



The Potential Role of Lutein in Preventing the Development of Myopia

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Abstract: This paper comprehensively analyzed the role of lutein in the prevention of myopia progression. Myopia, especially in adolescents, has become an increasingly serious global problem. As a natural carotenoid, lutein is considered to be effective in preventing the development of myopia. This article first reviews the research progress on the effect of lutein on myopia, and then elaborates on the antioxidant properties of lutein, its regulatory effect on the intraocular environment, and its important role in maintaining visual development. In addition, this paper also discusses the methods of preventing myopia by reasonable intake of lutein and the use of lutein supplements, as well as the matters and challenges that should be paid attention to in this process. Finally, the article summarizes the potential of lutein in preventing myopia and proposes future research directions.

Keywords: lutein, myopia prevention, antioxidation, retinal protection

1. Introduction

Myopia has become a global public health problem. Now children generally glasses, this is my concern. There is also the degree of physical health, due to less physical exercise, decreased. Myopia not only affects the quality of vision, but also may lead to a variety of eye diseases. Lutein, as a naturally occurring carotenoid in the eyes, has attracted attention due to its unique antioxidant and retinal protection properties. In recent years, researchers have begun to pay attention to the potential role of lutein in preventing myopia. This article aims to explore the role of lutein in the prevention of myopia, analyze its mechanism, and discuss how to effectively use lutein as a potential prevention strategy. By synthesizing the existing research, it aims to provide a scientific basis for the prevention of myopia and provide guidance for research and practice in related fields.

2. Research progress on the effect of lutein on myopia

In the study of myopia, lutein has been found to play an important role in eye health. Since lutein is mainly concentrated in the macular area of the eye, it is of great significance for protecting the retina, reducing light damage, and resisting free radicals. Studies have shown that lutein can absorb high-energy blue light and reduce the damage of blue light to the retina, which may help slow down the progression of myopia. A series of epidemiological studies and clinical trials have begun to explore the association between lutein levels and the development of myopia. These studies usually use blood samples or eye examinations to assess lutein levels and observe their relationship with the development of myopia. Preliminary results showed that higher lutein levels seem to be associated with a slower progression of myopia, especially in children and adolescents. The current research on how lutein affects the mechanism of myopia development is still in the exploratory stage. On the one hand, lutein protects the eyes from oxidative stress damage through its antioxidant properties; on the other hand, it may reduce the pressure caused by long-term eye focus by improving the optical quality inside the eye. In addition, some studies have suggested that lutein may regulate eye growth by affecting the intraocular signal transduction pathway, but this hypothesis needs more experimental evidence to support.

3. Why lutein can prevent myopia

3.1 Antioxidant properties and retinal protection of lutein

As a powerful antioxidant, lutein plays an important role in protecting the retina. Studies have shown that lutein can effectively absorb harmful light inside the eye, especially blue light, thereby reducing the damage of blue light to retinal cells. This protective effect helps to reduce oxidative stress caused by light irradiation, which is one of the main causes of retinal cell damage and functional degradation. In addition, lutein can also neutralize free radicals and reduce the negative effects of oxidative stress on eye health. Because the morphological changes of myopia will make the retina thinner, these effects of lutein are particularly important for the prevention of myopia and related complications [2].

3.2 Regulation of lutein on intraocular environment

Lutein may also play an anti-myopia role by regulating the intraocular environment. Studies have shown that lutein can improve the light filtering and scattering characteristics in the eye, which helps to improve visual quality and reduce the optical burden of the eye. In the macular area of the eye, the dense distribution of lutein helps maintain the functional stability of this area, which is essential for maintaining good visual perception and reducing eye fatigue. In addition, lutein may also regulate the growth and development of the eyeball by affecting intraocular signal transduction and cellular metabolic processes, although the specific mechanisms of these effects still need further study.

3.3 The role of lutein in maintaining visual development

In the critical period of visual development, the role of lutein is particularly significant. In children and adolescents, the eyes develop rapidly, and the supplementation of lutein may be of great significance for maintaining normal visual development and preventing the deterioration of myopia. Some studies have shown that adequate lutein intake is associated with better visual function and lower risk of myopia. Lutein helps to support the normal development of the visual system by maintaining the structural integrity of the retina and ensuring the correct transmission of visual signals. In addition, lutein may also prevent the development of myopia by affecting biochemical processes in the eye, such as by regulating intraocular pressure or improving blood supply to the retina.

