

# DISCLAIMER

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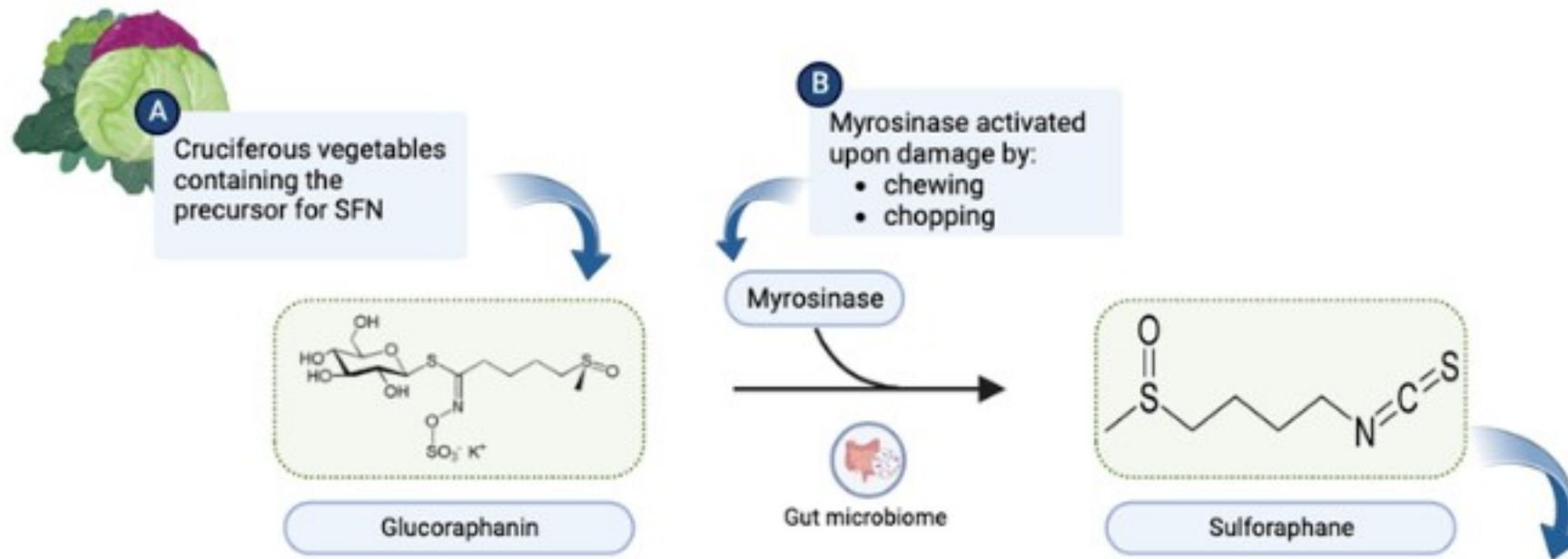
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# **SULFORAPHANE**

## **& its impact on EPIGENETIC expression**



# SULFORAPHANE – WHAT IS IT & WHERE DOES IT COME FROM?



When the plant is cut or chewed, the inactive precursor glucoraphanin in the plant mixes with the myrosinase in the plant. The result is the phytochemical compound sulforaphane. Myrosinase is also found in the gut, but how much you have and how effective it is in making the conversion to sulforaphane varies widely. (Otoo & Allen, 2023; Sikorska-Zimny & Beneduce, 2021).

