Adaptation of the eye to light intensity

By adaptation we mean the ability of vision to adapt to different levels of illumination.

If the luminous flux falls on the body, its surface is **illuminated** . This property of the body is characterized by the quantity **illuminance** . The main unit of illuminance is **lux** (lx). An area of 1 m² has an illuminance of 1 lx if a **light flux of 1 lumen** falls evenly on it. A healthy human eye is able to register an object whose illuminance is at least 2 nlx. Only rods and cones , except for larger ones, react to this illumination. The illuminance of the object on a bright sunny day is about 0.1 Mlx. The recommended value for reading is 100 lx, for fine mechanical operations and drawing 200 lx, for corridor lighting 20 lx.

Retinal sensitivity

The sensitivity of the retina is very high, about 10^4 times greater than the sensitivity of photographic emulsion, but it is not the same everywhere. The largest is around the intersection of the optical axis of the eye, where the so-called **yellow spot** lies . It is known that during the transition from light to dark, individual objects can be recognized with sufficient sensitivity only after a certain time (about 10-20 min, max. 45 min). During this time, the eye adapts to the dark. Objects whose image is formed in the peripheral areas of the retina are recognized earlier . During the transition from dark to light, the eye also needs a certain amount of time to adapt, but this time is significantly shorter. After a sharp illumination, the eyes are dazzled, but due to the rapid reaction of the pupils, they quickly adapt (miosis , mydriasis).

Functions of rods and cones

Suppositories and **rods** have relatively independent properties. At high intensities the cones provide vision, at low intensities the rods become more sensitive than the cones. All colors are registered by both cones and rods, but only cones are sensitive to red. The differences in **the speed of adaptation of the eye** to darkness after previous illumination is explained by the function of the rods. Rods contain rhodopsin - the so-called visual purple, composed of the protein opsin and retinal, which is an aldehyde of vitamin A. Under the influence of light, rhodopsin breaks down into these components and changes its color to yellow. The reaction is reversible and very fast. However, under too much light, retinal turns into retinol and its color turns white, this reaction is reversible by a slow process. Thus, rhodopsin regeneration can take place via a slow or a fast pathway.

Hemeralopia (night blindness) is a reduced ability to adapt. It can be hereditary or arise, for example, with avitaminosis A. A sufficient amount of rhodopsin is not produced, which manifests itself in dim vision, night blindness.

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Related Articles

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