4. How to prevent myopia by lutein

4.1 Method of reasonable intake of lutein

Lutein is naturally present in many foods, especially in green leafy vegetables. For example, spinach, kale, broccoli and kale are good sources of lutein. In addition to lutein, these foods are also rich in other vitamins and minerals, which have comprehensive health benefits. For example, spinach contains not only lutein, but also iron and vitamin K, which contributes to blood health and bone strength. Corn, orange vegetables and fruits (such as oranges and carrots) are still important sources of lutein in daily diet, although the content of lutein is low. In order to maximize the absorption of lutein, these vegetables can be eaten together with foods containing healthy fats, such as frying or pairing with olive oil. Lutein is fat-soluble, so the intake of fat is essential for its absorption. In the daily diet, it should be ensured that the right amount of healthy fat is consumed to promote the absorption and utilization of lutein. Healthy fats can be obtained from foods such as olive oil, fish oil, nuts (such as walnuts and almonds), avocados, etc. These foods not only help the absorption of lutein, but also rich in omega-3 fatty acids, is very beneficial to heart health. At the same time, avoid excessive intake of saturated fat and trans fat, these fat types may have a negative impact on health. The key to a balanced diet is to diversify food sources to ensure comprehensive nutrition while maintaining overall health [3].

For people who struggle to obtain sufficient lutein in their daily diet, lutein supplements are an effective choice. When choosing lutein supplements, attention should be paid to the lutein content and other ingredients on the product label. Lutein supplements on the market may contain different forms of lutein, and their bioavailability may vary. Therefore, choosing well-known brands and clinically tested products is very important. In addition, it is recommended to use supplements under the guidance of a doctor or nutritionist to determine the appropriate dosage and supplementation plan. Regular eye examinations and nutritional status assessments can help monitor the effectiveness of supplements and ensure long-term health. Regular testing of lutein levels and eye health is crucial, especially for those attempting to prevent myopia through lutein. Lutein levels can be measured through blood tests, which helps determine whether an individual has reached sufficient lutein intake. In addition, fundus examination can evaluate the health status of the macular area (the part of the eye that is rich in lutein), and visual examination can help monitor visual changes, especially in children and adolescents. These tests can help identify potential eye problems and evaluate the impact of lutein intake on eye health. Regularly conducting these tests can help detect any visual problems early and make adjustments to existing lutein supplementation plans. They can also guide individuals to make healthier choices in their daily lives, such as adjusting dietary habits and increasing the intake of beneficial nutrients for the eyes.

The intake of lutein should not be viewed in isolation, but should be part of a comprehensive and healthy lifestyle. This includes maintaining a balanced diet, ensuring that in addition to lutein, sufficient intake of other vitamins and minerals such as vitamins A, C, E, and zinc is also crucial for eye health. Moderate physical exercise is also an important component of maintaining eye health, as it can improve blood circulation, enhance the body's ability to absorb nutrients, including lutein. Meanwhile, avoiding prolonged close eye contact, such as reducing screen time and taking regular eye rest, can help alleviate eye fatigue and slow down the development of myopia.

4.2 Correct use of lutein supplements

Your doctor or ophthalmologist will evaluate your eye health, including checking your vision and fundus to determine whether there is myopia or other eye problems. They may also consider your family history and other potential risk factors. Based on an eye health assessment, a doctor or expert will determine whether you need lutein supplements. Not everyone needs additional lutein, so it is necessary to determine whether supplementation is necessary according to the individual situation. If it is determined that lutein supplementation is needed, the doctor or expert will formulate a dosage and supplementation scheme suitable for you. The dosage of lutein usually varies according to individual differences, so customized recommendations are the key to ensure the best effect. Once doctors or medical professionals recommend lutein supplements, the next key is to choose high-quality products. Carefully review the product label of lutein supplements. Ensure that the product contains sufficient lutein components and no unnecessary additives. The daily recommended dose information is usually provided on the label. Select well-known lutein supplement brands, which are usually more reliable because they are subject to more stringent quality control and testing. Lutein supplement products that pass clinical testing are preferred because they have been scientifically verified and have higher credibility. It is important to follow the dose guidance of doctors or medical professionals to ensure the safe and effective use of lutein supplements. Do not decide to increase or decrease the dose of lutein, but strictly follow the advice of doctors or experts. Too high or too low dose may lead to adverse reactions or affect the effect. Report your use to your doctor regularly so that they can adjust the dose or supplement the regimen if necessary. Regular monitoring can ensure your good experience in lutein supplementation and eye health [4].

