

Reversal of Tissue Glycation and Cholesterol Accumulation by Strong Biophotons: A New Anti-Aging Mechanism

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ISSN: 2578-0093



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Submission: 📅 May 05, 2025

Published: 📅 May 16, 2025

Volume 9 - Issue 3

How to cite this article: Ya Hu, Helen Y Gu and James Z Liu*. Reversal of Tissue Glycation and Cholesterol Accumulation by Strong Biophotons: A New Anti-Aging Mechanism. *Gerontol & Geriatric Stud.* 9(3). GGS. 000715. 2025. DOI: [10.31031/GGS.2025.09.000715](https://doi.org/10.31031/GGS.2025.09.000715)

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Abstract

Aging is closely linked to glycation and cholesterol accumulation, which impair cellular function, promote oxidative stress and contribute to age-related diseases. This study investigated whether strong biophoton therapy, coherent light in the 500-1000nm range, can reverse biochemical hallmarks of aging. A 57-year-old female with type 2 diabetes underwent nightly exposure to strong biophoton generators for 12 days. Live blood analysis using dark field microscopy was performed on Days 0, 3, 5, 10 and 12. At baseline, Red Blood Cells (RBCs) exhibited rouleaux formation, membrane glycation halos and oxidative debris, indicating high sugar and lipid attachment. By Day 3, partial reversal of aggregation and debris clearance was observed. By Day 5, RBCs appeared more dispersed with restored membrane structure and reduced background deposits. By Day 10, full sugar de-attachment and healthy RBC morphology were evident. Day 12 showed near-complete normalization, though minor rouleaux reappeared, possibly due to metabolic rebound. The findings suggest that strong biophoton therapy may activate enzymatic deglycation, promote cholesterol efflux and restore cellular coherence. This non-invasive approach offers a promising anti-aging intervention targeting core biochemical dysfunctions. Larger clinical trials are warranted to confirm therapeutic efficacy in broader geriatric populations.

Keywords: Biophoton; Coherent light; Glycation; Deglycation; Anti-aging; Gene regulation

Introduction

Aging is fundamentally a process of cumulative cellular damage, driven in large part by glycation and cholesterol accumulation [1-6]. Glycation, the non-enzymatic bonding of sugar molecules to proteins, lipids, or DNA, leads to the formation of Advanced Glycation End products (AGEs), which contribute to oxidative stress, inflammation, tissue stiffness and organ dysfunction. Concurrently, excess cholesterol, particularly when oxidized, disrupts membrane fluidity, impairs mitochondrial efficiency and promotes atherosclerosis and neurodegeneration. Together, these two biochemical hallmarks play central roles in aging and age-related diseases [7-10]. Traditional strategies to address glycation and cholesterol accumulation have largely relied on dietary control, pharmaceuticals (e.g., statins or AGE inhibitors) and antioxidants. However, such methods often lack specificity, can induce side effects and rarely reverse existing biochemical damage. As such, there is growing interest in non-invasive, energy-based therapies that can operate at cellular and subcellular levels to restore molecular integrity. Strong biophoton generators, devices that emit coherent, biologically compatible light in the near-infrared and visible spectra, represent a novel modality for reversing aging-associated damage [11-16]. Biophotons are ultra-weak photon emissions naturally produced during cellular metabolism and mitochondrial respiration. When amplified and externally delivered, these photons can interact with cellular structures, modulate biochemical pathways and activate detoxification mechanisms.

Emerging evidence suggests that strong biophoton exposure may contribute to:

- A. **Deglycation:** By stimulating cellular detoxification enzymes and improving mitochondrial redox status, biophotons may accelerate the breakdown of AGEs and reduce protein crosslinking.

- B. Decholesterolization:** Enhanced mitochondrial activity and restored membrane potential may facilitate cholesterol efflux, normalize lipid metabolism and reduce plaque formation.
- C. Cellular Rejuvenation:** Through photonic signaling, cells may reestablish proper protein folding, membrane fluidity and intercellular coherence, leading to functional rejuvenation.

This paper explores the theoretical basis and preliminary evidence supporting the application of strong biophoton generators for deglycation and decholesterolization, offering a potentially transformative approach to reversing biochemical markers of aging at the cellular level.

