Aronia Berry

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Austin Peay State University

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The Plant

- Black Chokeberry
- *Aronia is generally the berry in medicine*
- *Distant relative of the rose family*
- *Eaten fresh or used in pie, juice, syrup, tea.*

There are proven health benefits of the berry!

- Aronia is a rich source of antioxidants, particularly phenolic acids and flavonoids
- Aronia berry antioxidants have anti-inflammatory, gastroprotective, antidiabetic, cardioprotective, and anticancer effects.

Molecules **2017**, *22*(6), 944; https://doi.org/10.3390/molecules22060944

Open Access Review

Fruits of Black Chokeberry *Aronia melanocarpa* in the Prevention of Chronic Diseases

Tunde Jurikova [1], Jiri Mlcek [2,*], Sona Skrovankova [2], Daniela Sumczynski [2], Jiri Sochor [3], Irena Hlavacova [2], Lukas Snopek [2] and Jana Orsavova [4]

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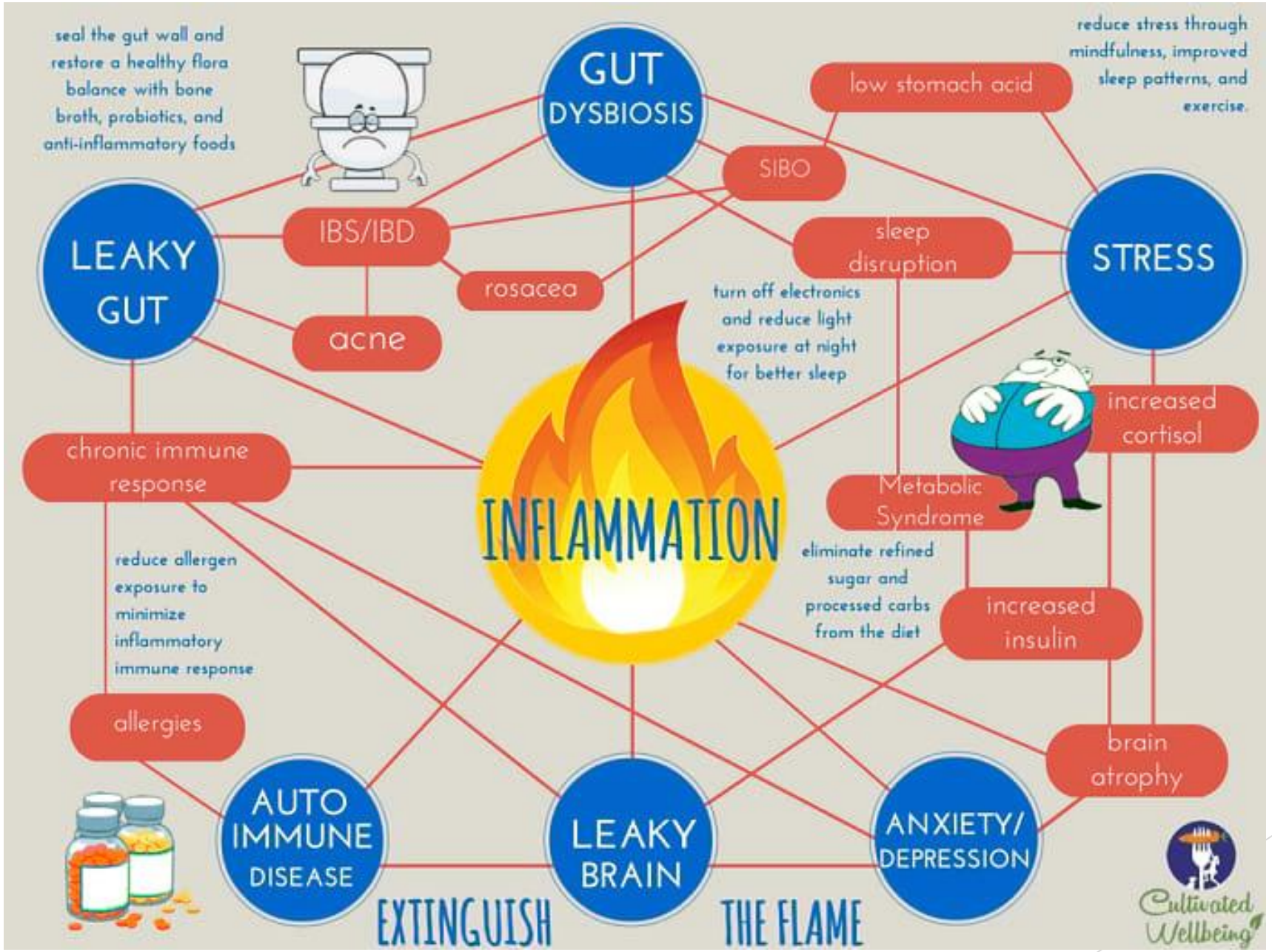
Terms to know

