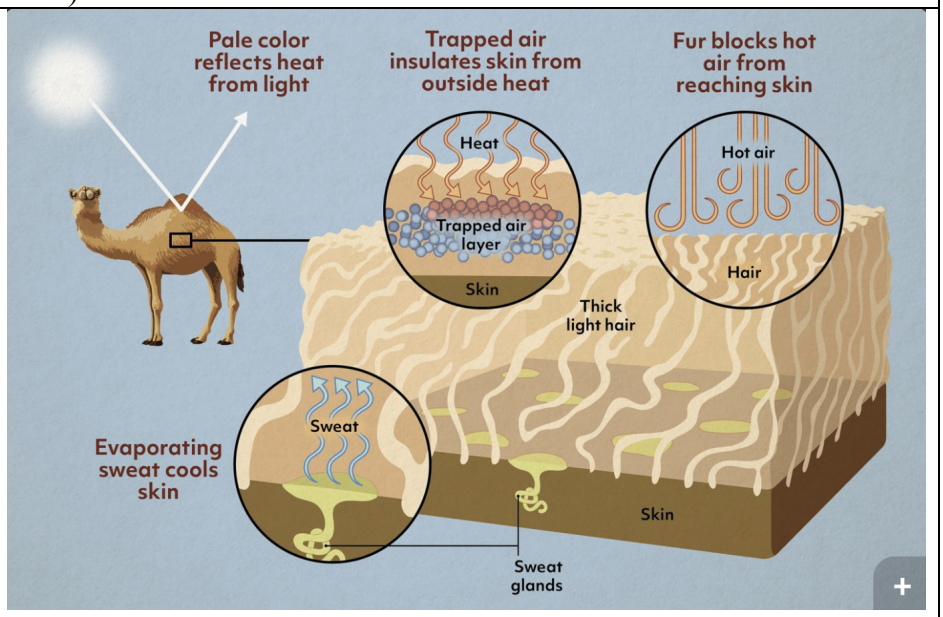
生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	駱駝的毛皮大衣如何保持涼爽 (How a camel's fur coat keeps it cool)
生物系統 LIVING SYSTEM	駱駝 (*Camelus ferus*)
功能類別 FUNCTIONS	#免受身體傷害的防護 #免受非生物傷害的防護 #溫度的防護 #Protect from physical harm #Protect from non-living threats #Protect from temperature
作用機制標題	駱駝的皮膚上有汗腺利用水的蒸發散熱，像人類一樣，然而，駱駝皮也被厚厚的毛皮覆蓋----有些地方有十公分左右的深度。不過他的毛皮並不會妨礙水的蒸發。其主要的作用是使駱駝免受傳入的熱量。 (Camels have sweat glands distributed throughout their skin, from which water removes body heat through evaporation, much as in humans. However, camel skin is also covered by thick fur—4 inches (10 cm) deep in places. This fur doesn't impede the evaporation of water though. What it does do is insulate the camel from incoming heat.)
生物系統/作用機制示意圖 (確認版權、註明出處；畫質)	 Image: Mesa Schumacher / Copyright © - All rights reserved

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

駱駝毛皮的這種絕緣力透過三種主要機制減少了從駱駝熱環境轉移到駱駝身體的熱量。駱駝毛皮的淺色反射光能，減少輻射對面板的熱量傳遞。 駱駝毛皮中的被困空氣作為一種薄薄的材料，單個分子之間有空間，透過傳導將熱量傳遞到皮膚最小化。 最後，駱駝毛的個體毛髮阻礙了空氣的運動，減少了對流對皮膚的熱量傳遞。

在毛皮的外表面和皮膚之間，溫度可能變化高達 30 攝氏度（86 華氏度）——夏天和下雪天的差異。 因此，駱駝需要從皮膚汗腺中蒸發更少的水來冷卻自己。 毛皮剃毛的駱駝比毛皮完好無損的駱駝用水量多得多，這一事實強調了它們毛皮的重要性。

This insulating power of the camel's fur reduces the amount of heat transferred to the camel's body from its hot ambient environment by three main mechanisms. The light color of a camel's fur reflects light energy, reducing heat transfer to its skin by radiation. The trapped air in the camel's fur functions as a thin material, with space between the individual molecules, minimizing heat transfer to the skin by conduction. Finally, the individual hairs of the camel's fur impede the movement of air, reducing heat transfer to its skin by convection.
Between the outer surface of their fur and their skin, temperatures can vary by as much as 30 degrees Celsius (86 degrees Fahrenheit) —the difference between a summer day and a snow day. As a consequence, camels need to evaporate much less water from their skin in order to cool themselves down. The importance of their fur is emphasized by the fact that camels with shorn fur use much more water than camels with fur intact.

文獻引用 (REFERENCES)

「汗水可以在面板表面蒸發，而不會滋潤毛皮。 然後，毛皮的絕緣值將保持不變，毛皮中的擴散或輕微的空氣運動將足以運輸水蒸氣。」（施密特-尼爾森和施密特-尼爾森 1952：159-160）

「事實證明，擁有天然毛皮的駱駝的用水量比被剪掉的駱駝低得多.....早些時候觀察到的差異是由於毛皮的絕緣效果。 本文早些時候提到，為了讓毛皮以這種方式運作，重要的是在面板表面進行蒸發，以便毛皮作為蒸發部位和外部熱源之間的熱屏障。 如果蒸發發生在毛皮表面，那麼對水經濟的有利程度將要小得多.....這意味著穿過毛皮的溫度梯度超過 30°C，因此羊毛的絕緣價值必須是最重要的。」(Schmidt-Nielsen 等人。 1956：111）

“Sweat could evaporate at the skin surface without moistening the fur. The insulation value of the fur would then be maintained, and diffusion or a slight air movement in the fur would be sufficient for transportation of the water vapor.” (Schmidt-Nielsen and Schmidt-Nielsen 1952: 159-160)

“It turned out that the camel with its natural fur had a much lower water consumption than the camel which had been clipped… the differences observed earlier were due to the insulating effect of the fur. It has been mentioned earlier in this paper that in order for the fur to function this way it is important that evaporation take place at the surface of the skin, so that the fur serves as a heat barrier between the site of evaporation and the external heat source. If evaporation were to take place at the surface of the fur it, would be much less advantageous to the water economy… This means that the temperature gradient through the fur was more than 30°C, and the insulation value of the wool must therefore be of the greatest importance.” (Schmidt-Nielsen et al. 1956: 111)

參考文獻清單與連結 (REFERENCE LIST) **Harvard 或 APA 格式**
Schmidt-Nielsen and Schmidt-Nielsen (1952). Water metabolism of desert mammals.*Physiological Reviews*:159-160 (https://journals.physiology.org/doi/abs/10.1152/physrev.1952.32.2.135?journalCode=physrev) Schmidt-Nielsen (1956). Body temperature of the camel and its relation to water economy.*American Journal of Physiology-Legacy Content* :111 (https://journals.physiology.org/doi/abs/10.1152/ajplegacy.1956.188.1.103)
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