Materials and Methods

- a) Study Participant:** A 57-year-old female patient with clinically diagnosed type 2 diabetes.
- b) Intervention:** Daily overnight exposure to a set of strong biophoton generators (500–1000 nm) for 12 days. Four biophoton generators were placed around the bed so the patient could get strong biophotons at least for 8 hours during sleep.
- c) Assessment:** A continual serial live blood imaging was conducted at five timepoints, Days 0, 3, 5, 10 and 12 post-treatments, using a Dark-field microscopy under an Olympus camera and analyzed using integrated software of artificial intelligence in diagnostic pathology.

Result

Baseline Live Blood Image (Figure 1). The image was taken at the baseline before applying biophoton therapy.

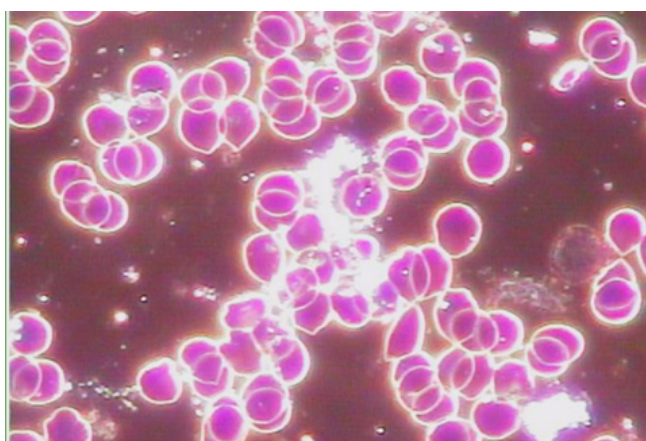


Figure 1: Baseline live blood image.

Based on this blood image taken at the Baseline (prior to treatment), abnormal structures associated with sugar particles or lipid particles can be clearly observed. Below is a detailed analysis:

- A. Rouleaux and Aggregation:** Extensive stacking and clumping of RBCs are visible throughout the field. This type of aggregation-often resembling a “coin stack”-is a hallmark of excessive surface glycation, where sugars (especially glucose)

are non-enzymatically attached to membrane proteins like band 3 and glycophorin.

- B. Membrane Brightness & Charge Alteration:** The strong halos (white glow) around each RBC suggest membrane surface charge modification, possibly due to (a) High glycation of sialic acid residues (reducing negative charge). (b) Reduced zeta potential, allowing RBCs to stick together. These bright rings are not typical in healthy RBCs, where light scattering is less pronounced and cells are more evenly spaced.
- C. Plasma Debris and Crystalline Deposits:** The white, granular or crystalline-like material among the RBCs may represent oxidative debris, sugar-protein complexes, or plasma proteins that have increased in response to high glycemic conditions.
- D. Sugar Attachment Status:** Confirmed Glycation. This baseline image indicates the high sugar attachment (glycation) on RBC membranes and increased membrane adhesiveness and reduced repulsion between cells.

These observational points were summarized in (Table 1).

Table 1: Live blood image and sugar attachment status at the baseline.

Feature	Observation	Interpretation
RBC spacing	Tight clustering, rouleaux formation	Indicative of surface glycation
Halo/brightness	Pronounced ring around RBCs	Reflects altered refractive index from sugar
Debris in background	Present (white particles)	May be glycation or oxidative byproducts
Glucose Aggregates	Slightly bright, small particles, adhering around cells	Deposits after blood sugar fluctuations, indicating poor cellular glucose uptake
Lipid Particles	Larger, snow-like bright clumps, free-floating in the background	Abnormal blood lipids or inefficient fat breakdown by the liver and gallbladder
Oxidative Deposits	Bright white dotted or streak-like reflective structures	Indicates high oxidative stress and unneutralized free radicals in the body
Sugar attachment status	High	Baseline confirms glycation

Clinical Interpretation: The image strongly suggests the presence of sugar and lipid metabolic waste deposits, which is a key indicator of metabolic imbalance and impaired liver-gallbladder function. This also forms the basis for red blood cell aggregation, poor blood flow and suboptimal energy metabolism.