- Inflammation (heat, redness, pain symptoms)
  - Initial response to an injury
  - At a cellular level local chemokines release signals… release chemical
  - Mast cells are activated by the injury, or the bacteria, or from listening to the chemokines (like cytokine)
  - Releases histamine, capillaries get larger, swelling, phagocytes, neutrophils, white blood cells, T Cells, B cells (specific immune system) move to the area

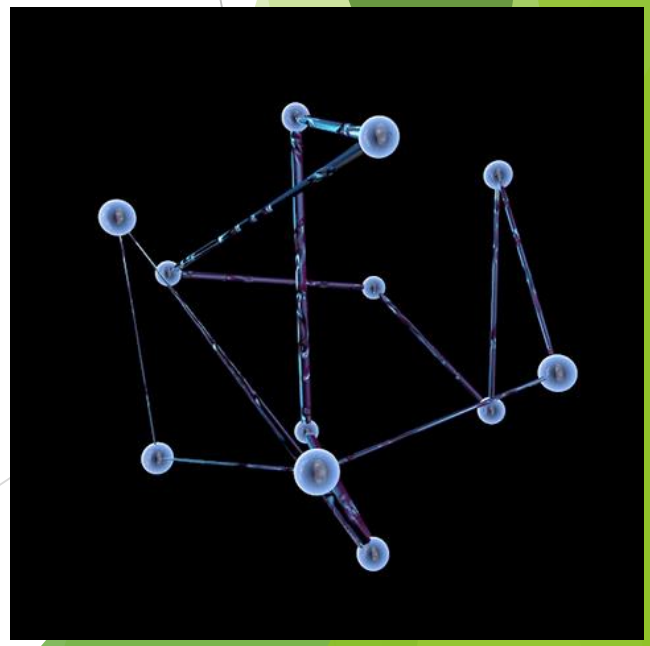

seal the gut wall and restore a healthy flora balance with bone broth, probiotics, and anti-inflammatory foods
GUT DYSBIOSIS
low stomach acid
reduce stress through mindfulness, improved sleep patterns, and exercise.
SIBO
LEAKY GUT
IBS/IBD
sleep disruption
STRESS
rosacea
turn off electronics and reduce light exposure at night for better sleep
acne
increased cortisol
chronic immune response
INFLAMMATION
Metabolic Syndrome
reduce allergen exposure to minimize inflammatory immune response
eliminate refined sugar and processed carbs from the diet
increased insulin
allergies
brain atrophy
AUTO IMMUNE DISEASE
LEAKY BRAIN
ANXIETY/ DEPRESSION
EXTINGUISH
THE FLAME
Cultivated Wellbeing

Examples of Inflammatory Diseases

- Asthma and other allergies.
- chronic peptic ulcer.
- diabetes.
- rheumatoid arthritis.
- periodontitis.
- ulcerative colitis, IBS, and Crohn's disease
- sinusitis.
- hepatitis.
- cancer

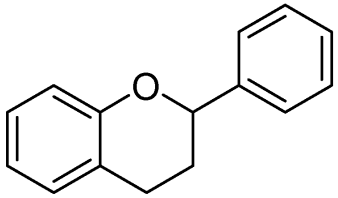
Terms to know

- Antioxidants
  - Molecular and atom changes
  - Loss of an electron
  - What is left is unstable and starts a chain of damage to surrounding molecules
  - Antioxidant ability has been well studied in vitamins, carotenoids, and minerals.
  - Then came flavonoids, which is a polyphenol.
  - We really began to understand their antioxidant properties in the 1990s.
  - Aging

