

Scientific Discussion on Omega-3 Fatty Acids and Immunity

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Introduction

Respiratory tract infections are established as a major contributor to morbidity and mortality across the world as recognized by seasonal influenza epidemics and, most recently, by the dramatic outbreak of the coronavirus epidemic known as COVID-19. Based on recent figures, approximately 150 million COVID-19 cases have been confirmed globally along with 3 million deaths including 35 million cases in North America and 600,000 deaths. High rates of hospitalization for COVID patients are required to provide mechanical ventilation for those in intensive care units who frequently suffer from acute respiratory failure as well as cardiac and kidney failures plus other serious health challenges.

Public health practices and their advisories to limit the impact and spread of respiratory viruses such as COVID have included maintaining distancing, regular handwashing, face-coverings, and other key measures such as vaccinations as soon as available. Efforts have recently been made to produce specialized food products often referred to as nutraceutical products, functional foods, or medical foods which can contribute to supporting the immune system. One such product is the 'Promuna' beverage drink (1) which contains the natural IgY antibodies as found in pasteurized egg yolk and significant amounts of the beneficial omega-3 fatty acids to support the immune system and related disorders (including COVID-19 outcomes) as discussed below.

The key role that nutrition and diet plays in supporting the immune system is well established. Regrettably, public health discussions and media/press releases and presentations have failed to communicate evidence-based support from leading medical and health journals on nutritional strategies to support the optimal functioning of the immune system. Several vitamins and trace elements (minerals) have been shown over the years to play important and complementary roles in supporting the immune system. Thus, providing optimal nutritional support via enhanced key immune-supporting nutrient intakes is a compelling complementary strategy in addition to public health measures to help control the impact of pathogenic viruses including COVID-19.

Convincing evidence and support as published in key peer-reviewed medical and health journals has come forth on the diverse health benefits of the long-chain omega-3 fatty acids, EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), and their potential beneficial roles in combatting adverse disease outcomes including mortality from COVID-19 viral infection.

Long-Chain Omega-3 Fatty Acid Intakes and the 'Nutrition Gap'

The very low intake of fish/seafood, which provide the primary dietary source of EPA/DHA, in North America averages approximately only one serving/person every 7-10 days. Such intakes provide an average daily intake of only 23-28 mgs of EPA plus 63-77 mgs DHA per adult daily with the sum of EPA plus DHA providing 90-110 mgs/adult/day (2). Regrettably, such intakes are well below minimal target daily intakes of at least 250 mgs/person/day for overall health from various global, regional, and national expert recommendations (3) and 500 mgs/person/day from the Dietitians of Canada and the American Dietetic Association (4) for overall cardiovascular health. Consequently, non-fish/seafood sources of foods enriched in the long-chain polyunsaturated omega-3 fatty acids (EPA/DHA) can thus play a key role

as a rich source of dietary EPA/DHA in filling the 'nutrition gap' between actual and target population intakes for optimal health outcomes as mediated by these important nutrients. Overcoming the widespread insufficient intakes of EPA/DHA omega-3 fatty acids across all sectors of society and throughout the human life cycle by offering nutritious and healthy enriched foods is a worthy goal for our society. The documented health benefits of enhanced omega-3 intakes have ranged from improved pregnancy and childhood performance/outcomes to the prevention and complementary management of chronic health conditions including cardiovascular disorders, inflammatory conditions, certain cancers, mental and age-related disorders as well as supporting athletic performance. Some of the latter published clinical trials using nutritional supplements given as soft gel capsules have administered daily doses of long-chain omega-3 fatty acids approaching up to 3,000-4,000 mgs/person/day. The Food and Drug administration considers daily intakes up to of 3,000 mgs of EPA plus DHA to be generally safe.

The remaining discussion will focus upon published evidence supporting the beneficial roles that increased intakes and the resulting improved status of EPA/DHA omega-3 fatty acids in the human body can provide to help support optimal immune function as related to the recent outbreak and very troublesome impact of the coronavirus, COVID-19.

Scientific Discussion on Omega-3 Fatty Acids and Immunity

Mounting evidence has been forthcoming as published in leading medical and health journals from clinical trials indicating that an optimal long-chain omega-3 fatty acid status (EPA/DHA) in the body and overcoming insufficient intakes is an important factor to help support optimal immune function and to protect against viral infections (5) and associated disease burden (including fever, shortness of breath, dry cough, gastrointestinal abnormalities, and mortality). A healthy immune system plays a central role in reducing the risk, severity, and duration of infections and disease while aiding recovery from illness. Throughout life, EPA and DHA provide important immune-regulatory functions via exerting a positive influence over the immune system. During infancy, DHA is regarded as essential for immune development and function while both EPA and DHA play key roles in immunity throughout the human life cycle particularly by modulating inflammation. Inflammation is well established as a key factor in influencing the immune system.

The immune response is mediated by a variety of pro-inflammatory bioactive molecules produced by different cell types. The omega-3 fatty acids, EPA and DHA, when present at the site of inflammation, are enzymatically converted to pro-resolving mediators known as resolvins, protectins, and maresins. These latter bio-products along with others prevent the infiltration of neutrophils (white cells) into the sites of inflammation and function to provide the resolution of inflammation and to support healing – including in the respiratory tract. Thus, nutritional deficiencies of EPA and DHA can result in both delayed and insufficient resolution of inflammation. When consumed in the diet, EPA and DHA also replace a portion of the cellular omega-6 fatty acid (AA, arachidonic acid) contents thereby reducing the resulting production of the pro-inflammatory metabolites derived from AA.

