**SOAKED BLACK BEANS**



**AVOCADO**

**FATTY FISH**



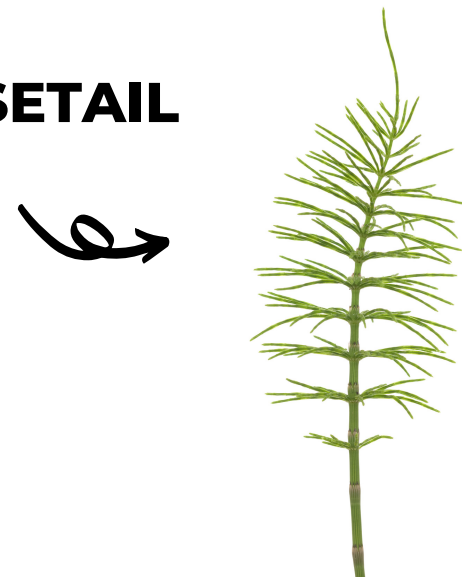


# Herbs: Magnesium



**ALFALFA**

**HORSETAIL**



**RED CLOVER**

**DILL**



**MARJORAM**



**NETTLE**



**CHERVIL**

**OREGANO**



# Magnesium: Meeting the Minimum

**1 CUP WHOLE MILK**



**1 CUP OF SOAKED BLACK BEANS**



**2 CUP OF GROUND BEEF**



**CHICKEN LIVER**



**1 CUP OF AVOCADO**





# Food First: Sodium

PREGNANCY: + LACTATION: 1500mg+



**SALTED  
SPROUTED  
ALMONDS**



**SEAWEED**



**COTTAGE  
CHEESE**



**COOKED CLAMS  
OR MUSSELS**





# Sodium: Meeting the Minimum



**1/4 TSP OF  
SEA SALT**

**1 PACK OF  
SEASNAX SEAWEED**



**1/4 CUP OF  
GREEN OLIVES**

**1/2 CUP OF  
COTTAGE CHEESE**