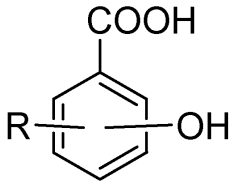


Antioxidants

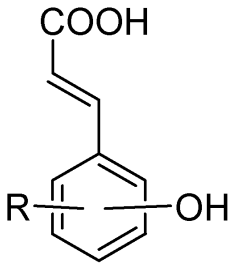
- Flavonoids
- Phenolic acids
- Polyphenols



Flavonoids



Hydroxybenzoic acids



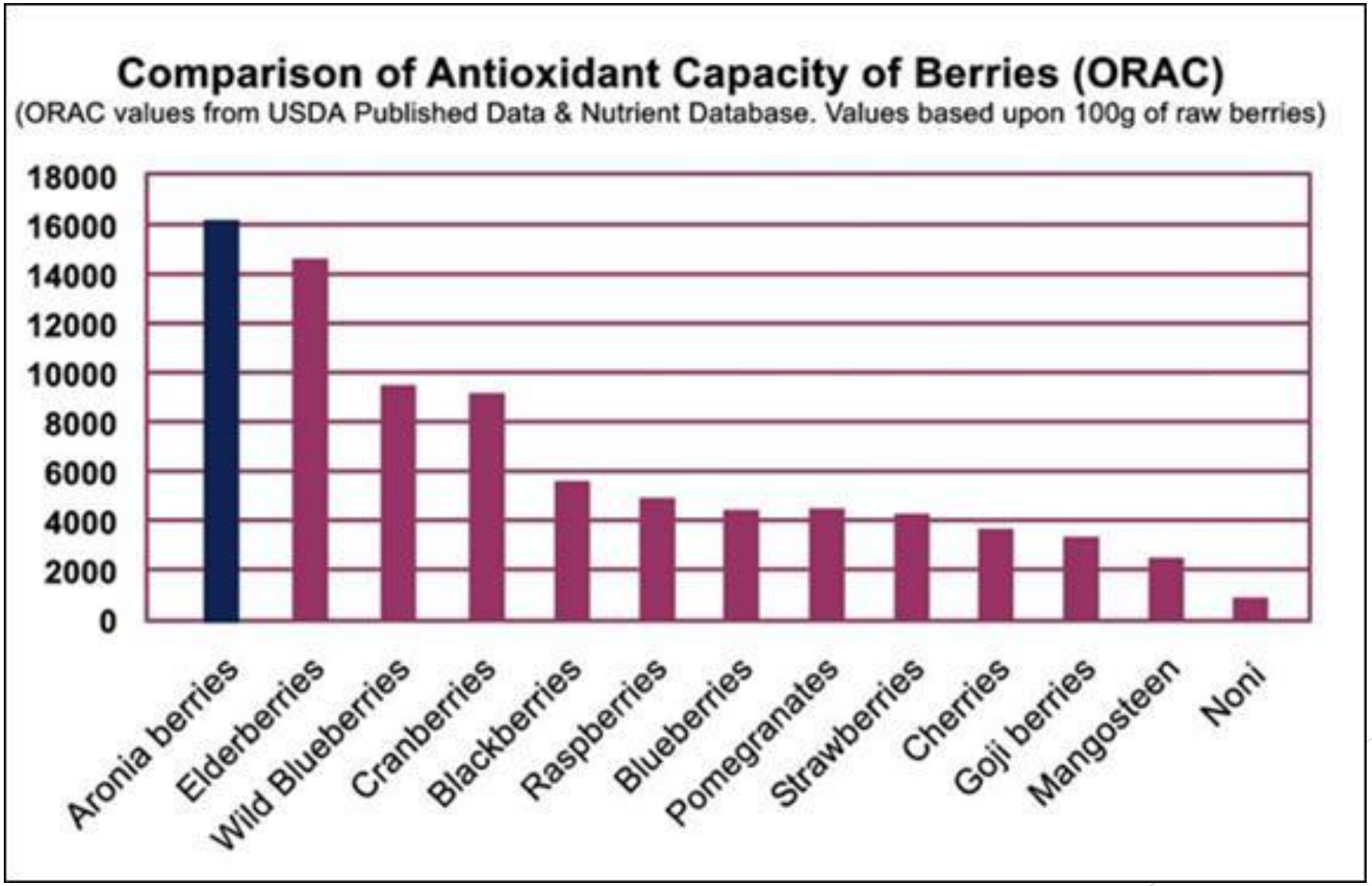
Hydroxycinnamic acids

Phenolic acids (from non-flavonoids group)

