

# The Devil in the Garlic: Sulfate, Toxins, and the Low Sulfur Diet

A case of adaptation gone too far, and an exploration of therapeutic  
strategies

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# Scope of the Sulfate Demand

- Average adult female has ~2.5g of iron in body\*
  - Male has 2.5-3.5g\*\*
- Average adult has 140g sulfur
  - Sulfur is ~0.3% of adult body mass\*\*\*

\* Iron regulates mRNA translation initiation through RNA iron responsive element (IRE)  
Ma, Jia. City University of New York. ProQuest Dissertations Publishing, 2014. 3612456.

\*\* Ropele, Stefan, and Christian Langkammer. "Iron quantification with susceptibility." *NMR in Biomedicine* 30.4 (2017): e3534.

\*\*\* Hewlings, Susan, and Douglas Kalman. "Sulfur in human health." *EC Nutrition* 14.9 (2019): 785-791.

# Job Description

- Heparan sulfate glycosaminoglycans
- Heparan sulfate proteoglycans
- Liver sulfation
- Inflammatory response
- Blood pressure regulation
- Beta-cell protection\*
  - Taniguchi, S., & Niki, I. (2011). Significance of hydrogen sulfide production in the pancreatic  $\beta$ -cell. *Journal of pharmacological sciences*, 1104200557-1104200557.
- Glucose utilization
- Mucin production



# A lesser known and gigantically important role:

- Sulfate supplies much of the negative charge for formation of structured water in the body
- Loss of water structure leads to profound cellular and systemic consequences
  - “Sulfate’s Critical Role for Maintaining Exclusion Zone Water: Dietary Factors Leading to Deficiencies” 10.14294/WATER.2019.5



What If The Supply Runs Low?

Why Would Supply Run Low?



# Last things first: Why

- Genetics (polymorphisms in CBS, CTH/CSE, PAPSS1, TXNRD2, SUOX, and surely many others)
- Dietary (lack of enzyme cofactors such as molybdenum, magnesium, glutathione, vitamin B12, vitamin B6, and many others)
- **Toxicant** (glyphosate, heavy metals, organophosphates, organochlorides, and many others)



# Cationic lipid nanoparticles (CLNs): the new toxicant on the block

- CLNs initiate inflammatory cascades\*
- They are drawn to the negative charge at cell surfaces\*\*
- They bind heparan sulfate\*\*\*
- This will alter local charge and erode the EZ water in that area, potentially causing severe disruption of ion transport at the cell surface\*\*\*\*

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- \* Lonez, C., Vandenbranden, M., & Ruyschaert, J. M. (2012). Cationic lipids activate intracellular signaling pathways. *Advanced drug delivery reviews*, 64(15), 1749-1758.
  - \*\*Henriksen-Lacey, M., Christensen, D., Bramwell, V. W., Lindenstrøm, T., Agger, E. M., Andersen, P., & Perrie, Y. (2010). Liposomal cationic charge and antigen adsorption are important properties for the efficient deposition of antigen at the injection site and ability of the vaccine to induce a CMI response. *Journal of controlled release*, 145(2), 102-108.
  - \*\*\*Gordon, R. E., Nemeth, J. F., Singh, S., Lingham, R. B., & Grewal, I. S. (2021). Harnessing SLE autoantibodies for intracellular delivery of biologic therapeutics. *Trends in Biotechnology*, 39(3), 298-310.; Kalra, R. S., & Kandimalla, R. (2021). Engaging the spikes: heparan sulfate facilitates SARS-CoV-2 spike protein binding to ACE2 and potentiates viral infection. *Signal Transduction and Targeted Therapy*, 6(1), 1-2.
  - \*\*\*\* Pereira Jr, A. (2016). The Complex Dynamics of Cations with Water and Proteins in Neuro-Astroglial Interactions. *Lugano–Switzerland*, 10, 2016.; Henriksen-Lacey, M., Christensen, D., Bramwell, V. W., Lindenstrøm, T., Agger, E. M., Andersen, P., & Perrie, Y. (2010). Liposomal cationic charge and antigen adsorption are important properties for the efficient deposition of antigen at the injection site and ability of the vaccine to induce a CMI response. *Journal of controlled release*, 145(2), 102-108.



