Berry anthocyanins as novel antioxidants in human health and disease prevention.

Zafra-Stone S, Yasmin T, Bagchi M, Chatterjee A, Vinson JA, Bagchi D

Abstract

Edible berries, a potential source of natural anthocyanin antioxidants, have demonstrated a broad spectrum of biomedical functions. These include cardiovascular disorders, advancing age-induced oxidative stress, inflammatory responses, and diverse degenerative diseases. Berry anthocyanins also improve neuronal and cognitive brain functions, ocular health as well as protect genomic DNA integrity. This chapter demonstrates the beneficial effects of wild blueberry, bilberry, cranberry, elderberry, raspberry seeds, and strawberry in human health and disease prevention. Furthermore, this chapter will discuss the pharmacological benefits of a novel combination of selected berry extracts known as OptiBerry, a combination of wild blueberry, wild bilberry, cranberry, elderberry, raspberry seeds, and strawberry, and its potential benefit over individual berries. Recent studies in our laboratories have demonstrated that OptiBerry exhibits high antioxidant efficacy as shown by its high oxygen radical absorbance capacity (ORAC) values, novel antiangiogenic and antiatherosclerotic activities, and potential cytotoxicity towards Helicobacter pylori, a noxious pathogen responsible for various gastrointestinal disorders including duodenal ulcer and gastric cancer, as compared to individual berry extracts. OptiBerry also significantly inhibited basal MCP-1 and inducible NF-kappabeta transcriptions as well as the inflammatory biomarker IL-8, and significantly reduced the ability to form hemangioma and markedly decreased EOMA cell-induced tumor growth in an in vivo model. Overall, berry anthocyanins trigger genetic signaling in promoting human health and disease prevention.
Safety and whole-body antioxidant potential of a novel anthocyanin-rich formulation of edible berries.


Source

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Abstract

Edible berry extracts rich in anthocyanins possess a broad spectrum of therapeutic, pharmacologic and anti-carcinogenic properties. Six berry extracts (wild blueberry, bilberry, cranberry, elderberry, raspberry seeds and strawberry), singly and in combination, were studied in our laboratories for antioxidant efficacy, cytotoxic potential, cellular uptake and anti-angiogenic properties. Combinations of edible berry extracts were evaluated to develop a synergistic formula, OptiBerry, which exhibited high oxygen radical absorbance capacity (ORAC) value, low cytotoxicity and superior anti-angiogenic properties compared to the other combinations tested. The current study sought to determine the broad spectrum safety and antioxidant potential of OptiBerry in vivo. Acute oral LD(50) of OptiBerry was greater than 5 g/kg in rats. Acute dermal LD(50) of OptiBerry was greater than 2 g/kg. No changes in the body weight or adverse effects were observed following necropsy. Primary skin and eye irritation studies were conducted in New Zealand albino rabbits. OptiBerry was classified as slightly irritating to the skin (primary skin irritation index 0.3) and minimally irritating to the eye (maximum mean total score 6.0). The antioxidant potential of OptiBerry was investigated in rats and mice by assessing GSH redox status in tissues as well as by a unique state-of-the-art electron paramagnetic resonance (EPR) imaging of whole-body redox status. A clinically relevant hyperbaric oxygen (HBO) exposure system (2 atm, 2 h) was employed to study the antioxidant properties of OptiBerry. OptiBerry feeding (8 weeks) significantly prevented HBO-induced GSH oxidation in the lung and liver of vitamin E-deficient Sprague Dawley rats. Furthermore, OptiBerry-fed mice, when exposed to HBO, demonstrated significant protection in whole-body HBO-induced oxidation compared to the unfed controls by EPR imaging. Taken together, these results indicate that OptiBerry is reasonably safe and possess antioxidant properties.
Inhibition of Helicobacter pylori in vitro by various berry extracts, with enhanced susceptibility to clarithromycin.

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Source

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Abstract

The objective of this study was to evaluate the effects of various berry extracts, with and without clarithromycin on Helicobacter pylori. Resistance to clarithromycin by H. pylori has been reported, leading to interest in alternatives/adjuncts to therapy with clarithromycin. H. pylori American type culture collection (ATCC) strain 49503 was grown, cell suspensions were made in PBS and diluted 10-fold. One hundred microL of the suspension was then incubated for 18 h with extracts of raspberry, strawberry, cranberry, elderberry, blueberry, bilberry, and OptiBerry, a blend of the six berries, at 0.25-1% concentrations. Serially diluted cell suspensions were exposed for 1 h to clarithromycin at 15 microg/ml. Ten microl of bacterial samples from the 10(-7) dilution tube were plated and incubated for 18 h and the number of colonies were counted. Growth of H. pylori was confirmed by the CLO test. All berry extracts significantly (p < 0.05) inhibited H. pylori, compared with controls, and also increased susceptibility of H. pylori to clarithromycin, with OptiBerry demonstrating maximal effects.
Anti-angiogenic, antioxidant, and anti-carcinogenic properties of a novel anthocyanin-rich berry extract formula.