Antioxidant Capacity

- Problems with studies on aronia as an antioxidant
  - Most studies done in the lab or on animals.
  - Lab studies include much higher doses that we can take in with diet.
  - Much is lost in digestion that is not lost in a test tube.
- What is known
  - Protective for CVD in lab, animals, and humans.
  - Evidence for polyphenols protective against cancer, inflammation, and brain function deterioration in lab and animals. Could do studies in humans if we had better biomarkers for these diseases.

Antioxidant capacity of Aronia (Kulling & Rawel , 2008)



Terms to know

- Oxidative stress
  - Triggers many age and inflammation related diseases.
  - Considerable literature on how these polyphenols (and other antioxidants) scavenge free radicals. There are also enzyme actions that reduce inflammation and chemokine action .
  - Polyphenols improve cell survival in healthy cells
  - They also kill off mutant cells and prevent tumor growth.
  - Polyphenols also have a role in bone health for postmenopausal women
  - Triggers of chains of reactions can be halted

Table 1.

Contents of Total Phenolics, Anthocyanins, Procyanidins, and Other Flavonoids of Chokeberry Cultivars

Sample	*Total phenols(mg GAE/100 g FW)*	*Total anthocyanins (mg cyanidin 3-galactoside/100 g FW)*	*Total procyanidins (mg epicatechin/100 g FW)*	*Other flavonoids (mg quercetin equivalents/100 g FW)*
A. prunifolia	2059.5±145.8[a]	366.16±1.4[a]	855.13±63.4[a]	47.67±3.7[c]
A. melanocarpa cultivar				
Viking	1713±110.2[b]	277.13±25.1[b]	627.57±55.3[b]	64.04±5.4[a]
Aron	1586.5±123.7[c]	176.18±19.4[c]	354.94±49.2[c]	60.0±4.6[b]

Data are means±SD.

[abc]Means with different letters in the same column have a statistically significant difference at $P \leq .05$.

GAE, gallic acid; FW, fresh weight.

Table 2.

Antioxidant Capacity of Selected Chokeberry Cultivars Measured by Different Complementary Assays

Chokeberry cultivar	*ABTS(µmol Trolox equivalents/g FW)*	*FRAP (µmol Fe^{2+}/g FW)*	*CUPRAC (µmol Trolox equivalents/g FW)*	*ORAC (µmol Trolox equivalents/g FW)*	*HPS (µmol Trolox equivalents/g FW)*	*WA* *	*Rank*
A. prunifolia	167.6±6.2 [a]	300.2±10.6 [a]	232.3±14.2 [a]	42.3±2.0 [a]	65.0±2.6 [a]	1.16	1
A. melanocarpa cultivar							
Viking	171.7±6.8 [a]	206.2±9.4 [b]	158.8±8.3 [c]	41.7±1.2 [a]	61.9±1.9 [a]	0.99	2
Aron	95.9±7.3 [b]	185±8.6 [b]	177.8±9.6 [b]	35.3±1.7 [b]	53.3±1.5 [b]	0.83	3
Average capacity	145.1	230.5	189.6	39.8	60.1		

Health Benefits of Aronia

Molecules. 2017 Jun 7;22(6). pii: E944. doi: 10.3390/molecules22060944.

Fruits of Black Chokeberry Aronia melanocarpa in the Prevention of Chronic Diseases.

Jurikova T[1], Mlcek J[2], Skrovankova S[3], Sumczynski D[4], Sochor J[5], Hlavacova I[6], Snopek L[7], Orsavova J[8].

