中 文 摘 要

已知蜜蜂能夠在腹節的營養細胞內沉積許多鐵顆粒，這些鐵顆粒內含有許多超順磁磁鐵奈米顆粒，有可能當作磁場之感應器。在本研究裡，我們研究蜜蜂如何感應磁場與傳遞訊息的路徑。利用共軛焦顯微鏡的數位化影像放大技術來觀察鐵顆粒外觀是否受磁場影響產生變化。透過共軛焦顯微鏡觀察處理過鈣離子指示劑之營養細胞內鈣離子的變動，以觀察鈣離子與外加磁場的關係。以上結果顯示鐵顆粒會受磁場影響產生膨脹與縮小現象，營養細胞內鈣離子則會受磁場影響而增高，但是當細胞骨架被抑制下，鈣離子則不受磁場影響。我們初步了解蜜蜂磁場導航的信息傳遞路徑是透過鐵顆粒受磁場作用產生形狀上的改變，接著牽動細胞骨架，造成細胞內鈣離子濃度變化，進而將信息傳遞至神經系統，開啟蜜蜂磁場導航的機制。

English abstract

Honeybees can deposit numerous iron granules in the trophocytes of ventral abdomen. These iron granules contain superparamagnetic magnetites, which seem to be magnetoreceptors. In this study, we investigate the pathway of the signal transduction of magnetoreception in honeybees (*Apis mellifera*.) The fluctuation of iron granules in size affected by additional magnetic field was monitored by digital amplification technique of confocal microscopy. The release of calcium ions in trophocytes affected by additional magnetic field was measured by confocal microscopy. The results show that additional magnetic field can induce the size of iron granules to shrink at the paralleled direction to magnetic field and to enlarge at the vertical direction. In addition, additional magnetic field can increase the release of calcium ions, which can be inhibited by microtubule-inhibitors (colchicine and taxol.) Our preliminary results show that the fluctuation in the size of iron granules can induce the relaxing and tensing of microtubules to trigger the release of calcium ions.