Bagchi D, Sen CK, Bagchi M, Atalay M.

Source

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Abstract

Edible berry anthocyanins possess a broad spectrum of therapeutic and anti-carcinogenic properties. Berries are rich in anthocyanins, compounds that provide pigmentation to fruits and serve as natural antioxidants. Anthocyanins repair and protect genomic DNA integrity. Earlier studies have shown that berry anthocyanins are beneficial in reducing age-associated oxidative stress, as well as in improving neuronal and cognitive brain function. Six berry extracts (wild blueberry, bilberry, cranberry, elderberry, raspberry seeds, and strawberry) were studied for antioxidant efficacy, cytotoxic potential, cellular uptake, and anti-angiogenic (the ability to reduce unwanted growth of blood vessels, which can lead to varicose veins and tumor formation) properties. We evaluated various combinations of edible berry extracts and developed a synergistic formula, OptiBerry IH141, which exhibited high ORAC (Oxygen-Radical Absorbing Capacity) value, low cytotoxicity, and superior anti-angiogenic properties compared to the other combinations tested. Anti-angiogenic approaches to treat cancer represent a priority area in vascular tumor biology. OptiBerry significantly inhibited both H2O2- and TNF-alpha-induced VEGF (Vascular Endothelial Growth Factor) expression by human keratinocytes. VEGF is a key regulator of tumor angiogenesis. Matrigel assay using human microvascular endothelial cells showed that OptiBerry impaired angiogenesis. In an in vivo model of angiogenesis, OptiBerry significantly inhibited basal MCP-1 and inducible NF-kappaB transcriptions. Endothelioma cells pretreated with OptiBerry showed a diminished ability to form hemangioma and markedly decreased tumor growth by more than 50%. In essence, these studies highlight the novel anti-angiogenic, antioxidant, and anti-carcinogenic potential of a novel anthocyanin-rich berry extract formula, OptiBerry.
Anti-angiogenic property of edible berry in a model of hemangioma.

Atalay M, Gordillo G, Roy S, Rovin B, Bagchi D, Bagchi M, Sen CK

Source

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Abstract

Hemangiomas represent a powerful model to study in vivo angiogenesis. Monocyte chemotactic protein 1 (MCP-1) is known to be responsible for recruiting macrophages to sites of infection or inflammation and facilitate angiogenesis. Recently we have demonstrated that edible berry extracts potently suppress inducible vascular endothelial growth factor expression and in vitro angiogenesis. Comparative analysis of several berry extracts led to the observation that wild blueberry and a berry mix were most effective. Our goal was to follow up on our findings with wild blueberry and the berry mix (OptiBerry). The present work rests on our current finding that these two berry powders significantly inhibit inducible MCP-1 expression in endothelioma cells. Therefore, we sought to examine the effects of wild blueberry and berry mix in an in vivo model of experimental angiogenesis. Reporter studies showed that the berry powders significantly inhibited basal MCP-1 transcription and inducible nuclear factor kappaB transcription. Endothelioma cells pre-treated with berry powders showed diminished ability to form hemangioma. Histological analysis demonstrated markedly decreased infiltration of macrophages in hemangioma of treated mice compared to placebo-treated controls. The current results provide the first in vivo evidence substantiating the anti-angiogenic property of edible berries.
Chapter 11 – The Benefits of Antioxidant-Rich Fruits on Skin Health

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Source

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Publisher Summary

Skin is the largest organ that is under constant assault by environmental oxidative stress including ultraviolet radiation (UVR), air pollutants, and chemical oxidants. Premature skin aging may occur due to factors such as external oxidative stress as well as smoking, imbalanced nutrition, excessive dieting, and mental stress. Studies suggest that antioxidants regulate the biomarkers associated with premature aging by reducing oxidative stress including environmental stress such as ozone and cigarette smoking. Oral and topical natural antioxidant treatments protect against the development of premature skin aging due to oxidative damage. Therefore, natural fruits and vegetables rich in antioxidants may protect skin against premature aging. The focus of this chapter is on the beneficial effects of antioxidant-rich berries on skin health. Consuming natural antioxidants provides a plethora of health benefits, including lowering age-related oxidative stress and inflammation. Anthocyanins are the common components of fruits and vegetables, particularly in berries, which provide the bright red, blue, and purple hues to the plants. Anthocyanins are naturally occurring antioxidants. In vitro and in vivo studies have shown that berry anthocyanins possess potent antioxidant activity and many potential health benefits, including cardiovascular protection, anticarcinogenic potential, antidiabetic properties, brain function enhancement, ocular and vision health, urinary tract health, and skin health. Based on these health benefits, a formulation of a synergistic blend (OptiBerry) containing wild blueberry, bilberry, cranberry, elderberry, strawberry, and raspberry seed extracts was developed which has been found to be superior in bioavailability and antioxidative properties, providing whole-body antioxidant protection.