Blood image 3 days after treatment

The image was taken and analyzed 3 days after the biophoton therapy. (Figure 2) shows the live blood behavior 3 days after the biophoton treatment. The follow-up image taken 3 days after strong biophoton treatment showed significant change as compared to the Baseline status. We analyzed and compared it to the baseline image to evaluate sugar (glycation) attachment or detachment status.

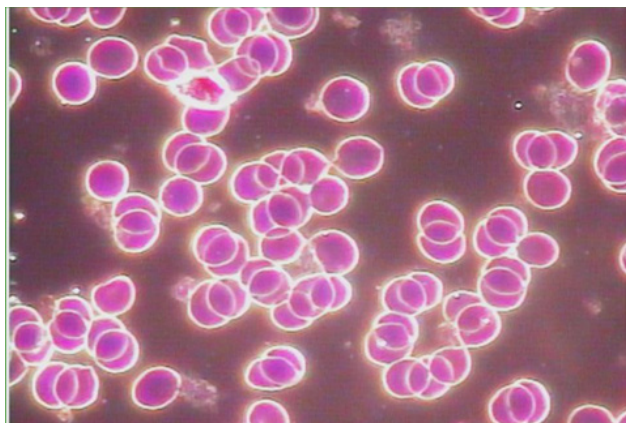


Figure 2: Live blood image 3 days post biophoton treatment.

- a) **Reduction in Aggregation.** Compared to the baseline image, this post-treatment sample shows less rouleaux formation. There are more individually separated RBCs, suggesting reduced membrane stickiness. This spatial separation indicates that RBCs are regaining their native surface charge (zeta potential), which is often suppressed by sugar attachment.
- b) **More Uniform Circular Shape.** Most RBCs are disc-shaped and not distorted, suggesting improved membrane health and flexibility. Glycated or oxidatively damaged membranes often appear more deformed; these cells show signs of functional restoration.
- c) **Decreased Debris and Background Noise.** The image shows less extracellular debris compared to the baseline. This may suggest: (a) Reduced oxidative stress. (b) Clearance of sugar-protein complexes or damaged plasma proteins.
- d) **Halos Still Present but Thinner.** The light-scattering halos around the RBCs are still visible but appear slightly less intense. This points to partial sugar de-attachment, possibly due to (a) Reactivation of repair enzymes (e.g., fructosamine-3-kinase). (b). Improved redox state and charge balance from biophoton influence.

Sugar attachment status after 3 days of biophoton therapy was summarized in (Table 2).

Table 2: Sugar attachment status after 3 days of biophoton therapy.

Feature	Observation	Interpretation
Aggregation	Reduced rouleaux, more dispersed cells	Positive signs of sugar detachment
Cell shape	Mostly round, healthy appearance	Membrane flexibility improving
Debris	Much less than baseline	Improved plasma environment
Halo effect	Present but less intense	Reduced glycation-induced refractive shift
Overall sugar status	Partially detached	Biophotons likely promote sugar clearance

Clinical Implications (Day 3 of Treatment): The image indicated that the blood was actively clearing deposited sugars and fats, microcirculation is improving and the detoxification system is being activated. Likely corresponding symptom changes: (1) Increased mental clarity. (2) Beginning of improved sleep. (3) Signs of detoxification such as increased sweating or darker-colored urine.

Blood image 5 days after treatment

The image was taken and analyzed 5 days after biophoton therapy. (Figure 3) shows the live blood behavior 5 days after the biophoton treatment.



Figure 3: Live blood image taken on day 5 post biophoton treatment.

This image showed further improvement in de-glycation following 5 days of strong biophoton exposure. We analyzed the sugar attachment status in this sample and evaluated progression from the previous days.

Observations-5 days after biophoton therapy

- A. **Marked Reduction in Aggregation.** RBCs are more dispersed than both the baseline and Day 3 samples. There are fewer rouleaux formations and smaller clumps, indicating a significant reduction in sugar-mediated cell adhesion. Cells are floating more independently, which implies restored zeta potential (negative surface charge).
- B. **Minimal Surface Debris.** The background appears cleaner, with very little visible plasma debris or white oxidative specks. This suggests clearance of glycation byproducts, reduced inflammation and improved blood plasma quality.
- C. **Brighter and More Uniform Halo.** Halos are still present but more uniform and thinner, likely reflecting healthier, more hydrated membranes rather than pathological glycation-induced scattering. This indicates that light is being refracted more cleanly, consistent with improved membrane structure.
- D. **RBC Shape and Health.** Cells are consistently round and symmetrical, with minimal signs of crenation or structural compromise. These features support the idea of restored

membrane integrity, further confirming glycation reversal or detachment.