# Food First: Potassium

PREGNANCY: 4700mg

LACTATION: 5100mg



**AVOCADO**



**APRICOTS**



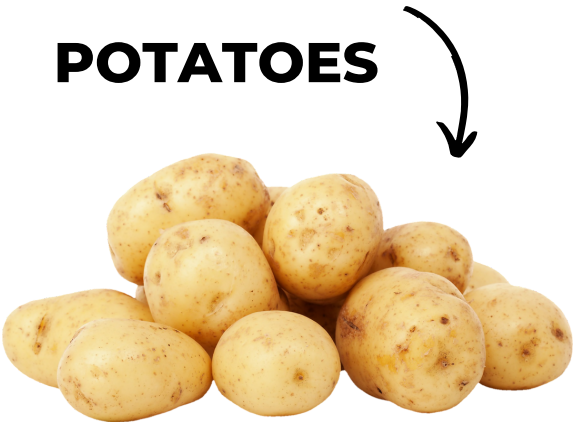
**CLAMS**



**PARSNIPS**



**BEETS**



**POTATOES**



**SARDINES**



**BANANAS**



# Herbs: Potassium



**NETTLE**



**PARSLEY**



**DILL**



**TURMERIC**



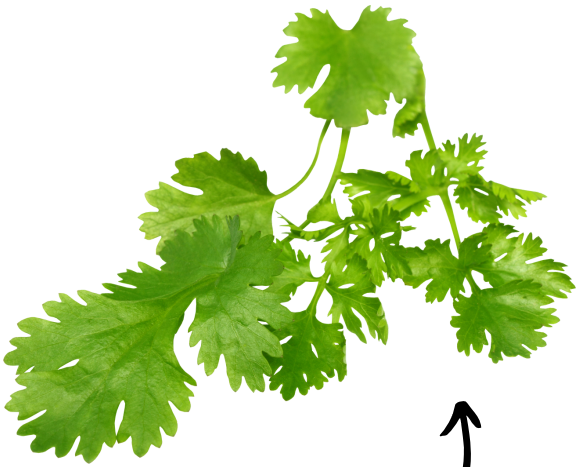
**CHERVIL**



**BASIL**



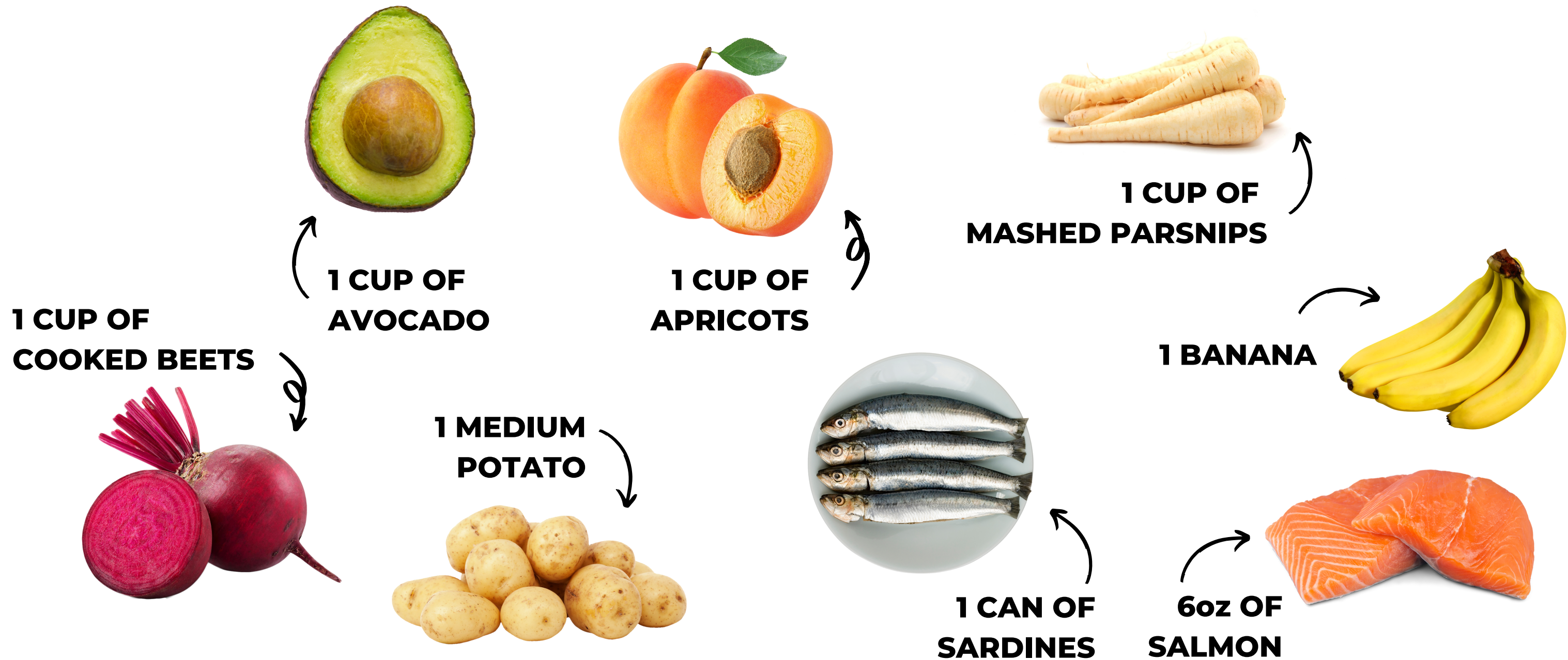
**TARRAGON**



**CORIANDER**



# Potassium: Meeting the Minimum



# Supplements:

Ca

## CALCIUM

- Calcium lactate
- Calcium pyruvate
- Bone meal
- Pearl powder

Mg

## MAGNESIUM

- Magnesium Glycinate
- Magnesium Bis-glycinate
- Magnesium Malate
- Epsom salt baths
- Transdermal (lotions, sprays)

