Nutritional preparedness recommended when facing viral epidemics

The risk of acquiring a coronavirus infection may be relatively low; however, the consequences of these infections could be severe. While medical science is diligently working on the development of an effective treatment, it may be prudent to learn about some protective measures now, and to become informed concerning potential nutritional therapies.

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An article published on February 12, 2020 in *Progress in Cardiovascular Diseases* proposes the use of nutritional supplements to enhance the body's type 1 interferon immune response to influenza and coronaviruses, which are among the viruses that have RNA, rather than DNA, as their genetic material.

"Activation of toll-like receptor 7 (TLR7) by single-stranded viral RNA trapped within endosomes provides a key stimulus to type 1 interferon induction by RNA viruses," authors Mark F. McCarty and James J. DiNicolantonio wrote. "Another key mediator of type 1 interferon response is the mitochondrial antiviral-signaling protein (MAVS)."

Based on this and other research findings, McCarty and DiNicolantonio identified the antioxidant compounds lipoic acid, ferulic acid (which occurs in plant foods such as bran) and sulforaphane (formed from a compound in Brassica family vegetables that include broccoli) as nutrients that may enhance TLR7-mediated induction of type 1 interferon. Spirulina or a protein in spirulina extracts known as phycocyanobilin may also improve this response to RNA viruses and has decreased mortality in mice infected with influenza. N-acetyl-L-cysteine (NAC) increases the production of glutathione (which forms part of the antioxidant enzyme glutathione peroxidase-1) and could help protect TLR7 from damage due to oxidation. Selenium, an element that is present in glutathione peroxidase-1, may also be beneficial. The authors noted that antioxidants in general may be useful due to their ability to dampen excessive lung inflammation induced by viruses.

Another mechanism of type 1 interferon response, activation of mitochondrial antiviral-signaling protein (MAVS), can be upregulated by a relatively high dose of glucosamine, a compound that supports joint health. The addition of glucosamine to the diet of mice infected with influenza significantly improved survival while failing to protect those that were genetically modified to lack MAVS. "This striking new finding points to the possibility that high-dose glucosamine supplementation might aid prevention and control of RNA virus infections," McCarty and DiNicolantonio remarked.

"Administration of spirulina (or a spirulina extract enriched in phycocyanobilin), a phase 2 inducer (such as ferulic acid, lipoic acid, or sulforaphane), N-acetyl-L-cysteine, selenium, and high-dose glucosamine, in adequate doses, might be expected to help prevent and control RNA

virus infections by amplifying the signaling functions of TLR7 and MAVS in evoking type 1 interferon production," they concluded. They added that beta-glucan from brewer's yeast, zinc and elderberry (which has an antiviral effect that may be partly mediated by ferulic acid) are further practical nutritional strategies for coping with RNA virus infections.

"The agents I suggest appear to be overall beneficial for general health - particularly cardiovascular health - and are therefore appropriate for use in primary prevention," McCarty said. "However, when drug therapies for coronavirus (or other RNA viruses) become available, these nutraceutical measures might be employed as adjuvants."

Apply What You've Learned: Coronaviruses

- Coronaviruses have gained recognition during the past few months due to the emergence of COVID-19. Many people may not know that the coronavirus family is widespread and includes viruses that cause common colds.[1]
- Coronaviruses are transmitted between certain animals and humans.[2]
- Avoidance of infected individuals or areas in which infections are prevalent, and regular and thorough handwashing are among recommended ways to help prevent contracting coronaviruses. While prudent use of hand sanitizers is helpful, overuse could disrupt the skin's protective barrier or cause microabrasions.
- Maintaining a healthy immune system by eating right, sleeping well, exercising, learning to handle stress positively and supplementing with nutrients that support immune function is recommended to help protect against coronavirus and other infectious agents.

References

1. "Common Human Coronaviruses." U. S. Centers for Disease Control. 13 Feb 2020. www.cdc.gov/coronavirus/general-information.html
2. "Coronavirus." World Health Organization. 2020. https://www.who.int/health-topics/coronavirus

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Phenolic acids - Hydroxycinnamic acids - Ferulic acid						
Alcoholic beverages						
Beers	Beer [Alcohol free]	0.12 mg/100 ml	0.00	0.23	0.07	10
	Beer [Ale]	0.33 mg/100 ml	0.05	0.76	0.23	12
	Beer [Dark]	0.09 mg/100 ml	0.03	0.13	0.04	4
	Beer [Regular]	0.26 mg/100 ml	0.01	1.41	0.28	51
Wines - Fortified Wines	Sherry	0.02 mg/100 ml	0.02	0.02	0.00	1
Wines - Grape wines	Wine [Red]	0.08 mg/100 ml	0.00	1.04	0.22	34
	Wine [White]	0.09 mg/100 ml	0.03	0.21	0.08	4
Wines - Sparkling wines	Champagne	0.03 mg/100 ml	7.00e-03	0.04	0.02	4
Cereals and cereal products						
Cereal products	Bread, rye, whole grain flour	3.90 mg/100 g FW	3.90	3.90	0.00	1
Cereals	Common wheat, refined flour	8.08 mg/100 g FW	0.00	9.70	3.96	6
	Common wheat, whole grain flour	0.15 mg/100 g FW	0.11	0.18	0.04	3
	Hard wheat, refined flour	14.11 mg/100 g FW	14.11	14.11	0.00	1
	Hard wheat, whole grain flour	72.21 mg/100 g FW	72.21	72.21	0.00	1

