生物策略格式

KJC, 2019/10/21

類別	生物策略 (Strategy)
生物策略 STRATEGY	體內溫度的皮膚微調 (Skin fine-tunes internal temperature)
生物系統 LIVING SYSTEM	非洲象 *Loxodonta africana* (African bush elephant)
功能類別 FUNCTIONS	#維持體內平衡 #保護免受溫度危害 #Maintain homeostasis #Protect from temperature
作用機制標題	大象的皮膚允許牠們通過「熱點」微調體溫調節，熱點是充滿血管的皮膚區塊。 (The skin of elephants allows them to fine-tune thermal regulation via 'hot spots', patches of skin that are highly vascularized.)
生物系統/作用機制示意圖	 

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

「由於牠們的厚皮和缺乏汗腺，以往一般均認為在炎熱氣候時，大象會依靠其醒目的大耳和在河流中浸浴，以保持涼爽。」

「然而，新的研究揭露世界上最大的陸地動物有個控制自己體溫的秘密技巧…」

「通過將血液供應流向身體周圍散布的皮膚小區塊之表面附近，大象可以快速散熱，使牠們能夠微調其體內溫度。」(Gray 2010)

"With their thick hides and lack of sweat glands, it has long been thought that elephants rely upon their distinctive large ears and bathing in rivers to stay cool in hot climates."

"New research, however, has revealed that the world's largest land animals have a secret trick to control their own body temperatures…"

"By directing their blood supply near the surface of small patches of skin scattered around their bodies, elephants can lose heat rapidly, allowing them to fine-tune their internal

temperature.” (Gray 2010)

文獻引用 (REFERENCES)

「在這項研究中，我們檢查了六隻非洲動物園大象的紅外線熱像圖 (thermogram)，研究過程中有觀察到兩種現象。首先，我們注意到獨立的熱窗 (thermal windows)，即富含血管的皮膚區域，分布在整個大象的身體上。其次，我們觀察到大象的耳廓 (pinnae) 上具有顯著和清楚劃分的熱區 (hot sections)。熱窗出現的頻率會隨著周遭溫度和體重的增加而增加。我們假設將流到熱窗的增強皮膚血液加以限制，可能使得動物在面對散熱此類需求時，能夠有更具彈性的反應。根據這種理解，在散熱時使用熱窗，可視為在體溫中性條件下 (thermoneutral condition)的一種微調機制。」 (Weissenböck et al. 2010: 182)

“In this study, we examined infrared thermograms in the course of time of six African zoo elephants and observed two phenomena. First, we noticed independent thermal windows, highly vascularised skin areas, on the whole elephants’ body and second we observed distinct and sharply delimited hot sections on the elephants’ pinnae. The frequency of thermal windows increased with increasing ambient temperature and body weight. We assume that the restriction of an enhanced cutaneous blood flow to thermal windows might enable the animal to react more flexibly to its needs with regard to heat loss. With this understanding, the use of thermal windows in heat loss might be seen as a fine-tuning mechanism under thermoneutral conditions.” (Weissenböck et al. 2010: 182)

參考文獻清單與連結 (REFERENCE LIST)

Weissenböcka, N. M., C. M. Weissb, H. M. Schwammerc, and H. Kratochvild. (2010). Thermal windows on the body surface of African elephants (*Loxodonta africana*) studied by infrared thermography. *Journal of Thermal Biology* 35: 182-188. (https://doi.org/10.1016/j.jtherbio.2010.03.002)

延伸閱讀:

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

https://en.wikipedia.org/wiki/loxodonta_africana

文章貢獻/編修者與日期:

陳儒璋翻譯 (2019/04/29)；朱天愛編修 (2019/12/19)；吳晧編修 (2020/01/04)；譚國鎏編修 (2020/05/26)；紀凱容編修 (2020/11/26)；施習德編修 (2020/12/20)

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https://asknature.org/strategy/skin-fine-tunes-internal-temperature/