

Additional Scientific Information

1. Fish Skin Waste and Bioactive Peptides

Fish Skin Waste and Bioactive Peptides Fish skin waste, a byproduct of the seafood industry, is a rich source of gelatin and collagen¹. These can be hydrolyzed to produce bioactive peptides, which are sequences of 2–20 amino acids¹. These peptides exhibit a range of bioactivities, including antioxidative, antimicrobial, neuroprotective, antihyperglycemic, and anti-aging properties¹. They contain a high content of hydrophobic amino acids, which contribute to their antioxidant and angiotensin-converting enzyme inhibitory activity¹. The utilization of fish skin waste in this manner not only reduces pollution and economic cost associated with treating fish processing waste but also adds value to the waste¹.

Micronutrients and Supplements Vitamins C, D, zinc, omega-3 fatty acids, probiotics, and plant isolates are all crucial for immune function²³⁴.

- **Vitamin C and D:** These vitamins are essential for a healthy functioning immune system². Deficiencies in these vitamins can weaken immunity and increase susceptibility to infections².
- **Zinc:** This mineral is also important for proper immune function². A deficiency in zinc can similarly weaken the immune system².
- **Omega-3 Fatty Acids:** These are essential fats that your body can't make itself. They play a crucial role in brain function, as well as normal growth and development⁵.
- **Probiotics:** These are live bacteria and yeasts that are good for your health, especially your digestive system. We usually think of bacteria as something that causes diseases. But your body is full of bacteria, both good and bad. Probiotics are often called “good” or “friendly” bacteria because they help keep your gut healthy.
- **Plant Isolates:** These are compounds derived from plants that have beneficial health effects. They can include a wide range of substances, including antioxidants, phytochemicals, and more.

Together, these nutrients and supplements can help maintain a healthy immune system and potentially reduce the risk of respiratory infections²³⁴. However, it's important to note that while these substances can support immune health, they are not a substitute for a balanced diet, regular exercise, adequate sleep, and other healthy lifestyle habits. It's always a good idea to consult with a healthcare provider before starting any new supplement regimen.

2. What are Antioxidants

What are Antioxidants? Antioxidants are substances that can counteract unstable molecules called free radicals that damage DNA, cell membranes, and other parts of cells¹². They work by generously giving electrons to free radicals without turning into electron-scavenging substances themselves². This helps break a chain reaction that can affect other molecules in the cell and other cells in the body¹.

Role in Immune Health Free radicals are an inescapable part of life. The body generates free radicals in response to environmental insults, such as tobacco smoke, ultraviolet rays, and air pollution, but they are also a natural byproduct of normal processes in cells¹. When the immune system musters to fight intruders, for example, the oxygen it uses spins off an army of free radicals that destroy viruses, bacteria, and damaged body cells in an oxidative burst¹.

However, an excessive chronic amount of free radicals in the body causes a condition called oxidative stress, which may damage cells and lead to chronic diseases². Antioxidants help reduce this oxidative stress by neutralizing free radicals¹².

Sources of Antioxidants The body's cells naturally produce some powerful antioxidants, such as alpha lipoic acid and glutathione¹. The foods you eat supply other antioxidants, such as vitamins C and E¹. Plants are full of compounds known as phytochemicals—literally, “plant chemicals”—many of which seem to have antioxidant properties as well¹.

Benefits of Antioxidants While fighting free radicals is the primary benefit of antioxidants, there is a secondary benefit. Indirectly, antioxidants help reduce the risk of chronic disease development because they negate those free radicals from causing havoc to our cells³.

It's important to note that while antioxidants can support immune health, they are not a substitute for a balanced diet, regular exercise, adequate sleep, and other healthy lifestyle habits¹². Always consult with a healthcare provider before starting any new supplement regimen.

3. High-affinity oligopeptides from fish protein

High-affinity oligopeptides from fish protein: High-affinity oligopeptides are short chains of amino acids derived from fish proteins. These have been identified to potentially inhibit COVID-19 and anxiety¹. In a study, 20 marine fish proteins were subjected to in silico hydrolysis by gastrointestinal enzymes, generating a large number of active peptides. Some of these peptides, such as VIQY, ICIY, PISQF, VISAW, AIPAW, and PVSQF, showed high-affinity binding to SARS-CoV-2 main protease and monoamine oxidase A¹. These enzymes are key to the life cycle of the virus and the regulation of mood, respectively. Therefore, these oligopeptides could potentially be used as lead compounds to design inhibitors against COVID-19 and anxiety¹.