A very recent review on the topic recommended a target intake of at least 250 mgs of EPA plus DHA/person/day (in keeping with global expert recommendations) as being appropriate for optimal immune health in the general population (6). Such a target intake is at least double or more of current typical intakes in Canada and the United States.

Brief Update of Omega-3 Fatty Acids and COVID-19

There is mounting scientific evidence that omega-3 fatty acids, notably EPA and DHA, may provide a safe, inexpensive, and important complementary role in addition to current public health measures in combatting COVID-19 severity and its adverse outcomes. As reviewed very recently (7), the anti-inflammatory and immunomodulating and possible antiviral effects provided by these unique and efficacious polyunsaturated fatty acids have been implicated in such effects. A very recent clinical study (8) determined the long-chain omega-3 fatty acid levels (summed % EPA + DHA of total fatty acids) in the circulating red blood cells of patients (mean age over 70 years) who were hospitalized with confirmed COVID-19 infection . The primary goal of this study was to determine if the long-chain omega-3 levels as measured may be associated with the resulting death from COVID-19. Interestingly, after adjusting for age and gender, death from COVID-19 was 75 % lower in those patients having higher (EPA + DHA) levels of at least 5.7 % or more in the circulating blood samples when compared to those whose levels were below 5.7 %. It is noteworthy that the average circulating levels in Canadian adults were found to be well below the 5.7 % level in a large population study (9) wherein the average levels were only 4.5 % for all adults and 4.3 % and 4.7 % for males and females, respectively.

Numerous published clinical trials in human subjects have consistently demonstrated that increased intakes of EPA/DHA omega-3 fatty acids, over and above current very low intakes, from fatty fish, special fish oil supplements, and certain enriched food products/functional foods can markedly improve EPA/DHA levels in the circulating blood . Such increases in circulating levels of these important fatty acids renders these available for their uptake and assimilation into various body cells and tissues and the resulting support for optimal health and disease prevention/attenuation. Early published human trials from the University of Guelph found that consumption of omega-3 enriched shell eggs containing DHA (10) significantly increased circulating blood levels of DHA. Subsequently, a follow-up clinical human trial wherein the subjects consumed a liquid egg product which was significantly enriched in EPA plus DHA resulted in an even more marked elevation of the circulating levels of these long-chain omega-3 fatty acids (11).

A very recent review (6) on the importance of an optimal nutritional status for a well-functioning immune system to protect against viral infections recommended an intake of at least 250 mgs of EPA plus DHA daily. With respect to the relationship as published and referred to above (8) between higher levels of (EPA plus DHA) in the circulating red blood cells (at or above 5.7 % of the total fatty acids) being associated with reduced mortality from COVID-19, the average daily intakes of (EPA plus DHA) to reach target levels of 5.7 % or more can be determined. Based on published clinical research (12) , average daily supplemental intakes of at least 300 mgs EPA plus DHA/person (over and above typical background daily intakes of only approximately 110 mgs/person/day) moved the majority of the subjects (with typical initial blood cell levels of approx. 4.3 %) to the higher target threshold of at least 5.7 % or more by the end of the study period of five months. Intakes above 300 mgs of EPA plus DHA /day resulted in progressively higher blood cell levels of these fatty acids and the target level of 5.7 % or more being attained within a shorter time interval (12). It is noteworthy that the new nutritional product called 'Promuna' which is focused on immune health is an excellent source of the long-chain omega fatty acids in addition to other nutrients by providing 600 mgs EPA plus DHA per serving.

ABOUT BURNBRAE FARMS: BURNBRAE FARMS is a 6th generation family owned and operated Canadian company that has been producing eggs for over 75 years. With egg grading, breaking, and farming operations in five provinces across Canada, it has been privately owned and operated by the Hudson family since it was founded in 1891. Burnbrae Farms eggs and egg products can be found in grocery

stores, restaurants, and homes across Canada. They were the first to introduce many important innovations in the egg category including products like Naturegg Free Run, Organic, and Omega 3 shell eggs; Naturegg Simply Egg Whites and EGGCreations! liquid products; Naturegg Eggs2go! ready-to-eat hardboiled eggs; and EGGBakes! and EGGBites! frozen crustless quiches... winning an incredible 14 Grand Prix new product awards from the Retail Council of Canada. To learn more visit burnbraefarms.com.

References

- (1) www.burnbraefarms.com
- (2) Papanikolaou, Y. et al., 2014, Nutrition Journal , 13: 31-36
- (3) Global Recommendations for EPA + DHA , www.issfal.org
- (4) Position of the Am. Dietetic Assoc. and Dietitians of Canada, J. Acad. of Nutrition and Dietetics, 107: P1599.E1 – 1599. E15
- (5) Pecora, F. et al., 2020, Nutrients, 12: in press
- (6) Calder, P. C. et al., 2020, Nutrients, 12: 1181-1190
- (7) Hathaway, D. et al., 2020, Infect. Chemother., 52: 478-495
- (8) Asher, A. et al., 2020, Prostaglandins, Leukotrienes , and Essential Fatty Acids , 166: in press
- (9) Langlois, K. and Ratnayake, W. M. N., 2015, Statistics Canada - Health Reports, 26: 3-11
- (10) Gillingham, L. H. et al., 2005, Food Research International, 38: 1117-1123
- (11) Rose, E. L. and Holub, B. J., 2006, Food Research International
- (12) Flock, M. R. et al., 2013, J. Am. Heart Assoc., 2 (6): e000513