

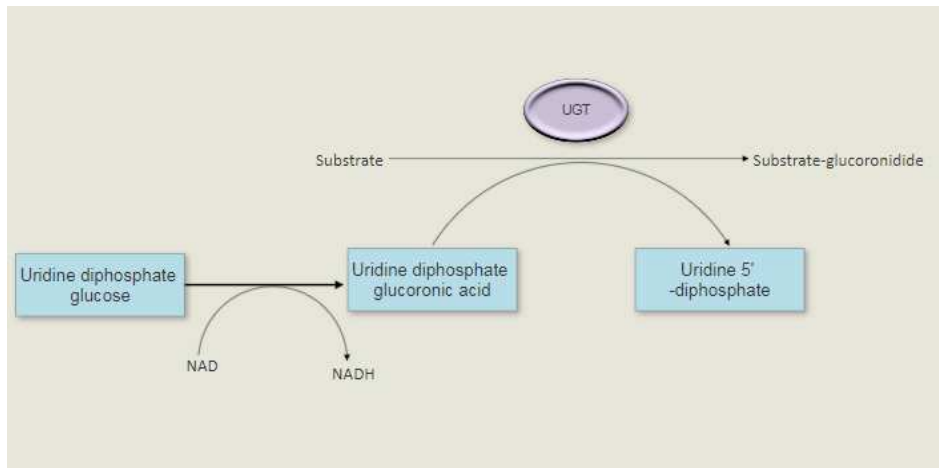
Glucuronidation is one of the most important Phase II detoxification pathways, and also one that is frequently overlooked and underestimated.

**Glucuronidation is central to the metabolism of numerous substances including:**

- Most medications
- Polychlorinated biphenyls
- Nitrosamines
- Heterocyclic amines
- Mycotoxins
- Androgens and estrogens
- Thyroid hormones T3, T4, Reverse T3
- Mineralocorticoids and glucocorticoids
- Oxidized fatty acids
- Prostaglandins B1 and E2
- Salicylates
- Serotonin
- Melatonin
- Vitamins A, D, E, K, Retinoids
- Bile Acid
- Bilirubin

The process of Glucuronidation is a catalytic reaction by the superfamily of enzymes uridine 5'diphospho (UDP)-glucuronosyltransferases, also called UGTs, located in the endoplasmic reticulum.<sup>8</sup> Most UGT expression occurs in humans in the liver, however, some expression also occurs in the brain, nasal tissue, kidneys, stomach, colon, small intestine, epithelium, lungs, adrenals, ovaries, mammary glands, testes, and prostate.<sup>1,9-13</sup>

The UGT enzymes catalyze the transfer of glucuronic acid, a sugar, to a hydrophobic molecule in order to make the molecule more water soluble for excretion through the urine and through the feces via bile conjugation.<sup>14</sup> There are 19 different human UGTs, with two subfamilies, UGT1 based upon structural and amino acid sequence homology, UGT1s and UGT2s.<sup>1</sup>



A mutation in the UGT1A1 gene may presents with elevated bilirubin<sup>15</sup> and possible other downstream effects due to decreased UGT1A1 glucuronidation activity.

Glucuronidation support is crucial for Phase II detoxification of mycotoxins, biotoxins, medications, many pollutants, salicylates and hormones. Supporting Glucuronidation is also necessary for healthy breakdown of fat soluble vitamins, fatty acids, bile, serotonin, melatonin, and bilirubin.

**Glucuronidation Assist Formula includes:**

- **Calcium D-Glucarate** may increase glucuronidation and reduce beta-glucuronidase.<sup>16</sup> Low levels of D-glucaric acid have been associated with elevated beta-glucuronidase,<sup>17</sup> which is correlated with an increased risk for certain hormone-dependent cancers.<sup>18,19</sup> Calcium D-Glucarate may reduce cancer cell proliferation and inflammation while supporting apoptosis,<sup>20</sup> as well as support elimination of carcinogens and tumor promoters via glucuronidation.<sup>19,21</sup> D-glucaric acid may increase enterohepatic circulation and lower total serum cholesterol.<sup>22</sup> D-glucaric acid is naturally found in many cruciferous vegetables and fruits.<sup>22</sup>
- **Dandelion Root Extract** may increase UGT enzyme activity involved in Phase II glucuronidation.<sup>23</sup> Dandelion root polysaccharides may have potent antioxidant and hepatoprotective effects via upregulation of Nrf2, NQO1 and HO-1, and downregulation of Keap1.<sup>24,25</sup> NRF2 is a potent signaling molecule of the glucuronidation UGT enzymes.<sup>26,27</sup> In addition to glucuronidation support, dandelion root may also support additional hepatic antioxidant activities by increasing enzyme activity of catalase, glutathione-S-transferase, glutathione peroxidase, glutathione reductase, and glutathione.<sup>28</sup>

Supplement Facts		
Serving Size 3 Capsules		
Servings Per Container 30		
	Amount Per Serving	%DV
Calcium D-Glucarate	500 mg	50%
Dandelion Root Extract	250 mg	*
Pterostibene	50 mg	*
Ellagic Acid	200 mg	*
Rosemary Dry	100 mg	*
Astaxanthin	2 mg	*

\* Daily Value not established.

Other ingredients: Micro Crystalline Cellulose (USP), Vegetable Capsule (cellulose, purified water).  
No artificial colors, artificial flavors, milk or milk derivatives or sodium added.

- **Ellagic Extract 90%** is a natural phenol antioxidant derived from fruits and vegetables. Ellagic acid may increase UGT enzyme activity involved in Phase II glucuronidation, as well as supporting other Phase II enzymes.<sup>29,30</sup> Ellagic acid also has chemo-preventative properties.<sup>27,31</sup> NRF2 is a potent signaling molecule of the glucuronidation UGT enzymes,<sup>26</sup> and ellagic acid may modulate NRF2 activity.<sup>32</sup>
- **Rosemary Dry Extract** may induce glucuronidation via the UGT enzymes, and UGT1A6 in particular,<sup>33,34</sup> and may modulate both Phase I and other Phase II enzyme activities.<sup>34</sup> Rosemary may induce NRF2 signaling<sup>35,36</sup> which is involved in modulating glucuronidation activity.<sup>27,31</sup>
- **Astaxanthin** may be an inducer of the UGT glucuronidation enzymes.<sup>37</sup> Multiple studies show Astaxanthin also induces NRF2 activity<sup>38,39</sup> as well as upregulates antioxidant molecules Superoxide Dismutase, NADPH, NQO1, and Heme Oxygenase.<sup>40</sup>
- **Pterostilbene** may increase glucuronidation activity, particularly via UGT1A1 and UGT1A3, with some increased action of UGT1A8, UGT1A9 and UGT1A10 as well.<sup>41</sup> Pterostilbene may be even more effective than Resveratrol in activating the NRF2 pathway,<sup>42</sup> which is involved in glucuronidation modulation.<sup>42</sup> Pterostilbene may also have substantial anti-inflammatory properties and may decrease cancer cell proliferative activity.<sup>43</sup>

This product has not been designed to treat any disease and has not been approved by the FDA. Its goal is to support healthy function.

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