PhytoBiome™

*Supports Akkermansia and Other Keystone Species**

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PhytoBiome™ is a unique blend of fruit and vegetable extracts featuring targeted amounts of polyphenols that promote a healthy diversity in the gut microbiome and metabolome.* Polyphenols are bioactive phytonutrients found in plant-based foods that may have health-promoting properties. Polyphenols exert prebiotic-like effects to support a balanced microbiome.* The polyphenols undergo metabolism by the gut bacteria, which provides beneficial metabolites for the gut.* This also promotes the growth of beneficial bacteria, such as *Akkermansia muciniphila* and other keystone species.* Using polyphenols rather than prebiotics to support a healthy gut microbiome may not increase flatulence or aggravate conditions such as small intestinal bacterial overgrowth.*

Benefits*

- Promotes healthy diversity in the gut microbiome
- May help support rebalancing of the microbiome in cases of dysbiosis
- Supports healthy gut mucosa
- Promotes a healthy inflammatory response and antioxidant status in the gut

Ingredient Highlights

- Provides 200 mg per serving of each of the following: wild blueberry blend, cranberry extract (as Exocyan™), pomegranate polyphenol extract (as Pomma+®), and quercetin to promote the growth of beneficial bacteria in the gut and support antioxidant status*
- Contains 100 mg per serving of each of the following: TrueBroc® broccoli seed extract with mustard seed powder, Vinia® red grape powder, and DeltaGold® delta- and gamma-tocotrienols to support microbial diversity and to promote a healthy inflammatory response*

Supplement Facts

Serving Size 3 capsules
Servings Per Container 30

Amount Per Serving		% Daily Value
Wild Blueberry Blend [Canadian wild blueberries (*Vaccinium angustifolium Ait.,Vaccinium angustifolium ssp nigrum, Vaccinium myrtilloides*)(berry)]	200 mg	*
Cranberry Extract (Exocyan™) (*Vaccinium macrocarpon*)(fruit)	200 mg	*
Pomegranate Polyphenol Extract (Pomma+®) (*Punica granatum*)(fruit)	200 mg	*
Quercetin	200 mg	*
Broccoli Blend [Broccoli Powder Extract (*Brassica oleracea L.*)(seed)(TrueBroc®), Mustard Powder (*Sinapis alba*)(seed)]	100 mg	*
Red Grape Powder (Vinia®) (*Vitis vinifera*)(cells)(with polyphenols and piceid resveratrol)	100 mg	*
Vitamin E Isomers (DeltaGold®) [as delta and gamma tocotrienols from annatto (*Bixa orellana*)(seed)]	100 mg	*

*Daily Value not established.

Other Ingredients: Cellulose (capsule), dicalcium phosphate, microcrystalline cellulose, silicon dioxide, vegetable stearate.

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Polyphenols and the Gut Microbiome

The gut microbiome is a complex ecosystem with many beneficial effects on overall health.[1] Diet is one of the major factors that influence the composition of the gut microbiota.[1] It is estimated that 90% to 95% of polyphenols are not absorbed in the small intestine, making them available for metabolism by the gut bacteria in the colon. This metabolism releases the bioactive compounds that potentially have a beneficial impact on health, including the support of antioxidant status and the promotion of a healthy inflammatory response.*[1-3] Increased consumption of these compounds may increase the bacteria that metabolize them, promoting a healthy microbiome diversity.*[1,2] Intestinal dysbiosis is associated with chronic inflammation, excess oxidative stress, impaired intestinal immune response, altered intestinal mucosa, poor immune function, and associated conditions, such as autoimmune disorders, inflammatory bowel disease, metabolic syndrome, cardiovascular disease, depression, anxiety, and Alzheimer's disease.[3,4]

