SPECIFICATION
MYOPIA PREVENTION ARTICLE AND MYOPIA PREVENTION SET

Field of the Invention

[0001]

The present invention relates to a myopia prevention article.

BACKGROUND ART

[0002]

The eye reportedly incurs various damage when exposed to ultraviolet light (Saito, et al., Jpn Opthalmol 2010; 54 486-493, Per G. Soderberg, Progress in Biophysics and Molecular Biology 107 (2011) 389-392). As a result, many products, such as eyeglasses and contact lenses, that minimize the transmission of ultraviolet light to the extent possible to prevent eye exposure to ultraviolet light across the full spectrum of wavelengths are now commercially available.

[0003]

Meanwhile, the number of persons with myopia is reportedly still increasing worldwide. Myopia includes refractive myopia and axial myopia, many cases being axial myopia. With axial myopia, myopia progresses in association with elongation of an axial length of the eye, and the elongation is irreversible (Morgan IG, et al., Lancet, 2012). When myopia progresses, high myopia occurs, and high myopia is known as the leading cause of blindness (Iwase A, et al., Ophthalmology, 2006). For this reason, there has been strong demand for means for preventing the occurrence of myopia and means for delaying the progression of myopia.

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0004]

It is therefore an object of the present invention to provide a myopia prevention article.

Means for Solving the Problems

[0005]

The present inventors were the first to discover that a degree of elongation of the axial length of an eye exposed to ultraviolet light of more than 315 nm and not more than 400 nm is significantly small compared to the degree of elongation of the axial length of an eye not exposed to ultraviolet light across the full spectrum of wavelengths, and the degree of myopia related to the refractive value of the eye decreases. That is, the present inventors were the first to discover that exposure of the eye to ultraviolet light only made of the wavelengths in that specified range makes it possible to prevent myopia and delay the progression of myopia. The present invention addresses the problem of providing a myopia prevention article that ensures eye exposure to ultraviolet light with wavelengths of more than 315 nm and not more than 400 nm or 360 nm to 400 nm inclusive.

[0006]

An embodiment of the present invention is a myopia prevention article (excluding

example of the present invention.
Fig. 3 is a graph showing degrees of elongation of an axial length of control eyes and eyes into which one of two types of intraocular lenses was inserted in one example of the present invention.
Fig. 4 is a graph showing the relationship between a strength and a wavelength of ultraviolet light emitted by a UVA irradiation device used in one example of the present invention.
Fig. 5 is a table showing the relationship between the strength of ultraviolet light emitted by the UVA irradiation device and a distance from the UVA irradiation device, used in one example of the present invention.
Fig. 6 is a graph showing refractive values of eyes of chicks irradiated with UVA and eyes of chicks not irradiated with UVA in one example of the present invention.
Fig. 7 is a graph showing axial lengths of eyes of chicks irradiated with UVA and eyes of chicks not irradiated with UVA in one example of the present invention.
Fig. 8 is a graph showing the relationship between a strength and a wavelength of light having a peak at 305 nm and emitted by the UV irradiation device, used in one example of the present invention.
Fig. 9 is an example of an optical spectrum of an LED lamp that does not emit short wavelength light with a wavelength of more than 315 nm and not more than 400 nm and does not have a myopia suppression effect.
Fig. 10 is an example of a transmittance light spectrum of eyeglass lenses through which short wavelength light with a wavelength of more than 315 nm and not more than 400 nm is not transmitted, and by which there is no myopia suppression effect.
Fig. 11 is an optical spectrum of a lamp that emits short wavelength light with a wavelength of 360 nm to 400 nm inclusive in one example of the present invention.
Fig. 12 is a lamp having the optical spectrum shown in Fig. 11 in one example of the present invention.
Fig. 13 is a transmittance spectrum of eyeglass lenses through which short wavelength light with a wavelength of more than 315 nm and not more than 400 nm is transmitted in one example of the present invention.

Embodiments of the Invention
[0013]

The following describes in detail embodiments of the present invention that were completed on the basis of the discovery described above while providing examples. Note that the object, features, advantages, and ideas of the present invention are apparent to those skilled in the art from the descriptions herein. Furthermore, those skilled in the art can easily reproduce the present invention from these descriptions. The embodiments and the specific examples described below represent preferable modes of the present invention, which are given for the purpose of illustration or description. The present invention is not limited thereto. It is obvious to those skilled in the art that various changes and modifications may be made according to the descriptions of the present specification without departing from the spirit and scope of the present invention disclosed herein.
[0014]

In the present specification, "to prevent myopia" means to prevent the occurrence of myopia and to delay the progression of myopia.

article that comprises the light emission part that emits ultraviolet light with a wavelength of more than 315 nm and not more than 400 nm, the myopia prevention effect was verified by the test described below.

