生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	分散的固體在水中運輸 (Dispersed solid transported within water)
生物系統 LIVING SYSTEM	天鵝絨蠕蟲 *Euperipatoides rowelli* (Tallaganda velvet worm)
功能類別 FUNCTIONS	#暫時性附著 #改變相性 #物理性組成結構 #Attach temporarily #Modify phase #Physically assemble structure
作用機制標題	天鵝絨蠕蟲的液體黏液含有防水的固體成分，因為分散的疏水性蛋白區域可阻止在水分蒸發前形成固體 (The liquid slime of the Tallaganda Velvet Worm carries a water-resistant solid because of dispersed hydrophobic protein regions that prevent the solid from forming until evaporation.)
生物系統/作用機制示意圖	

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

天鵝絨蠕蟲 (Tallaganda velvet worm) 噴出的黏液一開始是液態的，因為在黏液中的蛋白質是分散而不是凝結的狀態。這現象主要的原因是蛋白質的基因編碼 (genetic code) 中有分散的疏水性片段，防止蛋白質在水中折疊和成形。除此之外，由於混合物含有 90%的水和只有 3-5%的蛋白質，所以蛋白質之間保有很大的距離。

然而，當水分從液體狀黏液中蒸發，這通常是來自掙扎的獵物所釋放的能量，黏液會變成堅硬的固體。當水被去除後，蛋白質透過與其他蛋白質結合而形成固體結構的能力，將不再受到疏水性的區域干擾。然後，疏水性的區域則能確保剩下的固體是防水性的。

此策略是由 Rachel Major 所提供。

The slime projected by the Tallaganda velvet worm is at first a liquid because the proteins within the slime are separated and do not coagulate. The main reason for this is that the protein's genetic codes have dispersed hydrophobic - or water-fearing - segments that prevent them from folding and taking shape in water. In addition, the proteins remain largely separated from each other because the mixture is 90% water and only 3-5% protein.

However, when the water from the liquid slime evaporates, usually from the energy released from the struggling prey, the slime becomes a rigid solid. With the water removed, the hydrophobic regions no longer interfere with the proteins ability to create a solid structure by binding with other proteins. The hydrophobic regions then insure that the remaining solid is water-resistant.

This strategy was contributed by Rachel Major

文獻引用 (REFERENCES)

「因蒸發而流失的水分會觸發蛋白質溶液中的玻璃化轉變，透過蛋白質電荷互補和疏水性區域的交叉鏈接，而形成黏性和纏繞的絲線。」 (Haritos et al. 2010: 3255)

「在溶液中，蛋白質大部分的表面積被完全水合，蛋白質被保持在可溶狀態。當蛋白質溶液因蒸發作用流失水分而脫水後，蛋白質鏈中帶相反電荷和疏水性的區域更接近，可使離子或疏水-疏水鍵形成。」(Haritos et al. 2010: 3262)

「絲線一旦乾燥後，它們將不再具有黏性並不溶於水。」(Hasitos et al. 2010: 3257)

"...evaporative water loss triggers a glass transition change in the protein solution, resulting in adhesive and enmeshing thread formation, assisted by cross-linking of complementary charged and hydrophobic regions of the protein" (Haritos et al. 2010: 3255)

"In a solution, the large surface area of the proteins is fully hydrated and the proteins are maintained in a soluble state. Upon dehydration of the protein solution by evaporative water loss, regions of opposite charge and hydrophobicity in the protein strands may be brought in closer proximity to enable ionic or hydrophobic–hydrophobic bonds to form." (Haritos et al. 2010: 3262)

"Once threads had dried, they were no longer adhesive and were insoluble in water..." (Hasitos et al. 2010: 3257)

參考文獻清單與連結 (REFERENCE LIST)

V. S. Haritos, A. Niranjane, S. Weisman, H. E. Trueman, A. Sriskantha, T. D. Sutherland. (2010). Harnessing disorder: onychophorans use highly unstructured proteins, not silks, for prey capture. *Proceedings of the Royal Society B: Biological Sciences*. (https://doi.org/10.1098/rspb.2010.0604)

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

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