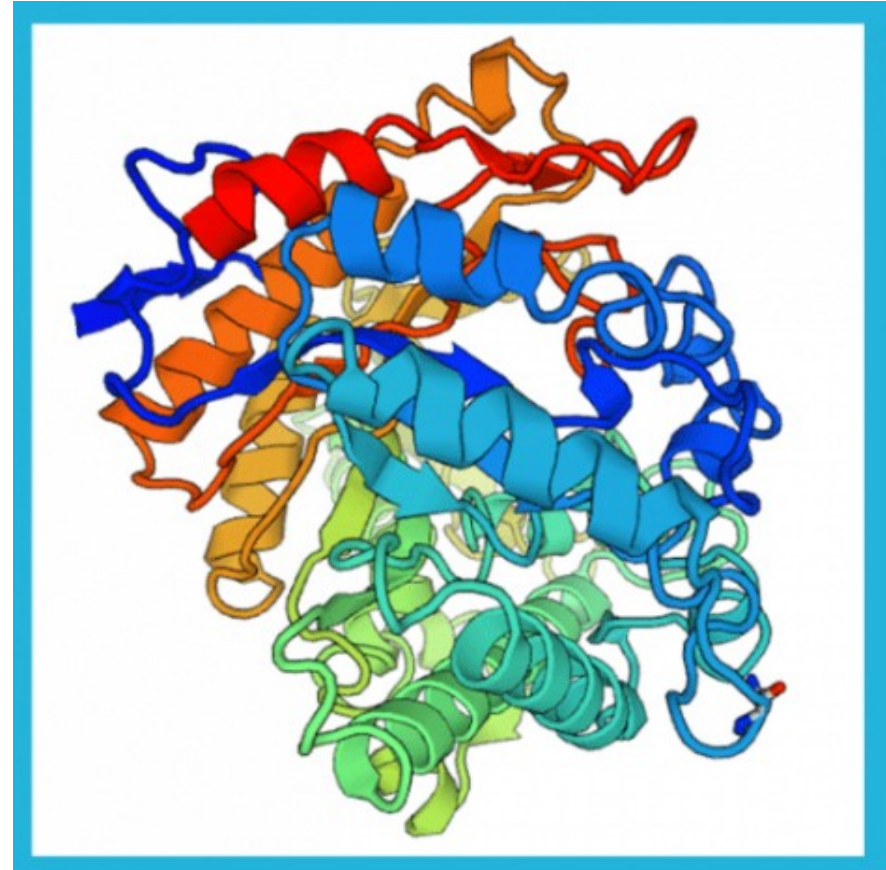
# SULFORAPHANE through food

- According to the Linus Pauling institute, glucosinolate is found at these amounts in the following raw cruciferous vegetables:
  - Kale (1 cup chopped = 67 g)
  - Turnip ( ½ cup cubes = 65 g)
  - Cauliflower (1/2 cup = 45 g)
  - Cabbage, savoy or red (1/2 cup = 45 g)
  - Brussel sprouts (1/2 cup = 44 g)
  - Broccoli ( ½ cup = 44 g)
  - bok choy (1/2 cup chopped = 35 g)
- Glucosinolate or glucaraphanins are not the same as sulforaphane!!!!
- How much sulforaphane do you need? Can vary widely, but the average person – 20 mg (Yagishita, 3x4 genetics sulforaphane tool).
- According to 3x4 Nutrigenomic experts (sulforaphane tool), the highest food containing glucaraphanin content necessary for a therapeutic 20 mg sulforaphane yield is contained in -
  - broccoli sprouts 3 ounces or one cup
  - mature broccoli 2.6 lbs or 1.2 kg.
  - 1 lb of broccoli of raw florets = 6 cups, so you would need over 15 cups of broccoli to reach the therapeutic dose; cooked 3 cups or 7.5 cups.
  - According to Gregor, it is best to chop your crucifers and let them 'sit' for 40 min prior to consumption to allow sulforaphane to form.



# HOW TO MAKE UP FOR MYROSINASE loss?

- KEY POINT: One cup of broccoli sprouts or 2.6 pounds of broccoli have the **POTENTIAL** to yield 20 mg of sulforaphane. **HOWEVER**, these quantities are dependent on the **SOURCE** and **QUALITY** of the vegetable **AND** the availability of **MYROSINASE** within the plant and within the gut. (Sikorska-Zimny & Benduce, 2021).
- To preserve myrosinase enzyme activity as much as possible, cook by steaming for 1-2 minutes at temps no greater than 248 degrees Fahrenheit. Avoid boiling or microwaving. (Coyle, 2019).
- ½-1 tsp of ground mustard seeds, which naturally contain myrosinase, can be used to activate the glucaraphanin in cruciferous vegetables to produce sulforaphane. (Ghawi Methven, & Niranjana, 2013; Gregor, 2016).



# FOOD vs. SUPPLEMENTS

- CONSIDER: **FOOD SOURCES** MAY NOT CONTAIN THERAPEUTIC LEVELS OF sulforaphane, even if you eat enough of those foods.
- CONSIDER: **SUPPLEMENT SOURCES** may only contain the glucaraphanin precursor and **DO NOT ACTUALLY CONTAIN MYROSINASE!** For example, if your supplement only says broccoli sprout extract, it does **NOT** have myrosinase.
- It is important to choose a supplement that yields 20 mg of sulforaphane. To begin, start slow and work up to the full dose gradually
- The top 3 most reliable sources of supplementation include the following choices:
  - Cell Logic (food form)
  - Mara Labs BrocElite (lab-stabilized form)
  - Xymogen Oncoplex Plus Myrosinase
- Sources: G.E.M.M. Clinician Implementation Training Manual, Maralabs.com, Xymogen.com



# DOSING CHALLENGES

- Sulforaphane enhances your body's ability to detoxify and balance oxidative stress on the cellular level. Until your body is accustomed to these changes, the slight symptoms of discomfort may be experienced, including but not limited to headache, fatigue, rashes, or GI disturbance. If symptoms worsen, stop taking the sulforaphane until you feel back to baseline and re-introduce gradually.
- Once you have taken sulforaphane for approximately 1 month with consistency, you can reduce your dosage to one 20 mg dose every 48-72 hours. The protective benefits will begin to drop after a maximum of 72 hours and you must take another dose.
- DO NOT take sulforaphane with NAC, glutathione, and synthetic antioxidant vitamins such as A/E/C in greater than dietary amounts. At the very least take them ~15 hours apart from each other. Sulforaphane is a mild oxidant, so antioxidants cancel out its positive effects. (G.E.M.M. Protocol, Clinician's Implementation Guide).

Source: 3x4 Genetics Mentorship Sessions & G.E.M.M. Protocol, Clinician's Implementation Guide.