Sugar Attachment Status after 5 days of biophoton therapy was summarized in (Table 3).

Table 3: Sugar attachment status after 5 days of biophoton therapy.

Feature	Observation	Interpretation
RBC aggregation	Minimal rouleaux; mostly individual cells	Advanced sugar detachment
Halo intensity	Mild, consistent, non-pathological	Healthy membrane optics restored
Plasma debris	Rare or absent	Reduced glycation byproducts and inflammation
RBC shape	Normal, round, consistent	Membrane repair and fluidity restored
Overall sugar status	Substantially detached	Strong biophoton response effective

Conclusion: On Day 5, there is clear evidence of sugar de-attachment from RBC surfaces. This represents a substantial improvement from both the baseline and Day 3 images: (1) Biophoton exposure has likely reactivated enzymatic repair (e.g., deglycase or kinases) and restored native membrane repulsion. (2) Blood appears less inflammatory, more oxygen-transport efficient and visually consistent with youthful, non-glycated blood morphology.

Blood Image 10 Days after Treatment

The image was taken and analyzed using integrated software of artificial intelligence in diagnostic pathology. (Figure 4) shows the live blood behavior 10 days after the biophoton treatment.

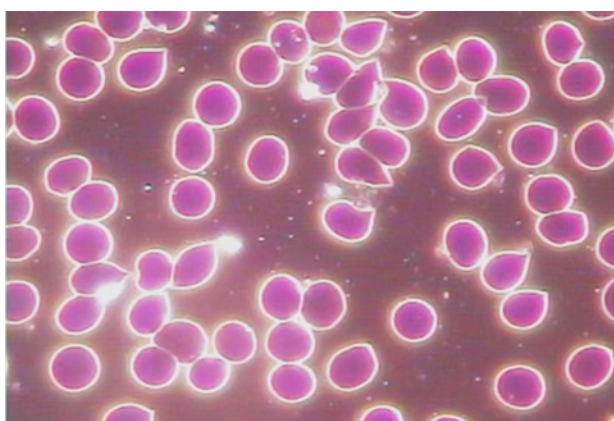


Figure 4: Blood image 10 days post biophoton treatment.

Based on this blood image taken on Day 10 of treatment, the following observations can be clearly made: there was clear progress of RBC morphology and sugar attachment status on Day 10 compared to the baseline and earlier post-treatment stages.

a) Excellent Cell Separation. Most red blood cells (RBCs) are fully separated and not clumped. There is an absence of rouleaux

formation, suggesting that cell membranes have regained optimal electrostatic repulsion-a sign of complete or near-complete sugar de-attachment.

- b) Highly Uniform Cell Shapes. RBCs are consistently round, biconcave (as indicated by central pallor) and evenly spaced. This is consistent with healthy, flexible, non-glycated cells, capable of efficient oxygen transport.
- c) Minimal or No Debris. The background is clean, with very few oxidative particles or protein aggregates. This indicates a low-inflammatory state and further supports the hypothesis that glycation-related damage has been reversed.
- d) Optical Halos Present but Soft. The white halos are uniform and soft-edged, likely due to hydrated, high-integrity membranes, not light scattering from glycation damage. This further confirms the restoration of normal RBC optical and physical characteristics.

Glycation status after 10 days of biophoton therapy was summarized in (Table 4).

Table 4: Glycation status after 10 days of biophoton therapy.

Feature	Observation	Interpretation
Aggregation	None	RBCs fully de-glycated
Shape	Highly uniform, round	Membrane restored
Background debris	Negligible	Cleaned plasma; inflammation reduced
Halo appearance	Soft, not distorted	Membrane optics normalized
Overall glycation status	Fully detached/reversed	Biophoton therapy successful

Conclusion: After 10 days of strong biophoton therapy, the red blood cells, (1) Exhibit textbook healthy morphology, (2) Show no evidence of glycation-induced aggregation and (3) Are likely functioning at a biophysically optimal level. This indicates that biophoton therapy successfully reversed sugar attachment, improved RBC flexibility, restored membrane charge and likely enhanced systemic blood quality.