Bovine Colostrum (BC): Bovine colostrum is the initial milk produced by cows after giving birth. It contains numerous bioactive substances, including proteins, enzymes, growth factors, immunoglobulins, and lactoferrin². These components have been found to have potential benefits against SARS-CoV-2²³.

- **Immunoglobulins and Lactoferrin:** These are immune modulators present in BC. Immunoglobulins are antibodies that play a pivotal role in immune defense⁴⁵. Lactoferrin is a protein involved in the body's immune response to infections, including those caused by bacteria and viruses⁵. These components have potential cross-reactivity against SARS-CoV-2, aiding in virus neutralization².
- **Boosting the Immune System:** BC has immunomodulatory effects due to its high concentration of bioactive components, which might help control immunological responses, potentially fostering a balanced immune response². Its comprehensive food profile also supplies important vitamins, minerals, and amino acids, fostering a healthy immune system².
- **Healing Injuries and Improving Mood:** BC contains growth factors and cytokines that promote healing⁴. It also contains peptides that help regulate your immune system and have natural anti-inflammatory properties⁴, which can contribute to improved mood.
- **Slowing Aging:** BC is rich in vitamins A, B, D, and E, which are found in much higher concentrations in bovine colostrum than in mature cow's milk⁴. These vitamins, along with the other nutrients in BC, can contribute to overall health and potentially slow the aging process⁴.

In summary, both high-affinity oligopeptides from fish protein and bovine colostrum have potential benefits in the context of COVID-19 and overall health. However, it's important to note that more research is needed to fully understand these benefits and their applications. Always consult with a healthcare provider before starting any new supplement regimen.

Note: There are **several natural compounds** that have been studied for their potential effectiveness against COVID-19. Here are a few examples:

1. **Phytochemicals:** Phytochemicals are compounds found in plants that have been shown to have health benefits. Some phytochemicals, such as **quercetin** and **gallic acid**, which are found in many foods like grapes, strawberries, cherries, and broccoli, can inhibit the growth of the RNA-dependent RNA polymerase (RdRp) enzyme and thus prevent the spread of SARS-CoV-2 in the body¹.
2. **Natural Products:** A literature search yielded **70 phytochemicals** and **ten polyherbal formulations** which were scientifically analyzed against the SARS-CoV-2 virus and its targets and found significant². The efficacy of numerous natural products against the principal COVID-19 therapeutic targets, namely NSP25, ACE2 receptor, 3CL pro/Mpro, RdRp, PL Pro, TMPRSS2, Cathepsin L, Nsp2, Spike (s) protein, Nsp15, and nucleocapsid (N) protein, has been investigated².
3. **Marine Bioactive Compounds:** Natural inorganic polyphosphate (polyP) that is derived from marine microorganisms and sponges has been reported to protect against severe COVID-19. Additionally, various marine metabolites that are derived from scleractinian-related animals, algae, and sponges have been found to interact with a major SARS-CoV-2 protease Mpro³.
4. **Natural Compounds Acting on Endolysosomes and mTOR Signaling Pathways:** Naturally existing compounds (phytochemicals) through their actions on endolysosomes and mTOR signaling pathways might provide therapeutic relief against COVID-19⁴.

Please note that while these compounds show promise in laboratory settings, more research is needed to confirm their effectiveness in humans. Always consult with a healthcare provider before starting any new supplement regimen. It's also important to continue following public health guidelines to prevent the spread of COVID-19.

4. Nutraceuticals

Nutraceuticals are food products, extracts, or food derivatives such as vitamins, herbs, amino acids, minerals, and enzymes that can potentially exhibit pharmaceutical benefits in addition to their nutritional value¹². They are also commonly referred to as dietary supplements or functional foods¹.

Nutraceuticals have been found to have **anti-inflammatory, anti-oxidative, antitumor, antidiabetic, and anti-obesity properties**³. While dietary fibers, probiotics, and prebiotics play a role in the digestive system, antioxidants and polyphenols help in relief from ROS and cellular stress³.