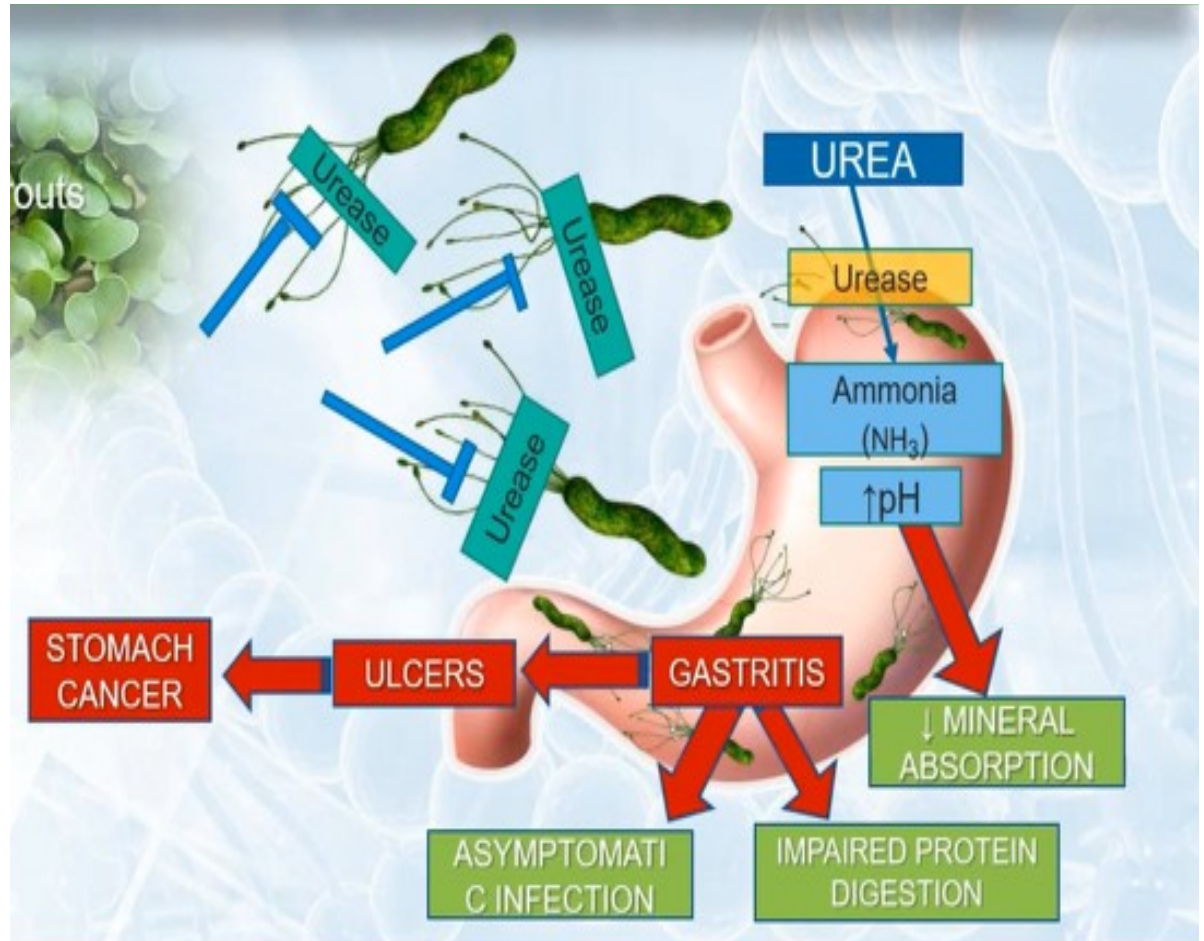
# MEDICAL CONSIDERATIONS & POSSIBLE CONTRAINDICATIONS

- Fully disclose the use of sulforaphane supplements when undergoing cancer treatments such as chemotherapy or radiation bc it can impact treatment (Sailo, Liu... 2024).
- Use caution when combining certain medications with sulforaphane bc it may decrease the liver's ability to metabolize them, or it may increase the response and side effects to that medication. Refer to this link for details and names of medications: [rxlis.t.com/supplements/sulforaphane.htm](https://rxlis.t.com/supplements/sulforaphane.htm)
- Cruciferous vegetables as goitrogenic (Bjarnadottir, 2023).
- Clotting implications related to the high Vit K content of crucifers, particularly if your client is on blood thinning medications or has genetic clotting issues, such as Factor V Leiden, etc. (Bjarnadottir, 2023).



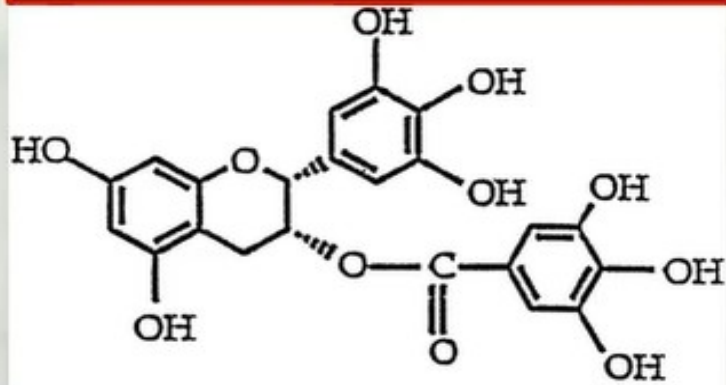
# Gastrointestinal Considerations

- Sulforaphane helps destroy urease positive microbes such as H pylori infection.
- H pylori makes urease.
- Urease converts urea to ammonia.
- Ammonia reduces stomach acid and impacts nutrient absorption and gut health is impaired by further proliferation.
- Sulforaphane is ultimately beneficial, but the initial inflammation from die off may produce discomfort.
- Source: The G.E.M.M protocol, Clinician's Implementation Guide