FTB | Food Technology & Biotechnology

Food Technol Biotechnol. 2015 Jun; 53(2): 171–179.
doi: 10.17113/ftb.53.02.15.3833

PMCID: PMC5068402
PMID: 27904346

Phenolic Content, Antioxidant Capacity and Quality of Chokeberry (*Aronia melanocarpa*) Products

Mandica-Tamara Tolić,[1] Irena Landeka Jurčević,[2] Ines Panjkota Krbavčić,[2] Ksenija Marković,[2] and Nada Vahčić[2]

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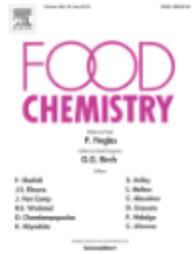
Food Chemistry
Volume 284, 30 June 2019, Pages 108-117

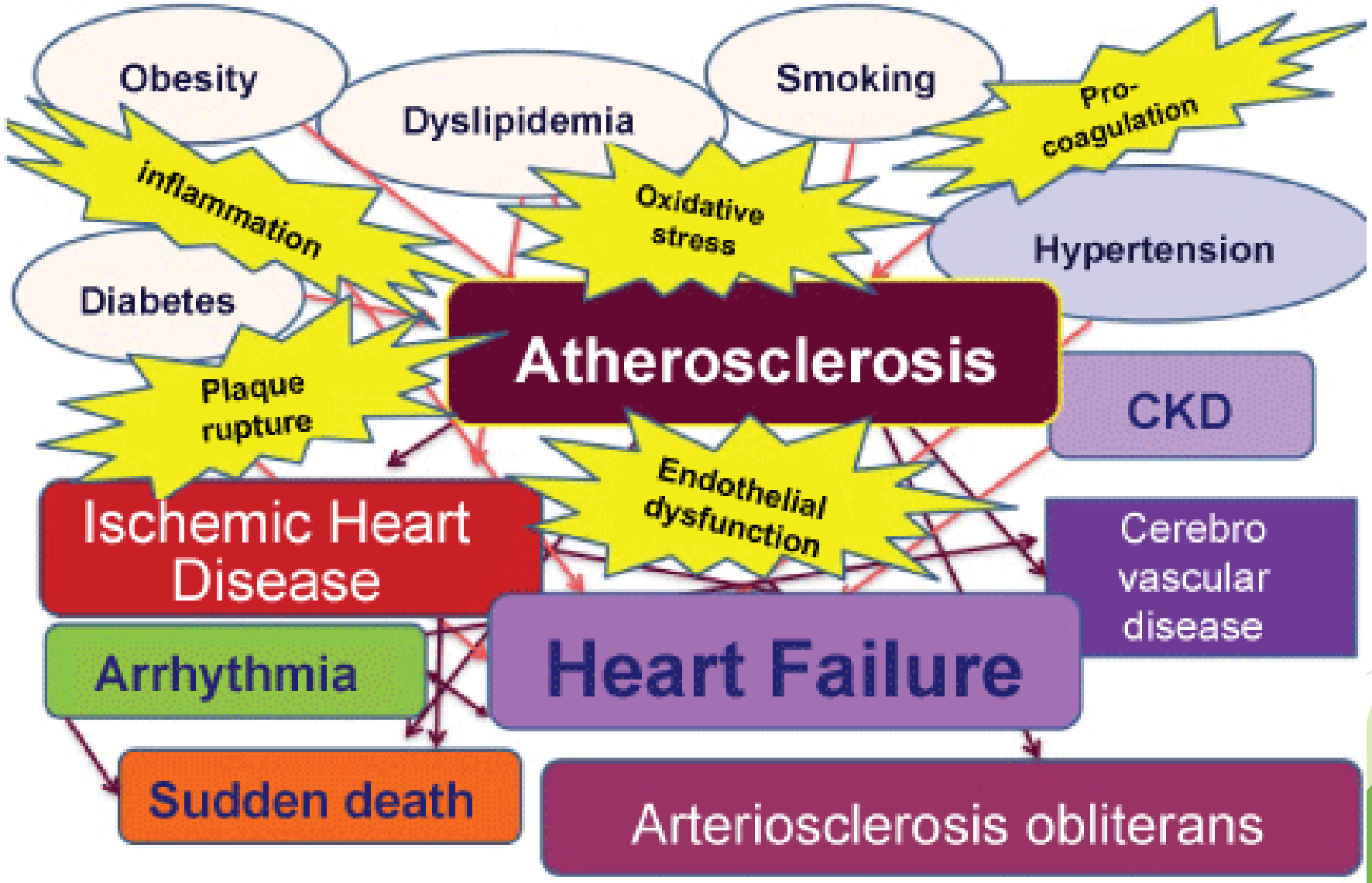


Black chokeberry (*Aronia melanocarpa*) polyphenols reveal different antioxidant, antimicrobial and neutrophil-modulating activities