Na

## SODIUM

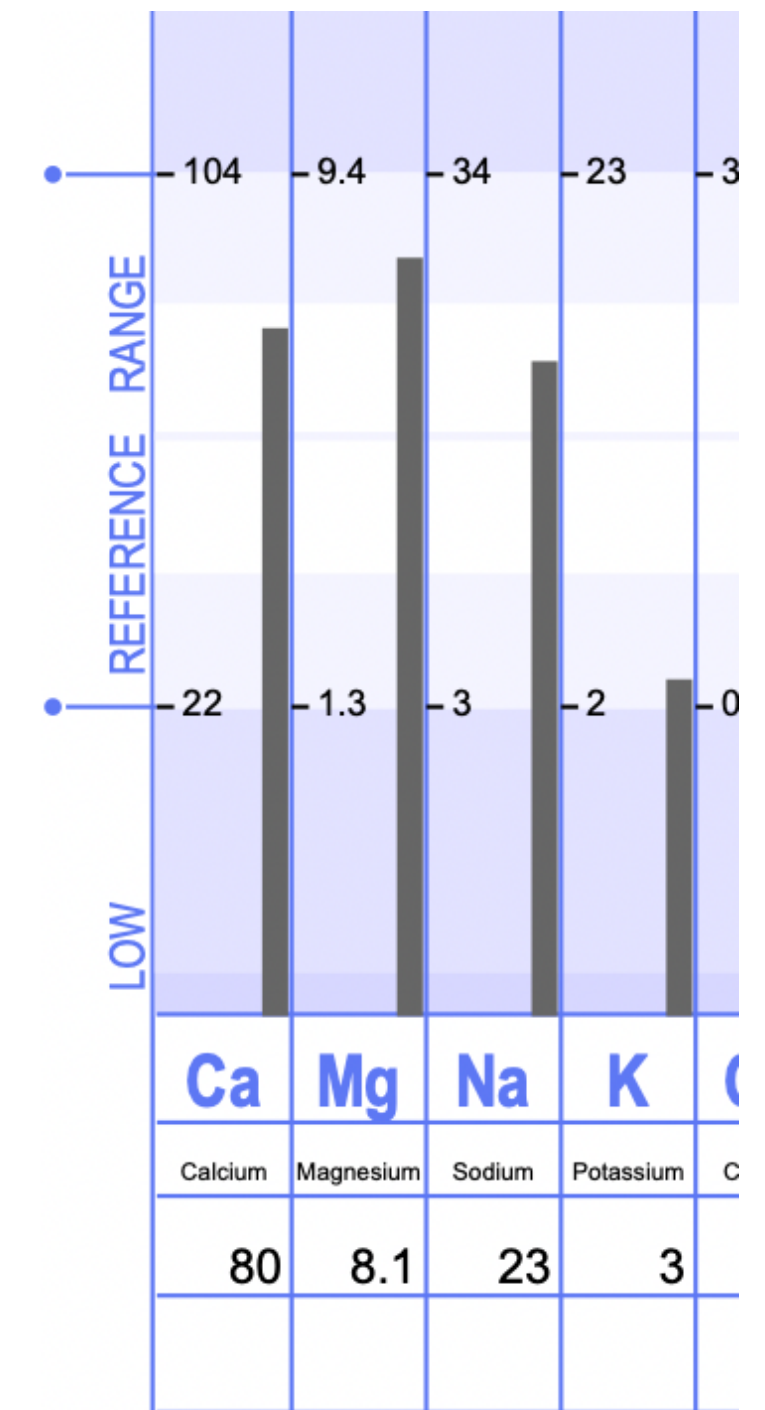
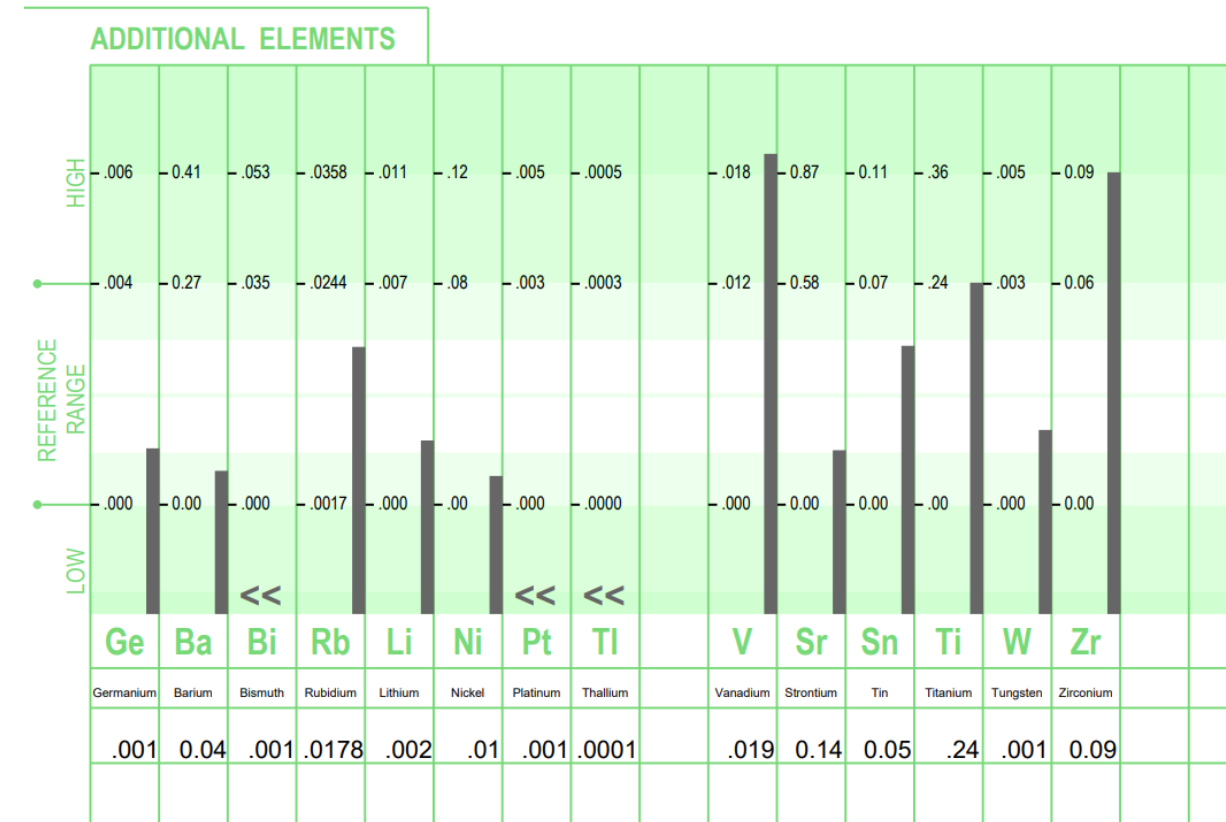
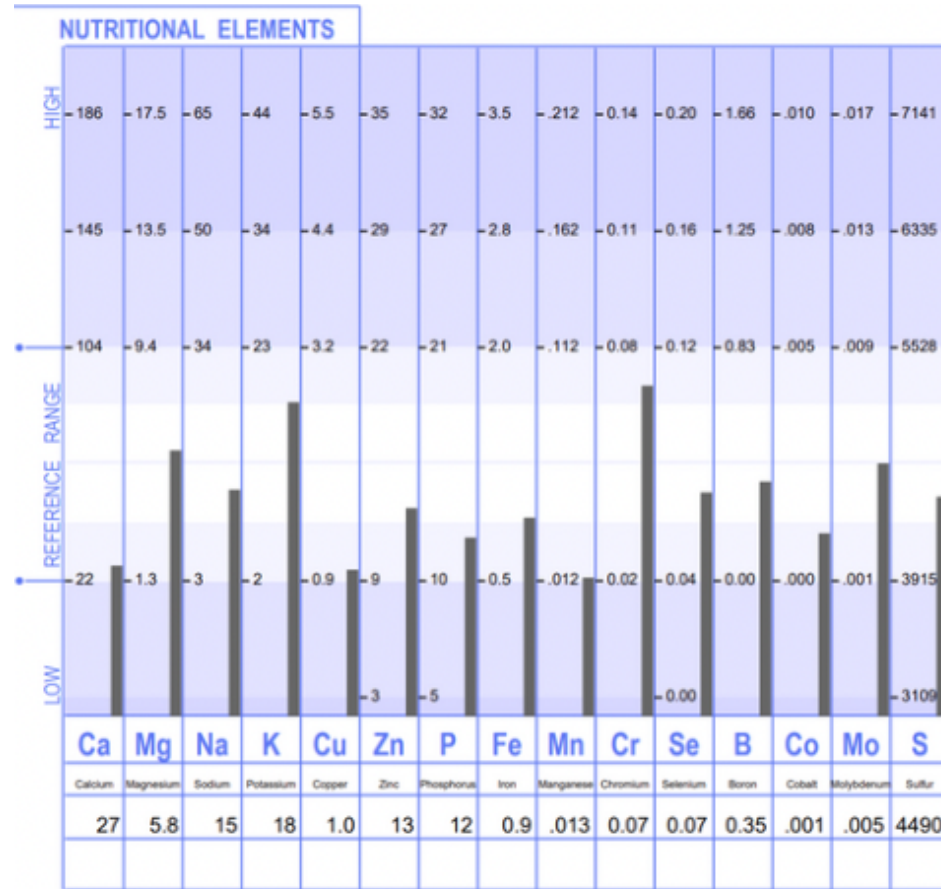
- Celtic Sea Salt
- Redmond's Real Salt
- Crucial Four Salt
- Baja Gold Salt

K

## POTASSIUM

- Potassium Glycinate
- Potassium Gluconate
- Potassium Carbonate
- Potassium Citrate

# Mineral balancing supports life.



## Any questions?

Where to find me:

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