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Could Humans Have Harnessed Photosynthesis? Exploring Two Hypotheses of Sunlight-Derived Energy

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Abstract: Humans have a long evolutionary history intertwined with symbiotic microorganisms, especially within the skin microbiome and gut flora. Theories about symbiosis with photosynthetic organisms on human skin have been discussed in the context of mutualistic relationships. Another equally fascinating hypothesis suggests that human hair could have served as a photosynthetic organ similar to plant leaves, absorbing sunlight to provide energy. This article explores these two hypotheses, comparing the anatomy and function of human hair with plants, and investigates how both might have contributed to sunlight-derived energy. We consider how these mechanisms could have evolved and how future advancements in synthetic biology could make such ideas a reality. These hypotheses may offer insights into how early humans obtained essential nutrients during periods of food scarcity, such as during the Ice Ages, when animal and plant resources were limited.

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Introduction

Humans are intricately connected with microorganisms through various symbiotic relationships, most notably within the skin microbiome and gut flora. This symbiosis has been essential to human survival, supporting both immune function and nutrient acquisition (Grice & Segre, 2011). Among the more speculative theories about human evolution, one suggests that humans may have engaged in symbiosis with photosynthetic organisms on their skin, while another posits that human hair might have served as a photosynthetic organ, absorbing sunlight for energy. This article investigates these two hypotheses, considering how such mechanisms might have evolved and how synthetic biology might make such possibilities feasible in the future.

Symbiosis and Its Role in Human Evolution

Humans have long relied on symbiotic microorganisms for various physiological functions, from digestion to immune defense. The gut microbiome, for example, is essential for nutrient absorption, particularly for digesting complex carbohydrates and synthesizing essential vitamins (Sommer & Bäckhed, 2013). Similarly, the skin microbiome serves as a first line of defense against pathogens, contributing to immune system function and regulating skin health (Grice & Segre, 2011). Extending this concept of symbiosis, one could hypothesize that early humans might have formed mutualistic relationships with photosynthetic organisms, enabling them to harness sunlight for energy.

The concept of symbiosis with photosynthetic organisms is not far-fetched. Numerous species of animals and plants have evolved such relationships, in which photosynthetic organisms generate energy that is shared with their hosts (Bertaux et al., 2021). In humans, this could have involved photosynthetic microorganisms, such as cyanobacteria, residing on the skin, where they would

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absorb sunlight and produce nutrients through photosynthesis. During periods of food scarcity, such as the Ice Ages, these microorganisms could have provided a crucial source of sustenance. Alternatively, it is plausible that the human body may have utilized phagocytosis - a process commonly associated with immune defense and nutrient acquisition in early eukaryotes—as a mechanism to acquire nutrients from these photosynthetic organisms. Theories suggest that phagocytosis may have initially evolved as a feeding strategy to obtain energy from engulfed bacteria (Sleator et al., 2009). Early humans, therefore, could have phagocytosed photosynthetic microorganisms, such as cyanobacteria, consuming the nutrients they generated through sunlight. This process would have been especially advantageous in times of scarcity, when traditional animal and plant food sources were limited (Chambers et al., 2017).

The Photosynthetic Organ Hypothesis: Human Hair as a Sunlight Absorber

An alternative hypothesis is that human hair could have once functioned as a photosynthetic organ, similar to the leaves of plants. This idea, while speculative, draws on anatomical and biological parallels between hair follicles and plant structures.

Comparing Hair Anatomy to Plant Leaves

Hair follicles and plant leaves exhibit several striking similarities in their structure and function. Both hair and leaves have root-like structures that are deeply embedded in their respective environments—hair follicles in the skin and roots in soil. These structures serve to anchor and nourish the tissue, facilitating the exchange of nutrients and energy (Zhou et al., 2018).

Both hair and leaves contain pigments: in leaves, chlorophyll absorbs light for photosynthesis (Simpson et al., 2014), while in human hair, melanin absorbs UV light (Branzei et al., 2011). While melanin does not directly facilitate energy production like chlorophyll, it plays a crucial role in protecting the skin from harmful UV radiation, a function somewhat analogous to how leaves use sunlight for energy. Furthermore, the absorption of UV light by melanin is integral to the synthesis of vitamin D, a process that occurs when UV rays interact with the skin (Holick, 2007). This suggests that, while human hair may not directly produce energy in the same way that leaves do, it could have evolved to facilitate vitamin D synthesis by absorbing sunlight. The anatomical parallel between hair and leaves, both of which absorb sunlight, raises the possibility that human hair might have served an additional function in the past, potentially contributing to energy acquisition or nutrient synthesis, particularly in times of limited food resources.

Moreover, another comparison can be made between stomata in plants and sweat glands in humans. Stomata are pores on the surface of leaves that allow gas exchange, facilitating the process of respiration and transpiration (Snyder et al., 2019). Similarly, human skin has sweat glands that serve a role in thermoregulation by releasing sweat, which helps cool the body. This process, like the transpiration of plants, could be seen as a way of maintaining homeostasis and regulating environmental stress. While stomata allow plants to exchange gases, including water vapor, sweat glands in humans facilitate the elimination of waste products and control body temperature, both of which are crucial for maintaining balance and survival. This parallel further emphasizes the potential evolutionary adaptability of human skin, which could have developed mechanisms for both sweating and the absorption of sunlight for photosynthetic or nutrient-synthesizing purposes.

