



designs for health®

## **BROCCOPROTECT™**

A SYNERGISTIC BROCCOLI BLEND

90 VEGETARIAN CAPSULES | NPN80056431 | BPT090-CN

**BroccoProtect™** is an optimized blend of broccoli seed extract and broccoli sprout concentrate, providing sulforaphane glucosinolate and the naturally-occurring myrosinase enzyme for maximal conversion to sulforaphane. It is designed to help support detoxification, antioxidant capacity and cellular health.

### **BroccoProtect™ features:**

- **Broccoli Seed Extract** – standardized to 6% sulforaphane glucosinolate (SGS); grown in North America and processed with supercritical fluid extraction, leaving no solvent residue in the finished product
- **Broccoli Sprout Concentrate** – containing the naturally-occurring myrosinase enzyme which converts SGS to sulforaphane during digestion
- **Delayed Release Capsule** – ensures interaction between SGS and myrosinase in the alkaline environment of the intestines, maximizing SGS conversion to sulforaphane and avoiding conversion to nitriles, which is favored in acidic environments.<sup>37</sup>

### **Benefits of sulforaphane (SFN), a derivative of sulforaphane glucosinolate**

- **Supports detoxification:** SFN upregulates phase II P450 enzymes, enhancing detoxification of unsafe compounds.<sup>1,30-32,38</sup> It is important for phase II detoxification to keep up with the rate of phase I reactions because intermediates produced by phase I may be more harmful than their original forms.
- **Promotes healthy cellular function:** SFN upregulates antioxidant defenses in normal cells but may increase oxidative stress in abnormal cells.<sup>19</sup> It's been shown to potentially help cancer cell proliferation and migration in several types of cancer, through multiple mechanisms.<sup>6,7,10,11,13,14,19,20,21,24</sup>
- **Supports healthy hormone levels:** SFN facilitates transformation and elimination of estrogen metabolites via stimulation of the enzymes glutathione S-transferase and quinone reductase, which convert estrogen quinones into safer metabolites.<sup>1</sup>
- **Supports normal immune function:** SFN was shown in an animal model to upregulate Th1 response, partially mitigating age-related decline in innate immune activity.<sup>4</sup>
- **May help support vascular health:** Animal and cell culture studies suggest SFN may reduce oxidation of LDL, decrease formation of advanced glycation end products (AGEs), and reduce AGE-induced inflammation in endothelial cells and the aorta.<sup>22,23,25</sup>

### **Purpose of SGS supplements and their sulforaphane potential**

The consumption of raw cruciferous vegetables in the US was estimated at two servings/week,<sup>42</sup> with an average US intake of glucosinolates at approximately 13 mg/day.<sup>41,42</sup> Based on epidemiological evidence, this level of intake is not adequate to derive maximal benefits from their active metabolites, isothiocyanates. One example of a well-researched isothiocyanate is sulforaphane. Results from studies that investigated the effects of supplementation with SGS (broccoli extracts) or preformed sulforaphane showed improvement of many aspects of physiology. Sulforaphane supplements that effectively deliver therapeutic levels are not available; formulas containing SGS plus myrosinase can be used instead to support significant sulforaphane formation and absorption in the body.<sup>16,40</sup>

### **Myrosinase increases bioavailability of SGS and other glucosinolates from co-ingested cruciferous vegetables**

There are numerous human, animal and cellular studies showing that diets rich in cruciferous vegetables (e.g., broccoli, cabbage, kale, radishes, watercress, mustard greens) promote a wide range of health benefits owing to specific active ingredients such as glucosinolates, which include sulforaphane glucosinolate. These have been recognized as some of the most potent in affecting health outcomes.<sup>1,17,24,29</sup>

The conversion of glucosinolates to isothiocyanates is catalyzed by myrosinase contained in raw cruciferous plants.<sup>15</sup> Juicing or chopping/chewing of raw cruciferous vegetables brings myrosinase in contact with glucosinolates, enabling their conversion to isothiocyanates,<sup>30</sup> which share many of the benefits of sulforaphane.

Unfortunately, cooking and other processing of cruciferous plants may inactivate the naturally occurring myrosinase, depending on the temperature applied and its duration.<sup>40</sup> Thus, the glucosinolate content of processed/cooked foods must be converted to isothiocyanates with the aid of myrosinase produced by intestinal bacteria. This conversion occurs at a much lower rate—1.2%-7.3% in cooked foods as compared to 77% in raw foods.<sup>30</sup> Thus, lack of myrosinase may reduce bioavailability of glucosinolates from cooked cruciferous foods by as much as 10-64 times. Supplementation with BroccoProtect™ can provide enough myrosinase for both the SGS in the supplement, and also for the glucosinolates contained in the co-ingested cruciferous vegetables, to support their conversion to sulforaphane and isothiocyanates.

