


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	細胞質創造最有效率的路徑 (Cytoplasm creates most efficient routes)
生物系統 LIVING SYSTEM	多頭絨泡黏菌 <i>Physarum polycephalum</i> (Many-headed slime)
功能類別 FUNCTIONS	#獲取、吸收、或過濾生物 #改變位置 #改變大小/形狀/質量/體積 #陸地上導航 #對訊號反應 #Capture, absorb, or filter organisms #Modify position #Modify size/shape/mass/volume #Navigate over land #Respond to signals
作用機制標題	黏菌的細胞質利用適應性的覓食策略創造有效率的連結網絡 (Cytoplasm of slime molds creates efficient connective networks using adaptive foraging strategies)
生物系統/作用機制 示意圖	

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

多頭絨泡黏菌 (*Physarum polycephalum*) 能在食物來源間建立廣泛且有效的網絡，是非常有效率的覓食者。這種單細胞生物被歸類為原生生物，它會滲入表面尋找細菌、真菌孢子和其他微生物以取食。在尋找食物的過程中，它進行擴展和生長，自然地將自己組織成管狀結構的網絡，可快速且有效地連接食物來源。

絨泡黏菌透過「記住」和增強細胞質連接有效的食物來源，以最大化尋找食物的能力。透過有節奏地收縮和擴張其身體，絨泡黏菌可以在尋找食物時移動並增長身體。當它找不到食物或食物來源乾涸，絨泡黏菌會縮回其細胞質，留下本質為黏液的路徑，標記哪個有用，哪些是死路。

透過修整連接點並僅維持有效的路徑，多頭絨泡菌盡可能使用最少的資源和能量，同時也創造了一個有彈性且容許錯誤的系統。黏菌網絡系統連接食物來源間的最短距離，但這種連結方式不會因一個區域的連接被中斷，而對整體的健康或效率造成影響。

The slime mold, *Physarum polycephalum*, is an extremely effective forager capable of creating extensive and highly efficient networks between food sources. This single-celled creature, classified

as a protist, oozes its way across surfaces in search of bacteria, fungal spores, and other microbes to feed on. As it spreads and grows in search of food, it naturally organizes itself into a network of tube-like structures that quickly and efficiently connect its disparate food sources.

Physarum maximizes its ability to find food by ‘remembering’ and strengthening the portions of its cytoplasm that connect to active food sources. By rhythmically contracting and expanding its body, *Physarum* is able to move and grow its body in search of food. When it fails to find food or the food source dries up, *Physarum* retracts its cytoplasm, leaving behind a trail of slime—essentially marking which pathways are useful and which are dead-ends.

By trimming back connections and maintaining only active pathways, *Physarum* uses the least amount of resources and energy possible while still creating a resilient and fault-tolerant system. Links between food sources are made covering the shortest possible distances, but are connected in such a way that a disruption in one area does not impact the overall health or efficiency of the slime mold’s network.

文獻引用 (REFERENCES)

「透過只鋪設位於兩種食物來源間的最短路徑，原生質團可以將自己的大部分身體運送到食物來源，因此攝取營養的效率變得更高。再者，由於管道是原生質流的通道，因此最短的管道可以最有效地運輸原生質。」 (Nakagaki 2001: 769)

By lying only in the shortest route between two food sources, the plasmodium can deliver much of its own body to the food sources, so that the intake of the nutrient is more efficient. Moreover, since the tube is a channel of protoplasmic streaming, the shortest tube leads to efficient transport of protoplasm.” (Nakagaki 2001: 769)

參考文獻清單與連結 (REFERENCE LIST)

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- Nakagaki, T. (2001). Smart behavior of true slime mold in a labyrinth. *Research Microbiology* 152: 767-770. (<https://www.ncbi.nlm.nih.gov/pubmed/11763236>)

延伸閱讀: Harvard 或 APA 格式

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

- https://en.wikipedia.org/wiki/Physarum_polycephalum
https://www.onezoom.org/life/@physarum_polycephalum
<https://eol.org/pages/1002810>

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AskNature 原文連結

<https://asknature.org/strategy/cytoplasm-creates-most-efficient-routes/>