[0042]

A chick is known to develop myopia in an eye (shielded eye) that is covered with a transparent hemisphere (refer to Seko, et al., Invest. Ophthalmol. Vis. Sci, May 1995, Vol. 36, No. 6, 1183-1187, for example). Hence, one eye of each of 30 White-Leghorn chicks was covered with a transparent hemisphere six days after birth. The chicks were divided into a non-UVA irradiation group of 15 that were not subjected to UVA irradiation and a UVA irradiation group of 15 that were subjected to UVA irradiation, and raised for one week spending 12 hours in the light and 12 hours in the dark each day. The degree of myopia development of the shielded eye was then examined.

[0043]

The UVA irradiation was performed using the UV lamp PL-S TL/08 (Phillips) at a UVA output of 1.7 W.

[0044]

Fig. 4 shows the spectrum energy distribution of the UVA irradiation device, and Fig. 5 shows the relationship between the strength of the irradiated ultraviolet light and the distance from the lamp.

[0045]

The refractive value, vitreous chamber length, and the axial length of the shielded eye of each of 14 chicks in the non-UVA irradiation group and 13 chicks in the UVA irradiation group were measured 13 days after birth (one week after shielding was started). The refractive value was measured using an autorefractometer by a standard method. The vitreous chamber length and the axial length of the eye were measured using US-4000 (Nidek) in mode B.

[0046]

Fig. 6 shows the results of refractive value measurements, and Fig. 7 shows the results of axial length measurements. A Mann-Whitney U test was used for the significance test.

[0047]

As shown in Fig. 6, the average refractive value of the shielded eyes of the UVA irradiation group was significantly large compared to the average refractive value of the shielded eyes of the non-UVA irradiation group (there was a myopia prevention effect from UVA irradiation). Further, as shown in Fig. 7, the average axial length of the shielded eyes of the UVA irradiation group was significantly small compared to the average axial length of the shielded eyes of the non-UVA irradiation group. Thus, it was clear that the degree of myopia of the UVA irradiation group was significantly small compared to that of the non-UVA irradiation group. Further, based on the values of strength shown in Figs. 4 and 5, the myopia prevention effect was achieved by relatively weak UVA.

[0048]

<Example 3>

When light (Fig. 8) having a peak at 305 nm was irradiated for two days on chicks five days after birth, epithelium inflammation was formed on the corneas of the chicks. Thus, the light has potent tissue damage properties, and thus the light irradiated for myopia

prevention is preferably 340 nm or greater, more preferably 350 nm or greater, and even more preferably 360 nm or greater.

[0049]

<Example 4>

To achieve a myopia suppression effect by light with a wavelength of more than 315 nm and not less than 400 nm, it is effective to use a lamp that emits light with that wavelength and eyeglass lenses through which that light is transmitted, in combination.

[0050]

The lamps and glasses already on the market do not exhibit the effect claimed in the present patent. For example, Fig. 9 shows the optical spectrum of an LED lamp that does not emit light with a wavelength of more than 315 nm and not more than 400 nm and does not have a myopia suppression effect, and Fig. 10 shows a transmittance light spectrum of eyeglass lenses through which light is not transmitted and by which there is no myopia suppression effect.

[0051]

On the other hand, Fig. 11 shows an optical spectrum of a lamp and Fig. 12 shows an image of the lamp as an example of a myopia prevention article of the present invention. The lamp shown in Fig. 12 only uses a special LED that emits the short wavelength light effective for myopia prevention so that the light is easier to see. Further, the lamp in Fig. 12 is capable of changing the strength of the 380 nm serving as the peak wavelength, as shown in Fig. 13.

[0052]

Fig. 13 shows a transmittance spectrum of the eyeglass lenses through which the wavelength light effective for myopia prevention is transmitted. Combined use of the glasses in Fig. 13 and the lamp shown in Fig. 11 makes it possible to effectively exhibit the myopia suppression effect.

[0053]

<Conclusion>

When the eye is exposed to ultraviolet light with a wavelength of more than 315 nm and not more than 400 nm, and preferably 360 nm to 400 nm inclusive, it is possible to prevent the occurrence of myopia in the eye and slow down the progression of myopia.

Industrial Applicability

[0054]

According to the present invention, it becomes possible to provide a myopia prevention article.

Claims

1. A myopia prevention article, using for the prevention of the myopia, comprising,

a light emission part has a peak wavelength of capable of changing a strength within a range of 365 nm to 380 nm,

the light emission part emits with a wavelength within a range of 350 nm to 400 nm,

the light emission part does not emit a peak wavelength with a wavelength less than 350 nm and greater than 400nm, and

the strength of the light from the light emission part is 5.0 mW/cm2 or less.

2. The myopia prevention article according to claim 1, wherein

the myopia prevention article is a lighting equipment, a display device, or an ultraviolet light irradiation device.

3. A set, comprising,

a myopia prevention article according to claim 1 or 2, and

a light transmission part that transmits with a wavelength 350 nm or greater and does not transmit with a wavelength less than 350 nm.

4. The set for myopia prevention according to claim 3, comprising,

a myopia prevention article including the light transmission part selected from the group including an eyesight correcting tool, an eye protection tool, a face protection tool, a sunshade, a display device, a window, a wall, a light source covering, or a coating material.