Physiology of Night vision

The vertebrate eyes have **Photosensitive cells** called **Rods and Cones**. Rods are elongated cells mainly confined in the **periphery** of the retina. These are meant for **Dim vision** in low light and for peripheral visions. Rods, are extremely light sensitive and their sensitivity is about **500 times** greater than the sensitivity of cones. Only **one photon** is required to stimulate a rod to send a signal to the brain. **Nocturnal mammals** have rods with unique properties that make enhanced night vision possible. The **nuclear pattern** of their rods changes shortly after birth to become inverted. **Inverted rods** have **heterochromatin** in the center of their nuclei and **euchromatin** and other transcription factors along the border. The outer nuclear layer in nocturnal mammals is thick due to the presence of millions of rods present to process the lower light intensities of a few photons. Light is passed to each nucleus individually.

Cones on the other had are pointed cells confined in the **central part** of the retina. These are meant for **Central vision**, **Bright vision** and **Colour vision**. Rods have photosensitive pigment called **Rhodopsin** and cones have **Iodopsin.**

Role of Rhodopsin

The molecules of Rhodopsin in the rods undergo a change in shape as light is absorbed by them. Rhodopsin is the chemical that allows night-vision, and is extremely sensitive to light. When exposed to light, it immediately **bleaches**, and it takes about 30 minutes to regenerate fully. Most of the adaptation occurs within the first five or ten minutes in the dark. Rhodopsin is less sensitive to the **longer red wavelengths** of light. So many people use red light to preserve night vision.

Role of Tapetum

Many animals have a tissue layer called the **Tapetum lucidum** in the back of the eye that reflects light back through the retina. This increases the amount of light entering into the retina. This is found in many nocturnal animals and some deep sea animals. This causes the phenomenon of **eye shine** in these animals. Tapetum lucidum is absent in human eye.