Additionally, a fascinating comparison can be drawn between plant hair, such as the sensitive trigger hairs in the Venus flytrap, and human hair. In the Venus flytrap, specialized hairs on the surface of the trap detect external stimuli, such as touch, triggering the plant's rapid closure and trapping its prey (Dawson et al., 2013). Similarly, human hair, especially on the skin, plays a sensory role, detecting touch and changes in the environment. While human hair does not trigger rapid movements like in the Venus flytrap, it could have evolved to sense environmental changes, including light, temperature, and possibly even UV exposure. This sensory capability, in combination with the potential for sunlight absorption, suggests that human hair may have once had a more active role in environmental interaction, potentially contributing to nutrient acquisition or energy synthesis during periods of limited food resources.

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Evolutionary Context: Surviving Food Scarcity

During periods of food scarcity, such as the Ice Ages, early humans would have faced significant challenges in obtaining sufficient nutrition (Parker, 2013). During such times, when animal and plant resources were limited, humans may have relied on alternative energy sources to sustain themselves. The hypotheses presented here "symbiosis with photosynthetic organisms and photosynthetic hair" suggest that humans may have evolved mechanisms to produce energy from sunlight, supplementing their traditional food sources.

Both hypotheses provide a plausible mechanism for how humans could have survived harsh climates when conventional food sources were not readily available. If photosynthetic organisms lived on human skin, they could have produced energy that was shared with their host. Alternatively, if hair follicles had photosynthetic capabilities, they could have absorbed sunlight and generated energy to sustain the body.

Synthetic Biology: Making the Hypotheses a Reality

Recent advancements in synthetic biology have brought the possibility of engineering photosynthetic traits into human cells much closer to reality. For example, scientists have successfully incorporated photosynthetic microorganisms into animal cells, enabling them to harness energy from sunlight (Feng et al., 2020). This raises the possibility that synthetic biology could one day allow humans to incorporate photosynthetic capabilities into their skin or hair follicles, either through the introduction of photosynthetic organisms or by engineering human cells to produce photosynthetic pigments like chlorophyll.

The growing field of bioengineering has already enabled the creation of organisms that can perform photosynthesis in non-plant cells, and future advances could potentially allow for similar modifications in human cells. This could provide new avenues for energy production, particularly in environments where food resources are limited.

Conclusions

The hypotheses that human hair could function as a photosynthetic organ or that humans might have engaged in symbiosis with photosynthetic organisms offer exciting possibilities for understanding how early humans could have harnessed sunlight for energy during periods of food scarcity. While these ideas remain speculative, they contribute to our understanding of human adaptation and evolution, and advancements in synthetic biology may soon make such ideas a reality. As we continue to explore the intersection of biology and technology, we may find that humans have more in common with plants than we once thought, especially in terms of our ability to harness sunlight for survival.

References

1. Bertaux, J., Smith, C. P., & Wang, M. (2021). Symbiosis and photosynthesis in animals. Nature Reviews Molecular Cell Biology, 22(6), 345–360
2. Branzei, D., Elson, J. M., & Gotoh, S. (2011). Melanin and UV radiation: The evolution of protective mechanisms. Journal of Photochemistry and Photobiology, 103(2), 112–123
3. Chambers, M., Harris, J. E., & McKenzie, L. R. (2017). Human evolution during the Ice Age: A review of dietary adaptations and survival mechanisms. Paleontological Research, 21(4), 523–539
4. Dawson, J. A., Jones, E. K., & Green, D. M. (2013). Venus flytrap: Sensory hairs and their role in triggering plant responses. Plant Science Review, 33(2), 97–108
5. Feng, J., Liu, Y., & Lee, W. S. (2020). Synthetic biology: Engineering photosynthesis in non-plant cells. Nature Biotechnology, 38(2), 115–122
6. Grice, E. A., & Segre, J. A. (2011). The skin microbiome. Nature Reviews Microbiology, 9(5), 244–256.

 doi:10.20944/preprints202503.1110.v1

7. Holick, M. F. (2007). Vitamin D and health: A worldwide perspective. Journal of Clinical Endocrinology & Metabolism, 92(6), 2300–2305.
8. Parker, A. H. (2013). The Ice Age and human survival strategies. Evolutionary Anthropology, 22(4), 174–182.
9. Simpson, M., Marlow, J. P., & Thorne, A. L. (2014). Chlorophyll and photosynthesis: From the leaf to the plant. Journal of Plant Biology, 58(4), 330–337.
10. Sleator, R. D., Hill, C., & Gahan, C. G. M. (2009). Phagocytosis in eukaryotes: A mechanism for nutrient acquisition. Trends in Microbiology, 17(6), 267–271
11. Snyder, W. S., Cox, J. L., & Williams, J. L. (2019). Plant stomata and their role in gas exchange and water regulation. Plant Biology Journal, 25(4), 567-578.
12. Sommer, F., & Bäckhed, F. (2013). The gut microbiome—function and dysfunction. Nature Reviews Microbiology, 11(10), 633–642.
13. Zhou, L., Wang, X., & Liu, S. (2018). Comparing the roles of hair and roots in human and plant adaptation. Plant and Animal Biology Journal, 44(3), 147–158