Segmenting the dose of lutein into multiple intakes is an important strategy to ensure its continuous availability in the body, thereby maintaining a stable lutein level and helping to support eye health. Dividing the dose of lutein into multiple intakes helps to avoid sharp fluctuations in lutein levels in the blood. In this way, a more stable lutein concentration can be maintained to ensure a continuous supply of lutein to the eyes and retina. This is important for supporting eye health and preventing myopia. Split dose means that the total lutein dose in a day is divided into multiple intakes, usually including morning, noon, and evening. This ensures that lutein is available at different time points to meet the needs of the eye. The specific way to split the dose can vary according to the individual's needs and the doctor's advice. Doctors or medical professionals can make the best segmentation plan according to your eye health and the specific brand and dose of lutein. Lutein is fat soluble, so it is best to take it with food, especially food containing healthy fat. Here are the details of lutein matching with diet: when taking lutein, taking healthy fat at the same time will help improve the absorption efficiency of lutein. Fat can help lutein to be digested and absorbed more easily, thus providing more lutein supply to the eyes. Choose foods containing healthy fats to match lutein intake. Some good sources of healthy fats include olive oil, fish oil, nuts (such as walnuts and almonds), avocado, etc. These foods are not only conducive to the absorption of lutein, but also beneficial to general health. After using lutein supplements, it is very important to have regular eye health checks. Regular eye health examination can help evaluate the effect of lutein supplements. Your doctor or ophthalmologist can check your vision and fundus to determine whether there is any improvement or change. If there are problems or adjustments after using lutein supplements, eye health experts can take timely action. This includes adjusting the dose or supplementation regimen to ensure you get the best results in terms of eye health.

4.3 Myopia prevention combined with other nutrients and lifestyle

In addition to lutein, make sure your diet also contains other important nutrients, such as vitamin A, vitamin C, vitamin E, zinc, and antioxidants. Vitamin A is the key to maintain eye health. It helps maintain the normal function of the retina, supports night vision, and maintains the health of the eye surface. Foods such as carrots, sweet peppers, sweet potatoes and green leafy vegetables are rich in vitamin A. Vitamin C is a powerful antioxidant that helps protect eyes from free radicals. Citrus fruits, strawberries, kiwi fruit and tomatoes are good sources of vitamin C. Vitamin E is also an antioxidant that helps protect eye tissues from oxidative stress. Foods such as nuts, seeds, olive oil and avocado are rich in vitamin E. Zinc is one of the trace elements necessary to maintain eye health. It is involved in the normal function of retina and the health of life support body. Nuts, meat, beans and whole grains are good sources of zinc. Foods are rich in antioxidants, such as blueberries, strawberries, nuts, red grapes and green tea, which can help resist free radical damage and protect eyes from oxidative stress. Antioxidants help maintain the health of eye tissues and reduce the risk of myopia. Reduce long-time close eye use, especially long-time use of electronic devices, such as computers, smartphones and tablets. Regular rest and keeping away from the screen can help reduce eye fatigue and the incidence of myopia. Encourage children and adults to participate in outdoor activities, especially in natural light. Outdoor activities can promote the focus adjustment of the eyes for long distance and help slow down the development of myopia. Regular eye exercises can help relieve the tension of eyes, enhance the flexibility of eye muscles, and improve the ability of hyperopia. These exercises can include eye rotation, far and near

focusing, etc. Check your vision regularly to find and correct any visual problems in time. Early vision problems can be more easily treated and managed, which is helpful to prevent further development of myopia. Vision tests can also help determine whether glasses or contact lenses are needed to improve vision. You can take comprehensive measures to maintain eye health and reduce the risk of myopia through a nutritionally balanced diet, increasing antioxidant intake, controlling screen time, outdoor activities, eye exercises and vision examination. These health habits can be easily implemented in daily life and help protect your eyesight [5].

5. Precautions for lutein use

Individual differences. Different people may have different eye health and lutein requirements. For example, a young person may not have obvious myopia problems, while an older adult may have developed moderate myopia. In this case, ophthalmologists need to determine whether lutein supplementation is needed and the appropriate dose according to the individual situation.

Side effects and excessive intake. Although lutein is considered relatively safe, in some cases, excessive intake may lead to side effects, such as headache, nausea, or skin allergy. Therefore, when using lutein supplements, the recommendations of doctors or medical professionals should be followed to avoid excessive doses or unnecessary intake.

Product selection. There are many different brands and types of lutein supplements on the market. Some products may claim higher bioavailability or better effects. When choosing products, consumers may feel confused. It is recommended to consult doctors or professional medical personnel to select well-known brands and lutein supplements that have passed clinical tests.

Considering these factors and taking comprehensive measures, including reasonable diet, lifestyle improvement and the use of lutein supplements under the guidance of doctors or professional medical personnel, can help reduce the risk of myopia and maintain good eye health. Most importantly, individual needs and situations will vary. Therefore, before using lutein, it is recommended to consult the advice of medical experts to develop the most appropriate prevention strategy.

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