Glucosinolates derived from diets high in cruciferous vegetables can add up to beneficial levels of intake, but one would have to consume approximately three cups of raw broccoli or similar amounts of other cruciferous vegetables per day in order to support formation of approximately 100 µM of sulforaphane and/or other isothiocyanates.<sup>32,37-39</sup> Thus, a more practical approach for deriving a consistent intake of glucosinolates with active myrosinase is to use a combination of sources: a diet rich cruciferous vegetables along with BroccoProtect™.

**The SGS content of one capsule of BroccoProtect™ is 32 mg (73.4 µM), similar to that provided by 50 g of fresh raw broccoli (about 1/2 - 3/4 cup),<sup>43</sup> while also providing a comparable amount of myrosinase.** Table 1 illustrates the metabolic steps and calculation of the sulforaphane produced (“SFN potential”) from ingesting one capsule of BroccoProtect™ in comparison with a supplement containing SGS without myrosinase. Therapeutic levels of sulforaphane have been reported in the range of 100 µM and above,<sup>32,37-39</sup> which may be delivered by a minimum of 2 capsules of BroccoProtect™ per day, ideally 12 hours apart, for sustained activity.

**HIGHLIGHTS:**

- Approximately 8X higher sulforaphane potential compared to SGS formulas without myrosinase (see calculations in Table 1)
- Higher sulforaphane potential compared to other formulas on the market containing SGS with insufficient myrosinase
- Does not contain significant amounts of goitrogens (affecting thyroid function), unlike large servings of cruciferous vegetables
- May be considered for use in conjunction with blood thinners when appropriate due to low vitamin K content per capsule (0.6mcg K1), unlike the substantial amounts in cruciferous vegetables

**Synergistic combinations with additional DFH formulations:**

- For added phytonutrients from fruit and vegetables: PaleoGreens™, PaleoReds™
- For detoxification support: Amino-D-Tox™, Detox Antiox™, VegeCleanse™

SGS Supplement	Upper GI Events	Lower GI Events	SFN Potential
<b>BroccoProtect™: 32 mg SGS plus 4 EU MYR (32 mg SGS= 73.4 µM)</b>	<b>MYR (from supplement) catalyzes SGS to SFN conversion at an approximate rate of 80% (70%-90%<sup>17</sup>)</b>	MYR (from GI bacteria) is not needed since the 4 enzyme units of MYR support maximized conversion of SGS to SFN in the upper GI	<b>approx. 10.4 mg (58.7 µM*)</b>
A supplement with 32 mg SGS and no MYR	A portion of SGS is likely absorbed in the blood unchanged, which reduces the total amount available for conversion to SFN in the lower GI	<b>MYR (from GI bacteria) catalyzes SGS to SFN conversion at an approximate rate of 10% (11.5%<sup>16</sup>, 9.4%<sup>17</sup>)</b>	<b>Approx. 1.3 mg (7.3 µM **)</b>

SGS: sulforaphane glucosinolate; MYR: myrosinase; SFN: sulforaphane

\* A conversion rate of 80% of 73.4 µM SGS = 58.7 µM SGS. This converts to 58.7 µM SFN = 10.4 mg SFN.  
 \*\*A conversion rate of 10% of 73.4 µM SGS = 7.34 µM SGS. This converts to 7.34 µM SFN = 1.3 mg SFN.  
 molecular weight of SGS = 436 µg/µM. molecular weight of SFN = 177.3 µg/µM  
 SGS: sulforaphane glucosinolate; MYR: myrosinase; SFN: sulforaphane

**Medicinal Ingredients (per capsule):**

Broccoli (*Brassica oleracea var. italica*-Seed(s)) ..... 500 mg

**Non-Medicinal Ingredients:** Hypromellose, microcrystalline cellulose, calcium ascorbate, silicon dioxide, magnesium stearate (vegetable source). **Recommended Dose:** Adults: Take 1 capsule per day with water, or as directed by your health care practitioner. Dosing recommendations are given for typical use based on an average 150 pound healthy adult. Healthcare practitioners are encouraged to use clinical judgement with case-specific dosing based on intended goals, subject body weight, medical history, and concomitant medication and supplement usage.

**REFERENCES**

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