	Maize, whole grain	0.53 mg/100 g FW	0.17	0.85	0.34	3
	Oat, whole grain flour	0.19 mg/100 g FW	0.10	0.25	0.07	6
	Rice, parboiled	0.17 mg/100 g FW	0.08	0.26	0.13	2
	Rice, whole grain	0.10 mg/100 g FW	0.04	0.13	0.05	3
	Rye, whole grain flour	0.45 mg/100 g FW	0.29	0.54	0.12	4
Coffee and cocoa						
Cocoa - Chocolate	Chocolate, dark	24.00 mg/100 g FW	24.00	24.00	0.00	1
Fruits and fruit products						
Dried fruits - Dried other fruits	Date, dried	11.83 mg/100 g FW	6.11	18.36	6.17	3
Fruits - Berries	American cranberry	0.81 mg/100 g FW	0.81	0.81	0.00	1
	Bilberry, raw	2.30 mg/100 g FW	2.30	2.30	0.00	1
	Cloudberry	1.00 mg/100 g FW	1.00	1.00	0.00	1
Fruits - Citrus	Grapefruit	1.00e-02 mg/100 g FW	0.01	0.01	0.00	1
Fruits - Other fruits	Date, fresh	9.62 mg/100 g FW	3.22	16.98	6.93	3
Fruits - Pomes	Apple [Dessert], whole, raw	0.07 mg/100 g FW	0.00	0.21	0.10	5
Non-alcoholic beverages						
Fruit juices - Berry juices	Grape [Green], pure juice	1.00e-02 mg/100 ml	0.01	0.01	0.00	1
Fruit juices - Pome juices	Apple [Cider], juice from concentrate	0.20 mg/100 ml	0.09	0.32	0.09	6
	Apple [Cider], pure juice	0.19 mg/100 ml	0.04	0.27	0.10	4
	Apple [Dessert], pure juice	0.07 mg/100 ml	0.00	1.35	0.43	11
Fruit juices - Tropical fruit juices	Pomegranate, pure juice	5.38e-04 mg/100 ml	0.00	6.00e-03	1.66e-03	13
Oils						

Oils - Fruit vegetable oils	Olive, oil, extra virgin	0.02 mg/100 g FW	0.00	0.05	0.02	9
	Olive, oil, virgin	0.02 mg/100 g FW	9.80e-04	0.15	0.05	28
Oils - Other seed oils	Rape seed, oil	0.16 mg/100 g FW	0.16	0.16	0.00	1
	Soy, oil	1.20e-03 mg/100 g FW	1.20e-03	1.20e-03	0.00	1
Seasonings						
Herbs	Common sage, dried	5.80 mg/100 g FW	0.00	11.60	8.20	2
	Common thyme, dried	5.65 mg/100 g FW	0.00	11.30	7.99	2
	Marjoram, dried	7.10 mg/100 g FW	7.10	7.10	0.00	1
	Oregano, dried (wild marjoram)	5.20 mg/100 g FW	0.00	10.40	7.35	2
	Rosemary, dried	2.00 mg/100 g FW	0.00	6.00	3.46	3
Other seasonings	Vinegar	0.11 mg/100 ml	0.00	0.93	0.24	21
Seeds						
Nuts	Walnut, dehulled	0.06 mg/100 g FW	0.04	0.11	0.02	10
Pulses - Beans - Common bean	Common bean [Black], dehulled, raw	0.35 mg/100 g FW	0.11	0.66	0.23	7
	Common bean [Others], dehulled, raw	0.30 mg/100 g FW	0.11	0.56	0.14	18
	Common bean [White], dehulled, raw	0.43 mg/100 g FW	0.32	0.64	0.18	3
Pulses - Lentils	Lentils, dehulled, raw	0.06 mg/100 g FW	0.05	0.09	0.02	4
	Lentils, whole, raw	0.07 mg/100 g FW	0.07	0.07	0.00	1
Soy and soy products	Soybean, sprout, raw	0.21 mg/100 g FW	0.21	0.21	0.00	1
Vegetables						
Cabbages	Cauliflower, raw	0.53 mg/100 g FW	0.53	0.54	7.07e-03	2

Fruit vegetables	Eggplant [Purple], whole, raw	 0.22 mg/100 g FW	0.14	0.34	0.11	3
	Olive [Black], raw	 0.21 mg/100 g FW	0.00	1.00	0.33	9
	Olive [Green], raw	 3.01 mg/100 g FW	0.04	5.00	2.62	3
	Tomato, whole, raw	 0.27 mg/100 g FW	0.16	0.53	0.12	9