rhodopsin

In rods, a reddish photochemical pigment named rhodopsin absorbs light, causing a chemical change and producing a stimuli. This pigment is located in vesicles in the rods, in the outer segment of the rod (see right).

Dark

There is a constant flow of Na⁺ ions into the outer segment via non specific cation channels. They move down the conc gradient into the inner segment, where they are pumped out. However, the raising potential is raised to around -40mV. This slight depolarisation causes the release of a neurotransmitter (glutamate) from the rod cells, which binds to the bipolar neurone, preventing the action potential spreading. In the dark, the glutamate is constantly produced.



Light

When light falls upon rhodopsin, it breaks into retinal and opsin. The opsin causes a chain of membranebound reactions which lead to the hydrolysis of a membrane molecule leading to the closure of the cation channels. The flow of Na⁺ in ceases, but the Na⁺ pump out continues; the glutamate production also ceases. This leads to hyperpolarisation of the bipolar cell with which the rod synapses, causing the opening of cation channels and eventually the depolarisation of neurones of the optic nerve, with an action potential generated.

The return of retinal and optic to rhodopsin is known as dark adaptation, and the time taken for this to occur depends upon the intensity of the original light stimuli.