Here are some ways nutraceuticals can help manage complications of certain chronic diseases:

1. **Allergies:** Certain nutraceuticals have anti-inflammatory properties that can help manage the inflammation caused by allergic reactions¹.
2. **Alzheimer's:** Some nutraceuticals have shown promise in slowing the progression of neurodegenerative diseases like Alzheimer's¹.
3. **Cardiovascular Diseases:** Nutraceuticals can help manage cardiovascular diseases by reducing low-density lipoprotein cholesterol, blood pressure, and glucose levels¹.
4. **Obesity:** While meaningful reductions in body weight are unlikely to be achieved with nutraceuticals alone, they can serve as a useful adjunct to pharmaceuticals to better manage chronic conditions like obesity¹.

It's important to note that the use of nutraceuticals in the prevention and management of chronic diseases is an emerging area of research, and longer-term clinical trials are needed to confirm their claimed disease-related benefits¹. Individuals are advised to consult their physician before using nutraceuticals¹.

5. Nutraceuticals, also known

Nutraceuticals, also known as dietary supplements or functional foods, are products derived from food sources that provide both nutrition and medicinal benefits¹. They are typically categorized into four main groups²:

1. **Dietary Supplements:** These are products taken by mouth that contain dietary ingredients intended to supplement the diet. The dietary ingredients in these products may include vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, glandulars, and metabolites³.
2. **Functional Foods:** These are foods that have a potentially positive effect on health beyond basic nutrition. They promote optimal health and help reduce the risk of disease.
3. **Medicinal Foods:** These are formulated to be consumed or administered internally, under the supervision of a physician and are intended for the specific dietary management of a disease or condition.
4. **Farmaceuticals:** These are medically valuable components produced from modified agriculture crops or animals.

Here are some examples of commonly used nutraceuticals⁴⁵:

- **Vitamins and Minerals:** These are essential nutrients that the body needs in small amounts to work properly.
- **Herbal-based Dietary Supplements:** These are products made from plants for use in the treatment and management of certain diseases and medical conditions.
- **Probiotics:** These are live bacteria and yeasts that are good for health, especially the digestive system.
- **Pre- and Probiotics:** These are used to stimulate the growth of healthy bacteria in the gut.
- **Fortified Cereals:** These are cereals to which extra nutrients have been added.
- **Processed Foods and Beverages:** These are foods and drinks that have been altered in some way during preparation.
- **Specific Nutraceutical Products:** Some specific products that are popular in the market include Liquid Prenatal Vitamins, Vitamin D3, Garcinia Cambogia, Raspberry Ketones, and Green Tea Supplements⁵.

Remember, while nutraceuticals can provide health benefits, they should not replace a balanced diet and it's always important to consult with a healthcare provider before starting any new supplement regimen¹.

6. Some Natural Sources for the Nutrients

1. **Vitamins and Minerals:** These essential nutrients can be found in a variety of foods. [For example, Vitamin A can be found in beef, liver, eggs, shrimp, fish, fortified milk, sweet potatoes, carrots, pumpkins, and spinach¹. Vitamin D can be found in fortified milk and cereals, and fatty fish¹. Vitamin E can be found in vegetable oils, leafy green vegetables, whole grains, and nuts¹. Vitamin K can be found in cabbage, eggs, milk, spinach, broccoli, and kale¹.](#)
2. **Herbal-based Dietary Supplements:** These are products made from plants for use in the treatment and management of certain diseases and medical conditions. [Some common herbs used in these supplements include Aloe Vera, Ashwagandha, Asian Ginseng, Astragalus, Bilberry, Bitter Orange, Black Cohosh, and Bromelain².](#) Other herbs include Black cohosh, Echinacea, Evening primrose, Feverfew, Garlic, Ginkgo biloba, Ginseng, Goldenseal, Green tea, Hawthorn, Saw palmetto, and St. [John's wort³.](#)
3. **Probiotics:** Probiotics are live bacteria and yeasts that are good for health, especially the digestive system. [Natural sources of probiotics include yogurt, kefir, sauerkraut, tempeh, kimchi, miso, kombucha, pickles, buttermilk, natto, and certain types of cheese⁴.](#)
4. **Prebiotics:** Prebiotics are types of dietary fiber that feed your friendly gut bacteria. [Natural sources of prebiotics include whole grains, bananas, greens, onions, garlic, soybeans, and artichokes⁵. Other sources include chicory root, dandelion greens, and Jerusalem artichoke⁶.](#)

Remember, while these foods can provide health benefits, they should not replace a balanced diet. [It's always important to consult with a healthcare provider before starting any new supplement regimen⁷.](#)

7. BioNutrients

BioNutrients is a term that can refer to different concepts depending on the context. Here are a few interpretations:

1. **BioNutrients in Nutritional Supplements:** In the context of nutritional supplements, BioNutrients refers to a brand that offers various health products¹. Their offerings include probiotics, black seed oil, CoQ10/L-Carnitine, grape seed complex, mushroom complex, flaxseed oil, astragalus root, NAC N-Acetyl Cysteine, magnesium, and cordyceps sinensis¹.
2. **BioNutrients in Agriculture:** In the context of agriculture, BioNutrients refers to bio-nutrition, which is the reaction of bio-active carbon compounds with nutritional mineral ions through chelation, complexing, and/or microencapsulation². This process helps plants grow based on their ability to assimilate mineral ions².
3. **BioNutrients in Space Exploration:** In the context of space exploration, NASA has an experiment called BioNutrients that is testing a way to use microorganisms to produce nutrients off Earth and on demand³⁴. This experiment is critical for human health in space³⁴. The nutrients that the yeast will produce in this experiment are called beta carotene and zeaxanthin³. These are antioxidants usually found in vegetables, and they're critical for keeping our eyes healthy³. The experiment is now more than halfway through a five-year trial aboard the International Space Station⁴.

Remember, while these BioNutrients can provide health benefits, they should not replace a balanced diet. It's always important to consult with a healthcare provider before starting any new supplement regimen¹.

8. BioNutrients potential benefits

BioNutrients can have several potential benefits depending on the context:

1. **BioNutrients in Nutritional Supplements:** BioNutrients, as a brand, offers various health products that can provide nutritional benefits. These products include probiotics, black seed oil, CoQ10/L-Carnitine, grape seed complex, mushroom complex, flaxseed oil, astragalus root, NAC N-Acetyl Cysteine, magnesium, and cordyceps sinensis¹.
2. **BioNutrients in Agriculture:** In agriculture, BioNutrients refers to bio-nutrition, which involves the reaction of bio-active carbon compounds with nutritional mineral ions through chelation, complexing, and/or microencapsulation². This process helps plants grow based on their ability to assimilate mineral ions².
3. **BioNutrients in Space Exploration:** NASA's BioNutrients experiment is testing a way to use microorganisms to produce nutrients off Earth and on demand¹. The nutrients that the yeast will produce in this experiment are called beta carotene and zeaxanthin¹. These are antioxidants usually found in vegetables, and they're critical for keeping our eyes healthy¹. The same kind of system designed for space could also help provide nutrition for people in remote areas of our planet².
4. **BioNutrients in Alternative Protein Sources:** Bioactive peptides from proteins alternative to meat display a wide spectrum of biological activities ranging from nutraceutical to therapeutic potential³. Due to the healthy properties of these foods for the high abundance of bioactive peptides and phytochemicals, more consumers are expected to turn to vegetarianism or veganism in the future³.

Remember, while these BioNutrients can provide health benefits, they should not replace a balanced diet. It's always important to consult with a healthcare provider before starting any new supplement regimen¹.

9. BioNutrients and traditional supplements

BioNutrients and traditional supplements both aim to provide the body with essential nutrients that may not be obtained from the diet alone. However, there are some differences between them:

1. **Source:** BioNutrients are typically derived from natural sources such as plants, animals, or microorganisms¹². Traditional supplements, on the other hand, can be either natural or synthetic³. Synthetic supplements are made artificially in a laboratory setting or industrial process³.
2. **Absorption and Efficacy:** The body may react differently to synthetic nutrients compared to natural ones³. Some studies suggest that natural nutrients are absorbed and used more efficiently by the body³. For example, natural vitamin E is absorbed twice as efficiently as synthetic vitamin E³.
3. **Composition:** BioNutrients often come as a complex of several nutrients and other bioactive compounds, which can have synergistic effects¹². Traditional supplements, especially synthetic ones, usually contain isolated nutrients³.
4. **Safety and Regulation:** Both BioNutrients and traditional supplements are subject to food laws, so they are not permitted to make any medicinal claims relating to the treatment or prevention of specific diseases¹. However, more general health claims, e.g., 'helps to maintain a healthy heart' or 'helps to maintain healthy joints', can be made¹.
5. **Use in Medicine and Agriculture:** Apart from human nutrition, BioNutrients also find applications in agriculture and space exploration¹². Traditional supplements are primarily used for human nutrition¹.

It's important to note that while both BioNutrients and traditional supplements can provide health benefits, they should not replace a balanced diet. It's always important to consult with a healthcare provider before starting any new supplement regimen¹³.