

Polyphenols: Nourishing the gut, naturally.

Sourced from nature and supported by science: polyphenols are poised to become the nutraceutical industry's new gut-health heroes.

Recognized as a **'novel prebiotic'** by the Scientific Association for Probiotics and Prebiotics (ISAPP) and the Global Prebiotic Association (GPA), polyphenols help lay the foundations for a **healthy gut microbiome** – supporting overall health and wellbeing, naturally. With consumer appetite for prebiotics at an all-time high and demand growing for convenient nutraceuticals with enhanced sensory attributes – plus **plant-based, clean label claims** – polyphenols represent a largely untapped opportunity for nutraceutical brands to gain ground in the flourishing gut health market.

Discover more about the potential of polyphenols in this informative guide.

What are polyphenols?

Polyphenols are a diverse class of secondary plant metabolites found in nature. They possess unique chemical structures, with varying functions. When ingested, polyphenols reach the colon intact, where they **stimulate the growth of beneficial bacteria**.

The result? A host of **nourishing health benefits**, within the gut and beyond.

In the past, polyphenols were not widely recognized for their health benefits due to the vastness of the category and their perceived low bioavailability.

But now, their health-boosting potential is finally getting the recognition it deserves. With a growing body of scientific evidence and endorsements from the ISAPP and GPA supporting their 'novel prebiotic' status, polyphenols offer nutraceutical brands an opportunity to create new, **science-backed and effective prebiotic products** that cater to ever growing market demand.



What are polyphenols?

In the game of **gut health**, **anthocyanin polyphenols** are the stars of the show. Why? Research shows that supplementation with **anthocyanin-rich elderberry extract** increases the abundance of the beneficial bacteria **Akkermansia, Bifidobacteria and Lactobacilli**.

How do polyphenols support gut health?

With its highly sensitive 'pathogen recognition patterns', the colonic epithelium (lining of the large intestine) plays a pivotal role in triggering and mediating our bodies' immune defenses. When damaged by disease or the effects of a poor diet however, the mucosal lining of the colonic epithelium can become compromised, leading to 'leaky gut' syndrome, microbiome imbalance and the growth of 'bad' bacteria (dysbiosis).³

All of these conditions are associated with increased inflammation, higher fat deposition, a weakened or overactive immune response, insulin resistance and other poor health outcomes.³

Upon metabolization by the microbiota, polyphenols can become more **bioavailable** and potentially beneficial, enhancing their health-promoting effects.

Polyphenols have been shown to³:

- Help re-establish the immune-supporting function of the mucosal epithelial barrier by promoting the production of the **short chain fatty acid butyrate**
- Support the growth of beneficial bacteria by creating an environment that favors their proliferation over less desirable strains
- **Reduce oxidative stress** (e.g. free radicals)

Research is ongoing, but the evidence for **polyphenols' prebiotic effect** is only getting stronger, as is their potential as the next **must-have nutraceutical ingredient**.

Science spotlight: Supplementation with ElderCraft® Black Elderberry Extract

Rich in polyphenols including anthocyanins, European black elderberries (*Sambucus nigra*) have been used in traditional cold and flu remedies for centuries. Until recently however, their microbiota-directed effects have remained unclear. Researchers at Johannes Kepler University, Austria set out to end this uncertainty by investigating the effects of a three-week supplementation with Iprona's **ElderCraft® Black Elderberry Extract** on a group of healthy adults.²

Over the course of the nine-week study period participants kept a diary of digestive symptoms, the data from which was compared to the results of weekly biospecimen testing and three blood tests taken at weeks one, six and nine. From weeks four to seven, the participants ingested a **daily dose of 600 mg of ElderCraft®** which was assessed to contain **18% polyphenol content per dose**, equivalent to that of 30 g raw fruit.

By the end of the study period, neither the researchers nor the participants had observed any adverse effects of the supplementation or any significant changes to digestion-related symptoms.² However, a different story emerged when attention turned to **microbial diversity**.

The introduction and withdrawal of ElderCraft® at weeks four and seven of the trial produced significant changes in the measures of **microbial α- and β-diversity**.

Overall, **92 bacterial taxa** (identified at the species level) were found to be differentially abundant in biospecimen samples when comparing the pre-, during- and post-intervention weeks with the participants' median microbial abundance at baseline.² Since these sudden changes in diversity closely aligned with the ingestion of ElderCraft®, researchers surmised that supplementation with this polyphenol-rich ingredient produced a **relevant microbiome-shaping capacity**, demonstrating its value as a prebiotic ingredient.²



Beyond gut health: polyphenols and immunity

In addition to its beneficial effects on microbial diversity, ElderCraft® Black Elderberry Extract has been shown to **support immunity** through three separate mechanisms of action:

- Flavonoids masking the surface of virus cells, shielding them from attaching to red blood cells.
- Anthocyanins inhibiting the activity of neuraminidase, the enzyme which is needed for influenza viruses to replicate.