Wild Blueberry Blend (Canadian wild blueberries: *Vaccinium angustifolium Ait., Vaccinium angustifolium ssp nigrum, Vaccinium myrtilloides*): Wild blueberries contain many polyphenols, including anthocyanins, chlorogenic acid, and pro-anthocyanins that promote gut microbiome diversity and redox balance.[4]* One mouse study assessed wild blueberry polyphenolic extract on the gut microbiota composition, gut epithelium histology, and cardiometabolic parameters on high-fat, high-sucrose diet-induced obese mice.[4] After 8 weeks, the wild blueberry extract restored the colonic mucosal layer and reduced the area under the curve of the oral glucose tolerance test by 18.3% compared to the control.[4] Additionally, the wild blueberry extract supported a healthier microbial makeup, with an improved *Bacteroidetes* and *Firmicutes* ratio, and the relative abundance of *Verrucomicrobia*, *Actinobacteria,* and *Coriobacteriaceae*.[4]

In a pilot study, the group consuming 38 g of freeze-dried blueberry powder daily for 6 weeks experienced a moderate increase in the diversity of the microbiota. Enriched beneficial species included *Anaerostipes hadrus*, *Faecalibacterium prausnitzii*, and *Ruminococcus bromii*.[5]

Cranberry extract (*Vaccinium macrocarpon*, as Exocyan™) contains many polyphenols, including pro-anthocyanidins, which may have antimicrobial properties to help support microbial diversity by inhibiting the colonization of potentially pathogenic species.[6] In a mouse study on dextran sodium sulfate-induced colitis, cranberry consumption improved dextran sodium sulfate-induced decline in microbial diversity and the *Firmicutes*-to-*Bacteroidetes* ratio.[7] It also increased the abundance of keystone, beneficial strains, including *Lactobacillus* and *Bifidobacterium*, and decreased the abundance of potentially harmful species, including *Sutterella* and *Bilophilaia*.[7] In a human gut simulator model, cranberry extract led to the growth of *Bacteroidaceae* and a decrease in *Enterobacteriaceae*.[8] A systematic review and meta-analysis demonstrated that cranberry extract may also support the eradication of *Helicobacter pylori*.[9]

Pomegranate Polyphenol Extract (*Punica granatum*, as Pomma+): Pomegranate features ellagitannin, a polyphenol that the gut microbiome metabolizes into urolithins, which has been shown to have health-promoting properties.[10-12] One randomized controlled trial of overweight–obese participants demonstrated that the groups that supplemented with 4 capsules (450 mg) of pomegranate extract daily for 3 weeks experienced a significant decrease of markers of metabolic endotoxemia and modulation of the makeup of the gut microbiome, including *Faecalibacterium*, *Odoribacter*, and *Parvimonas*.[13] One systematic review found that pomegranate extract increased the abundance of *Akkermansia muciniphila,* a nonpathogenic, mucin-degrading species found abundant in healthy microbiomes that encourages mucin growth, which helps strengthen the intestinal wall and helps stimulate glucagon-like peptide-1.[14,15] Lower abundance of *A. muciniphila* is associated with inflammation and metabolic dysfunction.[14,16] *A. muciniphila* may be involved in the metabolism of ellagic acid, which may help explain the increase in this bacteria after the consumption of pomegranate.[17] It may also help inhibit *C. difficile* growth and toxin production.[18]

Broccoli Blend [Broccoli Powder Extract (*Brassica oleracea*, as TrueBroc®) and Mustard Powder (*Sinapis alba*)] contains myrosinase enzymes and also glucosinolates that are metabolized by the microbiome.[19] A randomized controlled, crossover study was conducted on healthy adults who consumed 200 g of cooked broccoli and 20 g of raw daikon radish daily (for a source of myrosinase). The results of the study indicated a decrease in the relative abundance of *Firmicutes* by 9%, an increase in the relative abundance of *Bacteroidetes* by 10%, and an increase in the *Bacteroides* by 8% compared to the controls.[19] There was also an association between bacterial relative abundance and glucosinolate metabolites.[19]

