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Popular Article

# Cryptochromes as photoreceptors

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**Introduction:**

In Last few decades strongly proposed that the different types of potential mangneto-receptors involved in photocycle rhythmic activities of geomagnetic compass navigation in migratory birds and well enough supported for switching of diurnal to nocturnal in non-migrants birds also. Particularly the photoreceptors of radical pair involved from the circadian clock and retinal clock as well.

Cryptochromes are photoreceptors that regulate entertainment by light a circadian clock in plants and animals. Cryptochromes are probably the evolutionary descents of DNA photolyases, which are light activated DNA repair enzymes. It mainly employed in the repairing mechanism of DNA which has been damaged by exposure to ultraviolet light. They are classified into three groups,

a. Plant cryptochromes
b. Animal cryptochromes
c. CRY-DASH proteins (Lin and Takeshi, 2005)

Animal Cryptochromes act as a component of the circadian clock that control daily physiological and behavioural rhythm and as photoreceptors which mediate entertainment of circadian clock to the light (Cashmore, 2003). Cryptochromes are class of flavoproteins which are sensitive to blue light. It also involved in circadian rhythm and sensing of magnetic fields. The

mammalian cryptochromes and melanopsin proposed as circadian photoreceptor pigments. These pigments predominantly found in retina of human and mice eyes Ibrahim and Sancar (2002) observed that cryptochromes are clock proteins present in the cytosol of ganglionic cells of retina.

**Migratory Birds:**

The geomagnetic fields provide compass directional information of migratory birds at large. These navigations characteristically played from the underlying sensory mechanism based on photoreceptor molecule like cryptochromes. The cryptochromes mainly consists of Flavin Adenine Dinucleotide (FAD) undergoes photocycle formed radical pairs either produced photo-reduction or re-oxidation. The re-oxidation of FAD is crucial for detecting magnetic directions. There are five types of cryptochromes present in the retina of birds (Wilschko *et al*., 2021).

1. Cryptochrome 1a (Cry1a)
2. Cryptochrome 1b (Cry1b)
3. Cryptochrome 2 (Cry2)
4. Cryptochrome 4a (Cry4a)
5. Cryptochrome 4b (Cry4b)

The presently available evidence indicates that Cry1a as the most likely receptor for sensing compass direction in migratory birds. Cryptochrome 1a (Cry1a) and Cryptochrome 1b (Cry1b) are most abundantly present and responsible for diurnal rhythmic activity to nocturnal activity in night migrant birds also (Pinzon- Rodriguez *et al*., 2018). In birds, Cry proteins positioned within retinal cones respond to a magnetic field (MF) in the presence of blue light by generating spin-correlated radical pairs and creating a signaling state transmitted through the retina through the optic nerve to the brain centres.

**Future Perspective of Cryptochromes:**

There are many photoreceptors regulates under photoperiodicity of individual life cycle. This light spectrum is to regulate the developmental processes through molecular signalling pathways. Probably, the Cryptochromes may be magneto receptors in birds but it was originally put forward on the ground that the redox cycle of Cryptochromes can generate unpaired radicals which on theoretical grounds may be affected by weak magnetic fields.

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