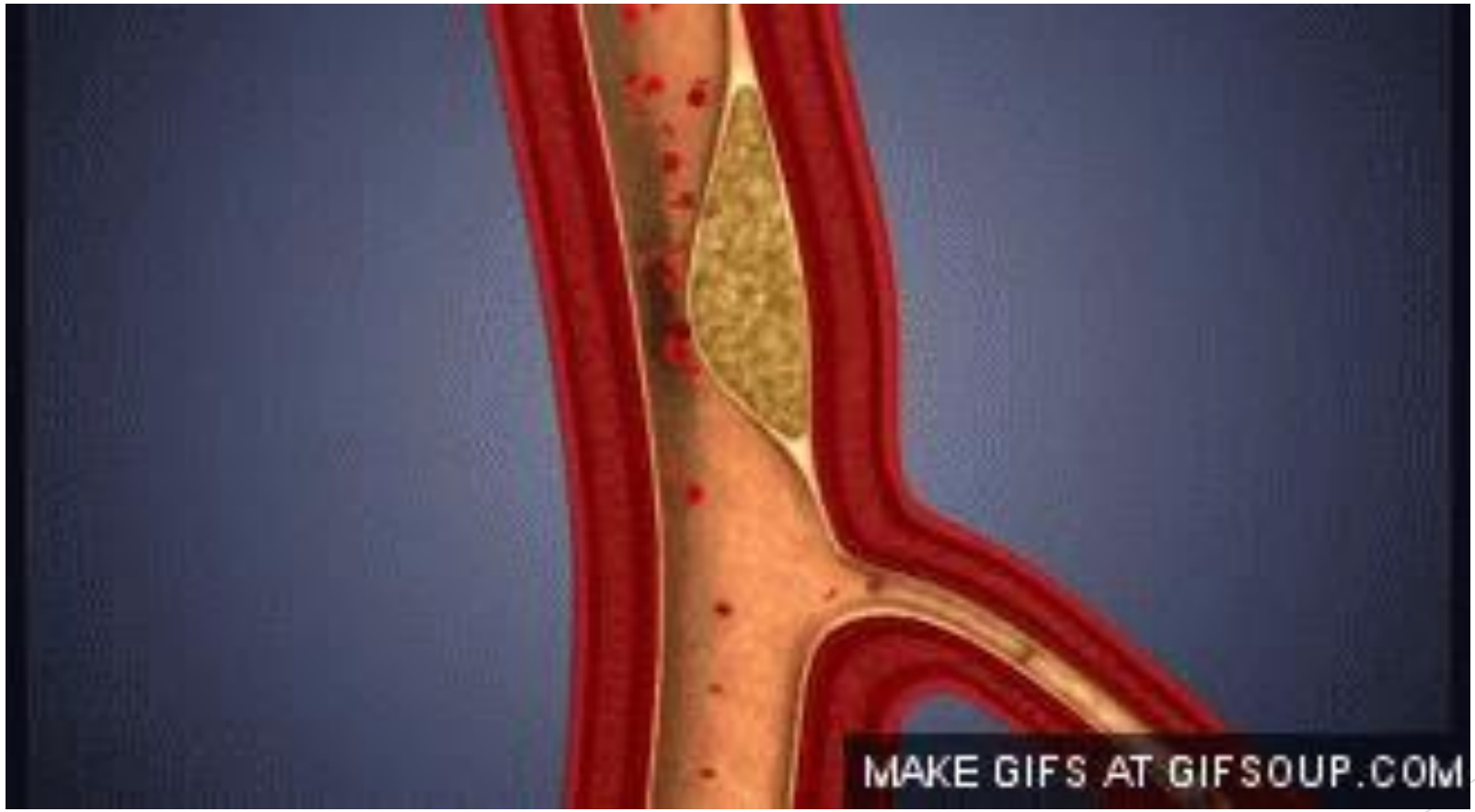
Petko Denev [a], Milan Číž [b, c], Maria Kratchanova [a], Denica Blazheva [d]