Another study demonstrated that a high-*Brassica* diet led to a reduction in the relative abundance of sulfur-reducing bacteria, which are associated with ulcerative colitis and irritable bowel syndrome.[20] The diet included six portions (84 g) each of broccoli and frozen cauliflower, and six portions (300 g) of a broccoli and sweet potato soup for a 2-week period.[20] In an animal model, DSS-induced colitis mice that were given broccoli seed extract rich in glucoraphanin and polysaccharides showed improvements in intestinal barrier function through the upregulation of messenger RNA levels and tight junction protein expression, decreased pro-inflammatory cytokine expression, significantly increased cecal short-chain fatty acids, and beneficial modulation of gut microbiota.[21]

A review examined the effects of sulforaphane (a potent phytochemical found in broccoli and other cruciferous vegetables) on *H. pylori*-induced gastric mucosal oxidative stress in vitro in mice and in human subjects. The results showed that sulforaphane inhibited *H. pylori* viability in vitro and in vivo and attenuated the effects of *H. pylori*-induced gastritis in mice and in human subjects compared to controls, suggesting that this compound found in broccoli may help protect the gastrointestinal mucosal cells against the effects of *H. pylori*-induced oxidative stress.[22] The same study also revealed that sulforaphane administration mitigated aspirin- and indomethacin-induced small intestinal epithelial cell injury in vitro and in mice.[22] Another study demonstrated sulforaphane to inhibit the growth of a broad spectrum of microbial and fungal pathogens in vitro and in vivo.[23]

Vinia® is a complex of red grape cells from the red grape skins, flesh, pulp, and seeds, providing the full spectrum of nutrients and polyphenols found in red grapes and wine. This includes the polyphenols of resveratrol, tannins, quercetin, catechins, and anthocyanins that promote microbial diversity in the gut.*

An in vitro study analyzed the polyphenol content of red grape cells complex and found that it had a similar polyphenol count to agricultural grapes, except that it may have up to 100 times the resveratrol content.[24] Resveratrol supports a healthy microbial diversity in the gut, including an increase of *A. muciniphila* and a decrease in the *Firmicutes*-to-*Bacteroidetes* ratio.[2,3,14,25] Several studies demonstrated the potential benefits of resveratrol on the gut microbiome, which included enhancing the growth of *Lactococcus lactis* and inhibiting the growth of *Enterococcus faecalis*.*[3,25]

Quercetin is a polyphenol found in many different fruits and vegetables. One animal study found that quercetin reverted the gut microbiome imbalance and endotoxemia induced by a high-fat diet.[26] Another animal study demonstrated that a combination of resveratrol and quercetin decreased *Firmicutes* and the *Firmicutes*-to-*Bacteroidetes* ratio.[27] It inhibited the relative abundance of several species associated with diet-induced obesity, including *Desulfovibrionaceae* and *Acidaminococcacea*. There was also an increase in the relative abundance of potentially beneficial species, including *Bacteroidales*, *Akkermansia*, and *Ruminococcaceae*.[27] It may also help support gut barrier function.[28]

Vitamin E isomers (as delta- and gamma-tocotrienols) may support gut microbe diversity.* In a study on mice with induced colitis-associated colon cancer, delta-tocotrienols modulated the composition of the gut microbiota.[29] The mice were given an equivalent of 200 mg to 230 mg per day. It enhanced the beneficial bacteria of *Lactococcus* and *Bacteroides* and counteracted the depletion of *Roseburia*, which has been shown to decrease for those with inflammatory bowel disease.[29]

Recommended Use: Take 3 capsules daily or as directed by your health-care practitioner.

For a list of references cited in this document, please visit:

https://www.designsforhealth.com/api/library-assets/literature-reference---phytobiome-tech-sheet-references

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.

To contact Designs for Health, please call us at (860) 623-6314 or visit us on the web at www.designsforhealth.com.