- General immunostimulant properties, helping support both local and systemic immune responses.

Even better – ElderCraft® delivers all of this with a pleasant, natural taste and aroma, and a plant-based clean-label positioning that resonates with today's nutraceutical consumer.

Polyphenols: Addressing consumer needs

The market opportunities offered by polyphenols are vast – and this starts with consumer trends and perspectives.

Modern diets have a serious diversity problem, with 75% of the world's food generated from only 12 plants and five animal species. A less varied dietary palate translates into a weaker gut microbiome that is more susceptible to dysbiosis and diseases.⁷

Consumers can physically feel the effects of an imbalance in their gut, leading them to seek out prebiotics. In fact, **over 70% of nutraceutical shoppers see prebiotics as effective for nourishing gut health, strengthening immunity and supporting healthy metabolism.**

But heightened demand doesn't mean consumers have lowered their expectations for quality, efficacy and an attractive, environmentally responsible positioning. Right now, 15% of global shoppers state they often consider sustainability in their purchasing decisions, while around 70% say transparency influences their decision to buy to some extent.¹¹

Trend data like this demonstrates the close connection between sustainability, traceability and product safety, and the value brands can add by pursuing related claims such as **'organic', 'plant-based' and 'clean label'.**

Natural, effective, safe and simple – polyphenols are emerging as an ideal prebiotic solution, with only a 600 mg daily dose required to deliver measurable benefits, versus the 2–3 g often needed for other prebiotic ingredients. What's more, polyphenols currently sit at the intersection between novel and familiar. This means they are already recognized by 80% of prebiotic users as part of the category, but offer plenty of scope to engage more consumers new to the world of gut health supplements.¹¹

Backed by solid science, credible claims and consumer-appeal, the future looks bright for polyphenols.

Discover more about the science behind polyphenols and the nourishing potential of Iprona's ElderCraft® Black Elderberry Extract here:

**healthandnutrition@iprona.com
www.craft-ingredients.info/polyphenols**



¹ Glenn R. Gibson et al, The International Scientific Association for Probiotics and Prebiotics (ISAPP) consensus statement on the definition and scope of prebiotics, *Nature Reviews, Gastroenterology & Hepatology*, vol. 14, August 2017, doi:10.1038/nrgastro.2017.75

² Global Prebiotic Association (GPA), *New Applications (White Paper)*, <https://prebioticassociation.org/new-applications-white-paper-download-form/>

³ Rodríguez-Daza MC et al, (2021) Polyphenol-Mediated Gut Microbiota Modulation: Toward Prebiotics and Further. *Front. Nutr.* 8:689456. doi: 10.3389/fnut.2021.689456

⁴ Reider, S. et al; Short- and Long-Term Effects of a Prebiotic Intervention with Polyphenols Extracted from European Black Elderberry—Sustained Expansion of *Akkermansia* spp. *J. Pers. Med.* 2022, 12, 1479. <https://doi.org/10.3390/jpm12091479>

⁵ Roschek B, Fink RC, McMichael MD, Li D, Alberte RS. Elderberry flavonoids bind to and prevent H1N1 infection in vitro. *Phytochemistry.* 2009;70(10):1255-1261. doi:10.1016/j.phytochem.2009.06.003

⁶ Swaminathan K, Dyason JC, Maggioni A, Von Itzstein M, Downard KM. Binding of a natural anthocyanin inhibitor to influenza neuraminidase by mass spectrometry. *Anal Bioanal Chem.* 2013;405(20):6563-6572. doi:10.1007/s00216-013-7068-x

⁷ Kinoshita E, Hayashi K, Katayama H, Hayashi T, Obata A. Anti-influenza virus effects of elderberry juice and its fractions. *Biosci Biotechnol Biochem.* 2012;76(9):1633-1638. doi:10.1271/bbb.120112

⁸ Mark L. Heiman et al, A healthy gastrointestinal microbiome is dependent on dietary diversity, *Molecular Metabolism*, vol. 5, (2016) p. 317-320

⁹ Industry Transparency Center, *2023 Functional Food and Beverage Survey*, p. 19, 35, 37-9, 41-2, 46, 47.