Specific conditions

Artery and blood vessel health



Artery and blood vessel health



Artery and blood vessel health

Eur J Nutr. 2012 Aug; 51(5): 563–572.
Published online 2011 Aug 24. doi: 10.1007/s00394-011-0240-1

PMCID: PMC3397226
PMID: 21863241

Aronia melanocarpa fruit extract exhibits anti-inflammatory activity in human aortic endothelial cells

D. Zapolska-Downar,[✉] D. Bryk, M. Małecki, K. Hajdukiewicz, and D. Sitkiewicz

Artery and blood vessel health

J Food Biochem. 2016 Aug;40(4):404-410. Epub 2015 Dec 2.

Effects of a natural extract of *Aronia Melanocarpa* berry on endothelial cell nitric oxide production.

Varela CE[1], Fromentin E[2], Roller M[3], Villarreal F[1], Ramirez-Sanchez I[4].

Nitric oxide benefits

- **Nitric oxide benefits:**
- helps dilate blood vessels
- supports a healthy heart
- boosts brain power
- improves sexual health
- increases blood flow
- regulates digestion
- increases cognitive abilities
- increases memory retention
- lowers blood pressure
- strengthens the immune system
- increases stamina
- helps re-build muscles after exercise
- increases sex drive
- helps the liver and pancreas function efficiently

Anti-cancer effects

- Cytotoxic
- Kills cervical cancer cells in the lab (Rugina et al., 12).
- The *anthocyanins* in chokeberries could act as antitumor agents, so these fruits can be recommended for daily consumption.

JOURNAL OF MEDICINAL FOOD

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J Med Food. 2012 Aug; 15(8): 700–706.
doi: 10.1089/jmf.2011.0246

PMCID: PMC3407391
PMID: 22846076

Antioxidant Activities of Chokeberry Extracts and the Cytotoxic Action of Their Anthocyanin Fraction on HeLa Human Cervical Tumor Cells

Dumitriţa Rugină, Zorița Sconța, Loredana Leopold, Adela Pintea, Andrea Bunea, and Carmen Socaciu

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The present study provides for the first time information regarding the phytochemical content rich in anthocyanins and procyanidins in aronia

Anti-diabetic effects

Journal of Medicinal Food, Vol. 21, No. 3 | Full Communications

The Effect of Aronia Berry on Type 1 Diabetes *In Vivo* and *In Vitro*

Yong-Deok Jeon, Sa-Haeng Kang, Kwang-Hyun Moon, Jeong-Ho Lee, Dae-Geun Kim, Wook Kim, Jong-Sung Kim, Byung-Yong Ahn, and Jong-Sik Jin

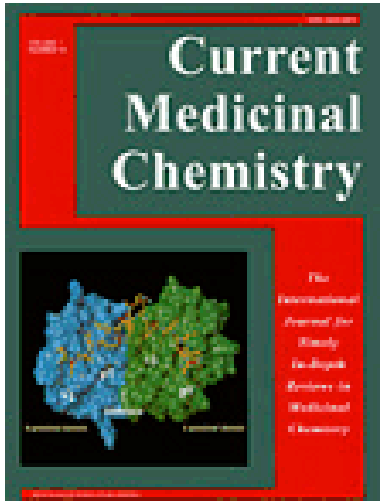
Published Online: 1 Mar 2018 | https://doi.org/10.1089/jmf.2017.3939

Anti-diabetic effects

Antidiabetic Effects of *Aronia melanocarpa* and Its Other Therapeutic Properties

Ines Banjari[1], Andreja Misir[1], Katarina Šavikin[2], Stela Jokić[1], Maja Molnar[1], H. K. S. De Zoysa[3] and Viduranga Y. Waisundara[3]*