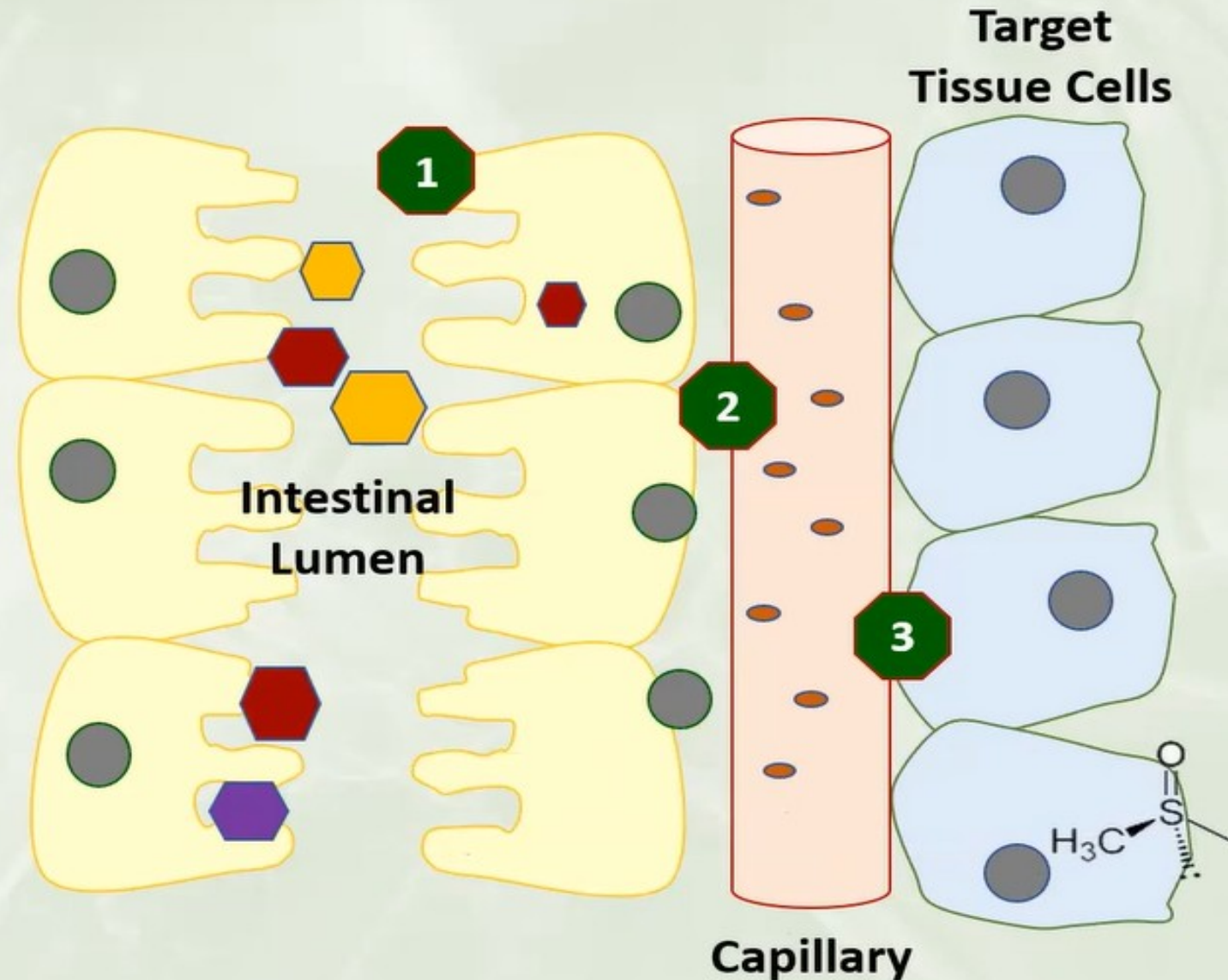
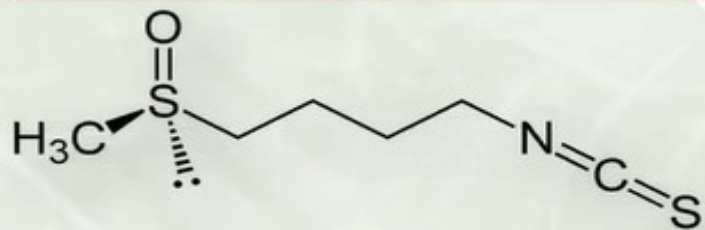
# Barriers to Bioavailability

