

摘要

脊椎動物視網膜的雙極細胞主要是將感光細胞的訊息傳遞至神經節細胞。雙極細胞的成熟不僅對建立正常的視覺功能很重要，而且可能對神經節細胞的樹突在發育期間有修飾的作用。目前已經有人證實，初生時期失去光照會影響哺乳動物神經節細胞的突觸連結，但是卻很少有對雙極細胞影響的相關研究。本篇研究主要是用微量注射和基因槍標定技術，觀察在全暗飼養下和正常光照飼養下兔子雙極細胞的分化情形有何不同。我的結果發現，兔子出生後 1-3 天就能發現尚未發育完全的雙極細胞，約至 4-6 天大部分雙極細胞的特徵皆已具備。更重要的是，我們發現兔子出生後若無光照會延遲雙極細胞的發育，但不會使其成熟過程完全終止。兔子出生後約 10-11 天開眼時，不論是正常環境飼養或是全暗環境飼養下的雙極細胞皆已經接近成熟的細胞了。本篇結果證明了視覺經驗可促進雙極細胞的形態發育，並可進而推論早期成熟的雙極細胞提供了光傳入視網膜的訊號，再進一步去影響內層視網膜中神經節細胞在發育過程中的突觸連結。

關鍵字：視覺經驗，雙極細胞的發育，視網膜成熟

Abstract

Bipolar cells are responsible of transmitting light signals from photoreceptors to ganglion cells in vertebrate retinas. Their maturation process is not only important for establishing normal visual functions, but may also underlie the dendritic remodeling of ganglion cells during development. It has been shown that light deprivation affects synaptic connections of ganglion cells in the mammalian retina, but little is known about impacts of visual deprivation on bipolar cell development. Here we have used dye injection and gene gun labeling to identify and follow their differentiation in both normal and dark reared rabbits. Our results show that immature bipolar cells can be found as early as P1-3, and most characteristic bipolar cells can be identified in P4-6 of the rabbit retina. Most importantly, we found that light deprivation causes a delay rather than a permanent arrest of the bipolar cell maturation. By eye opening at P10-11, both normal and dark reared rabbits have possessed adult-like bipolar cells. The results suggest that visual experience has a facilitating effect on morphological differentiation of bipolar cells, and early mature bipolar cells could provide light dependent signals to guide synaptic connections of ganglion cells in the inner retina.

Key words: visual experience, bipolar cell development, retina maturation