# Sulfur dysregulation is a sign of the times!

- Depleted soil
- Excess dietary sulfur due to year-round/non-seasonal vegetable supply
- Universal exposure to glyphosate and all the rest



# Our Belief: Our Body Compensates In Important Ways

- Bodies must have a way of generating sulfate if the normal pathways aren't open
- The “work arounds” our body utilizes cause symptoms, but are essential
- Simply killing off the bugs won't work as a lasting solution



# What if: Backup Plans

- Plan A: Sulfomucin production (acute need)
- Plan B: Sulfur-fixing bacteria (“pre-chronic” need)
- Plan C: Chronic inflammation (chronic need)
- Plan D: Cancer? (extreme local and/or systemic need)



# Sulfomucins

- Ask: Bloating even when you haven't eaten for a long time?
- Bacterial mucinase
  - *E.coli*, *Akkermansia muciniphila*, *Bacteroides thetaiotaomicron*, *Bifidobacterium bifidum*
- Inhibit with fenugreek seed powder, oregano, ginger



# Sulfur-fixing Bacteria: The Crux of the Problem/Solution

Helicobacter pylori	Enterobacter spp.
Desulfovibrio spp.	Bilophila wadsworthia
Campylobacter jejuni	Staphylococcus aureus
Escherichia coli	Streptococcus anginosus
Clostridium spp.	Klebsiella spp.



# Chronic inflammation

- An inflammatory environment is needed to generate sulfate from  $\text{SO}_2$
- This is proposed to happen in gout, encephalitis, IBD, and other inflammatory diseases



# Cancer

- Tumors are factories cranking out sulfur compounds that the body can turn into sulfate
- Incidental stage I and II tumors may be supplying local sulfate deficits



# Therapeutic goals:

- Reduce sulfur and support its metabolism
- Bring in sulfate
- Enhance negative charge
- Hydrate
- Deal with autonomic issues!



# Home therapies

- Epsom salt baths
- Supplements
  - Molybdenum, butyrate, IONbiome, IgG, GSH?, etc.
- Grounding
- Tepid showers
- Castor oil
- SSP, DNRS, Vagus nerve exercises



# The Key Therapy:

- Low Sulfur Diet
  - Reduce the input
  - Increase the outflow



# Overview of the Diet

- This is both diagnostic and detoxifying
- Eliminate acutely reactive sulfur foods
  - There are dozens of sulfur compounds in any given food
- Reducing total sulfur load
- Two weeks, give or take, then re-introductions



# Be Prepared

- The “Sulfur Dump”

- Things can get worse before they get better
- Usually starts and ends within the first 5 days



# Record Symptom Picture, Pre and Post

- Skin, brain fog, guts, sweats, fatigue, headaches, heart arrhythmias or palpitations, and everything else



# Primary Eliminations

- ▶ Alliums, Brassica/Cruciferous, mustard greens, legumes, dairy and animal products
- ▶ Coffee, alcohol, fermented foods and drinks
- ▶ Foods with sulfur dioxide residue: frozen potatoes, dried coconut, dried fruit, grapes, corn husks (for tamales)
- ▶ Lemon/lime juice concentrates



# Common Mistakes, Recurring Questions

- Not reading labels
- What substitutions?
- Can I have...?
- Why does this other diet allow/not allow...?



# More Comments and Questions

- I thought these foods were good for me?
- Will I ever be able to eat ... again?
- If I make a mistake do I have to start over?



# Ending the Process

- Re-introductions are the gold
- Distinguish acute from non-acute sensitivities
- Diets should be as healthy and varied as possible
- Reintroduction schedule varies but generally includes: garlic, onion, kale, egg, cabbage, broccoli, cauliflower



Thank You!