Anti-diabetic effects Type II



Polyphenols-Rich Natural Products for Treatment of Diabetes

Authors: Dragan, S.; Andrica, F.; Serban, Maria-Corina; Timar, R.
Source: Current Medicinal Chemistry, Volume 22, Number 1, January 2015, pp. 14-22(9)
Publisher: Bentham Science Publishers

Anti-inflammatory

ELSEVIER

Nutrition Research

Volume 37, January 2017, Pages 67-77

Original Research

Aronia berry polyphenol consumption reduces plasma total and low-density lipoprotein cholesterol in former smokers without lowering biomarkers of inflammation and oxidative stress: a randomized controlled trial

Liyang Xie [a], Terrence Vance [a], Bohkyung Kim [a], Sang Gil Lee [a], Christian Caceres [a], Ying Wang [a], Patrice A. Hubert [a], Ji-Young Lee [a], Ock K. Chun [a], Bradley W. Bolling [a, b]

Colitis Anti-inflammatory

Journal of Medicinal Food, Vol. 20, No. 7 | Full Communications

Aronia Berry Extract Ameliorates the Severity of Dextran Sodium Sulfate-Induced Ulcerative Colitis in Mice

Sa-Haeng Kang, Yong-Deok Jeon, Kwang-Hyun Moon, Jeong-Ho Lee, Dae-Geun Kim, Wook Kim, Hyun Myung, Jong-Sung Kim, Hyun-Ju Kim, Keuk-Soo Bang ✉, and Jong-Sik Jin ✉

Published Online: 1 Jul 2017 | https://doi.org/10.1089/jmf.2016.3822

Gut health

- Works as an anti-inflammatory in the digestive system.
- Reduces colitis in mice. Likely a good choice for people with colitis, Chron’s disease, IBD
- Not mentioned on the Crohns and Colitis Foundation website

Journal of Functional Foods
Volume 44, May 2018, Pages 48-57

Aronia berry (*Aronia mitschurinii* 'Viking') inhibits colitis in mice and inhibits T cell tumour necrosis factor-α secretion

Derek A. Martin [a, b, 1], Joan A. Smyth [c, d], Zhenhua Liu [e], Bradley W. Bolling [a, b, 1]

Show more

https://doi.org/10.1016/j.jff.2018.02.025

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Nutrition | Free Access

Anti-inflammatory Activity of Aronia Berry Polyphenols in Jurkat T Cells

Derek Martin and Bradley Bolling

Published Online: 1 Apr 2017 | **Abstract Number:** 166.4

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Figures References Related

Federation of American Societies for Experimental Biology Journal

Gut microbiome

- Modulator (Wu, 2018).
- Polyphenols aren’t absorbed well.
- But they are used in the gut. Gut microbiota metabolize than and this in turn improves body health and immune function
- They have an anti-inflammatory action on the lining of the gut

Nutritional Benefits

Vitamins
vitamin C: 137–270 milligrams per kilogram (mg/kg)
folate: 200 micrograms per kilogram (µg/kg)
vitamin B-1: 180 µg/kg
vitamin B-2: 200 µg/kg
vitamin B-6: 280 µg/kg
niacin: 3,000 µg/kg
pantothenic acid: 2,790 µg/kg
tocopherols: 17.1 mg/kg
vitamin K: 242 µg/kg
Minerals
sodium: 26 mg/kg
potassium: 2,180 mg/kg
calcium: 322 mg/kg
magnesium: 162 mg/kg
iron: 9.3 mg/kg
zinc: 1.47 mg/kg
All weights are the weight of the berries when fresh.

Who is paying for the research?

Summary

- Aronia contains a variety of ingredients such as polyphenols, anthocyanins, flavonoids, and tannins. Especially, *anthocyanin* content in aronia berry is known to be much higher than in other plants and berries. It is known for exerting antioxidant, anti-inflammation, and anti-tumour effects.
- Highest Polyphenol content compared to 143 plants (2008).
- A rich source of antioxidants, particularly phenolic acids and flavanoids.
- Some of the better studied attributes of antioxidants include anti-inflammatory, gastroprotective, antidiabetic, cardioprotective, and anticancer effects.
- There are more studies coming out all the time.