Bulky Molecular Polyphenol  
Structure of EGCG - Green Tea

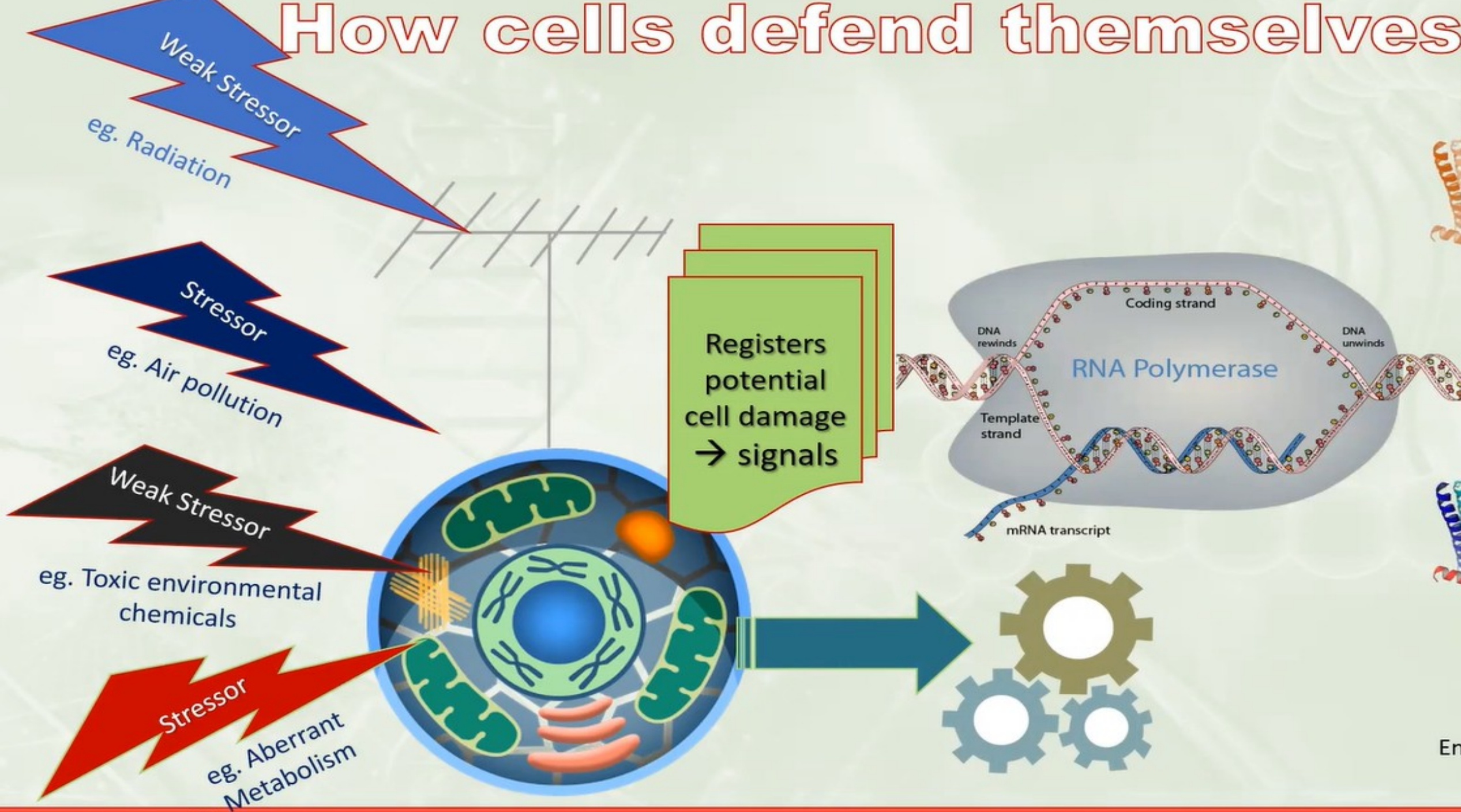


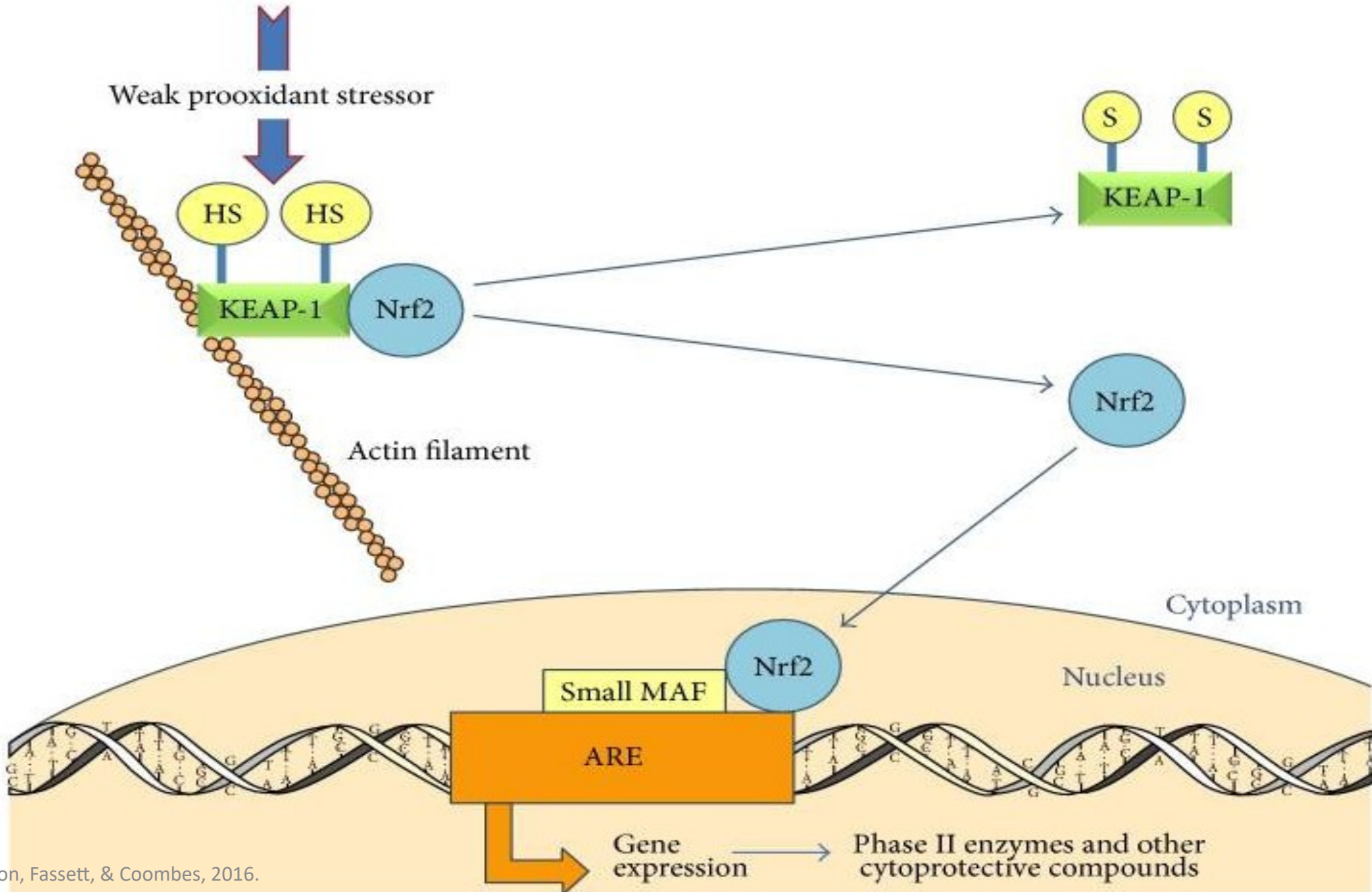
(-)-Epigallocatechin-3-gallate

Lipophilic 'Slim' Molecule  
Sulforaphane

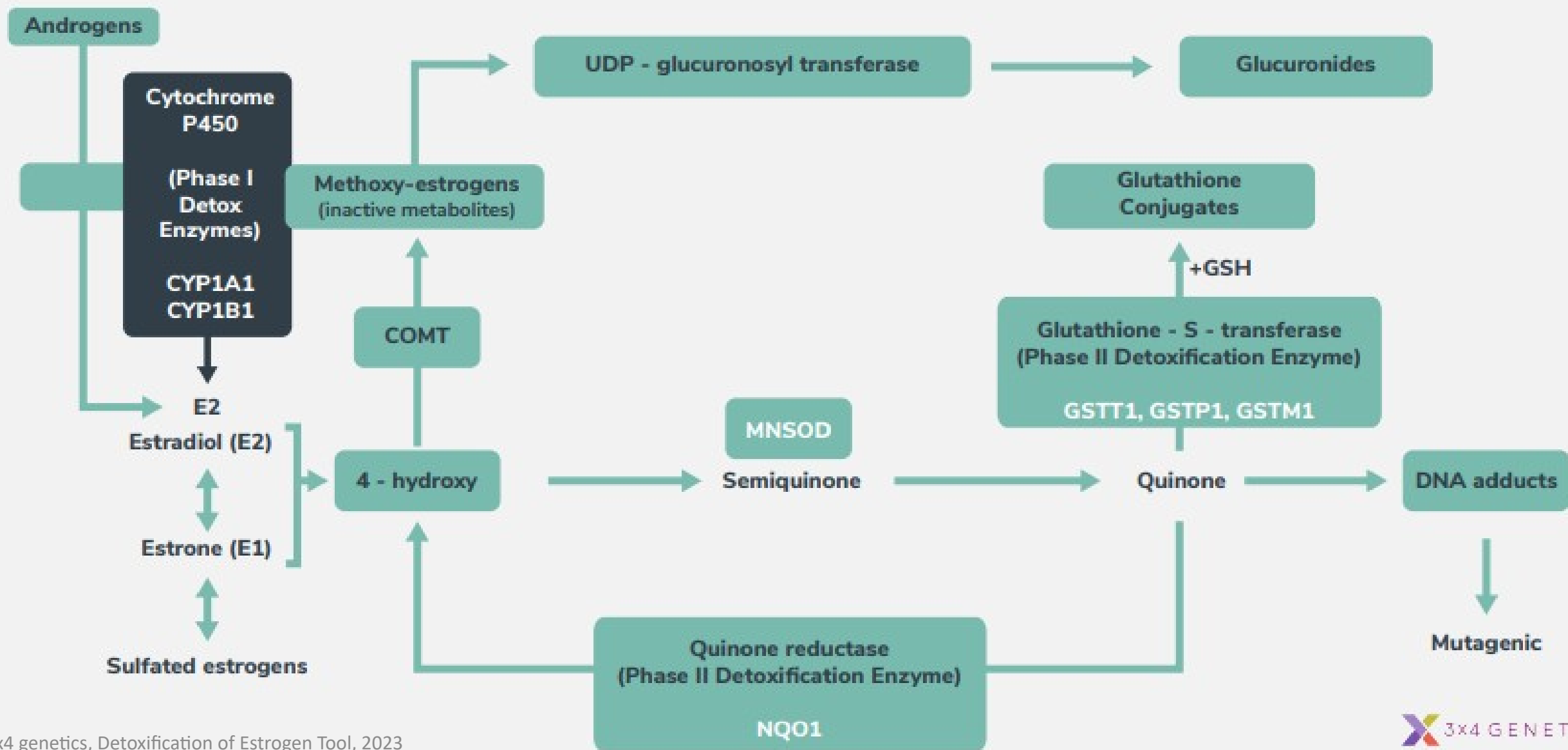


# How cells defend themselves

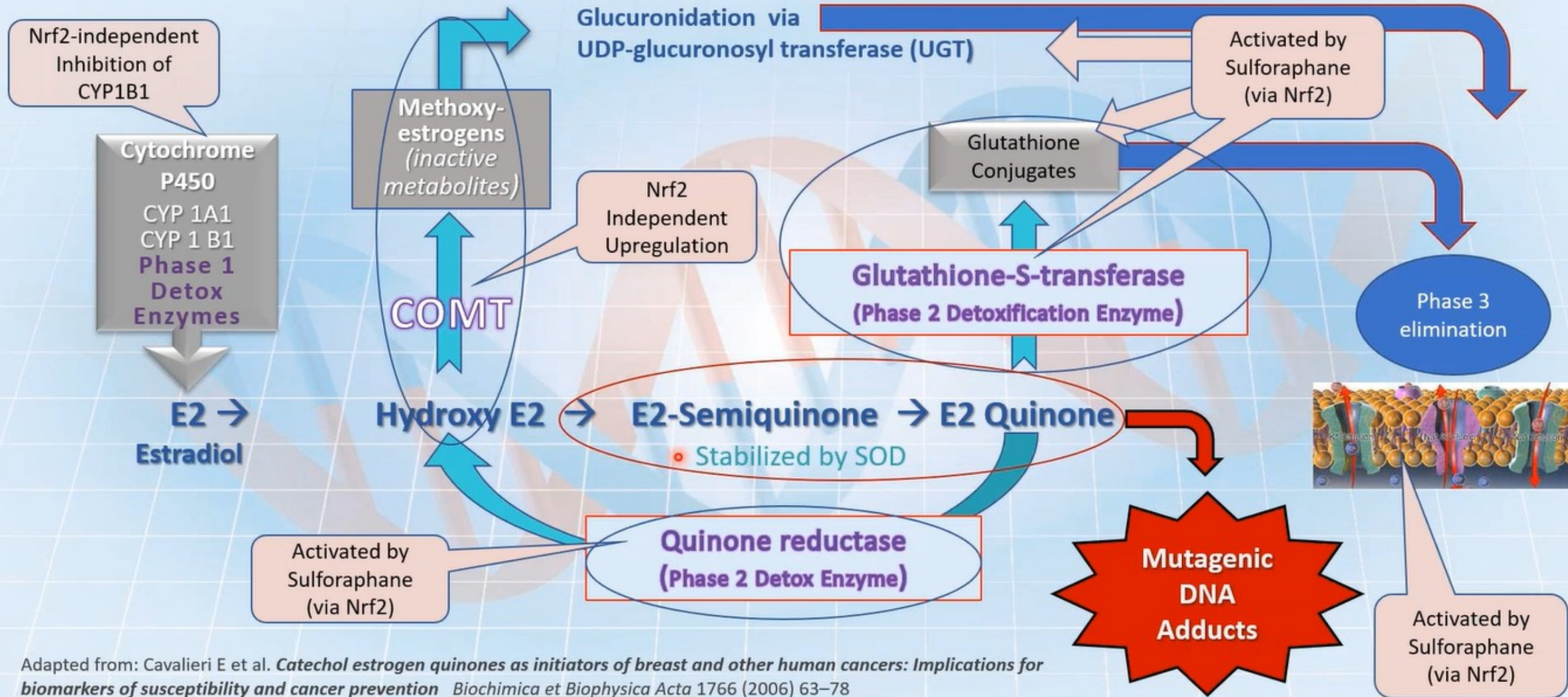




# Detoxification of Estrogen



# Sulforaphane – Unsurpassed in Phase 2 Detoxification



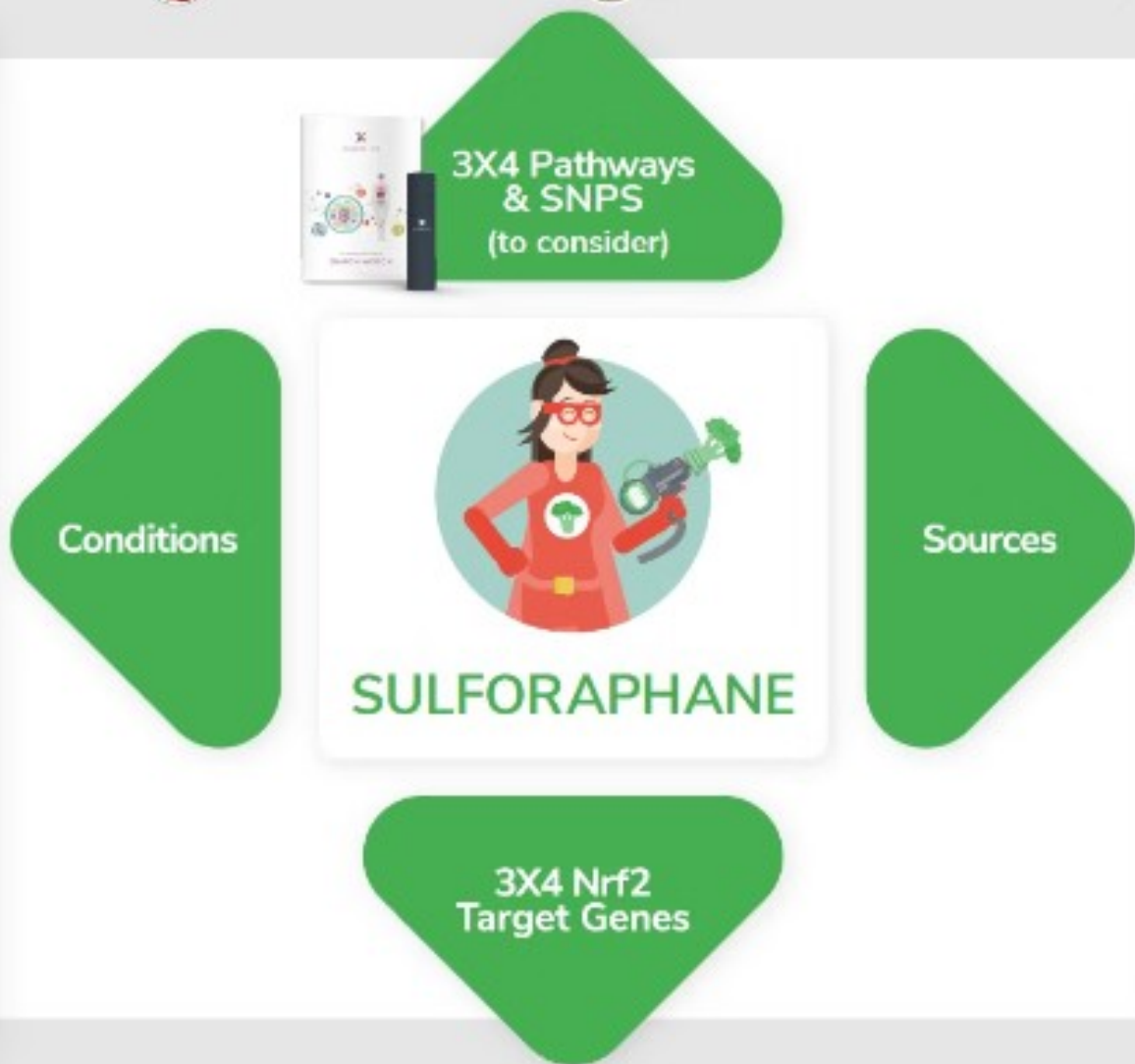
Adapted from: Cavalieri E et al. *Catechol estrogen quinones as initiators of breast and other human cancers: Implications for biomarkers of susceptibility and cancer prevention* *Biochimica et Biophysica Acta* 1766 (2006) 63–78

# CONCLUSION

- Sulforaphane is a potent polyphenol found in crucifers, particularly broccoli sprouts and broccoli.
- 20 mg of sulforaphane yield is the average therapeutic value to activate cellular defences through NrF2.
- Research has shown that sulforaphane has the potential to support epigenetic expression by turning up the “good” genes and turning down the “bad” genes that play a role in numerous conditions, including allergies, autism, cancer prevention, covid, viral infections, diabetes, metabolic syndrome, hormone imbalance, prostate dx, neurodegeneration, and aging (3x4 genetics, Sulforaphane Tool). The final three slides are just for your own reference. They are tools on dosing from 3x4 genetics and GEMM Clinician Implementation Tools (used with their permission).

### CONDITIONS SHOWN TO BENEFIT FROM SULFORAPHANE

- Allergy
- Autism
- Cancer Prevention
- COVID / Viral Infections
- Detoxification
- Diabetes / Metabolic Syndrome
- Gut
- H. Pylori
- Lung disease / Asthma
- Neurodegeneration + Aging
- Prostate



### DOSE RESPONSE 20 - 40mg

- Broccoli Sprouts - 3oz / 1 cup\*
- Broccoli - 2.6lb / 1.2kg estimate\*  
(has the potential to yield around 20mg of sulforaphane)

\*These quantities are dependent on the source and quality of sprouts and availability of myrosinase. Myrosinase may be inhibited by compounds within the plant and by cooking.

- Capsules or Powder  
1% Sulforaphane yield means if a capsule contains 700mg of broccoli sprout powder it will yield 7mg of Sulforaphane; 1 gram of powder will yield 10 mg of Sulforaphane
- It's important that it is myrosinase activated

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