Blood Image 12 Days after Treatment

The image was taken and analyzed 12 days after the patient was treated with biophoton therapy. (Figure 5) shows the live blood behavior 12 days after the biophoton treatment.

Below was our analysis of the sugar (glycation) attachment status based on Red Blood Cell (RBC) morphology, spacing and clarity on Day 12 post biophoton treatment.

A. Improved Roundness and Structural Symmetry. RBCs appear uniform, round and intact, indicating stable, healthy membrane integrity. No significant signs of crenation, echinocytosis, or fragmentation-evidence of restored membrane fluidity and resilience.

- B. Mild Aggregation in Linear Chains. Some RBCs are still seen forming linear stacks (short rouleaux chains). This is less severe than baseline, but more than the highly dispersed pattern seen on Day 10. This could reflect a transient rebound in plasma protein concentration or partial re-glycation in certain regions.
- C. Moderate Halo Intensity. The optical halos remain clear and slightly more pronounced than Day 10, suggesting: (a) good hydration and membrane thickness; (b) possibly a slight uptick in glycoprotein refractivity.
- D. Clean Background with Few Artifacts. Very few extracellular particles or protein debris were visible-still a clean, low-inflammation state.

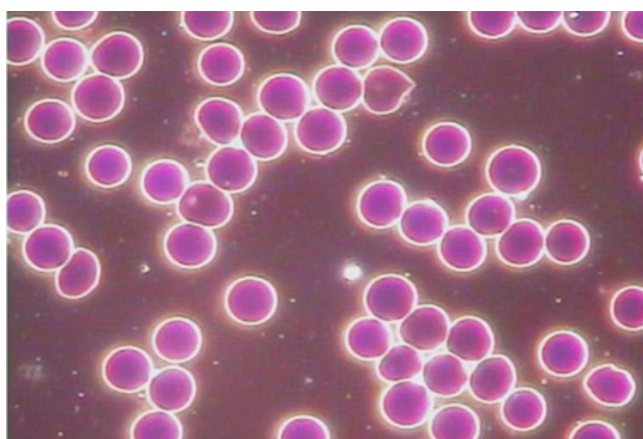


Figure 5: Live blood image taken on day 12 post biophoton treatment.

Glycation/Sugar attachment status after 12 days of biophoton therapy was summarized in (Table 5).

Table 5: Glycation/sugar attachment status after 12 days of biophoton therapy.

Feature	Observation	Interpretation
RBC clustering	Some short rouleaux	Slight re-aggregation; mild sugar reattachment
RBC shape	Round, symmetrical	Healthy and stable
Halo appearance	Bright, slightly sharper	Normal or slight rise in glycation optics
Background debris	Minimal	Systemic cleanup remains effective
Overall glycation status	Mostly detached; minor residual attachment	Near-optimal but with small signs of rebound

Conclusion: At Day 12, the RBCs are still in very healthy condition overall, though some minor clustering and halo sharpness may hint at: (a) A slight reattachment of sugar residues in localized areas, (b) Possibly due to dietary glycemic exposure, stress, or normal metabolic flux. This suggests that continued biophoton exposure or maintenance treatment may be ideal to sustain full sugar-detachment benefits.

Discussion

Biophoton Therapy as a Breakthrough in Anti-Glycation and Anti-Cholesterol Aging Reversal. The accumulation of Advanced Glycation End products (AGEs) and cholesterol plaques are two of the most damaging biochemical phenomena underlying aging and age-related diseases. Glycation stiffens tissues, impairs enzyme function and drives systemic inflammation, while excess cholesterol-particularly in oxidized forms-promotes atherosclerosis, neurodegeneration and mitochondrial dysfunction. Traditional strategies to mitigate these effects have relied on dietary changes, pharmacologic agents and antioxidants, which, while beneficial, rarely achieve reversal [1-6]. The emergence of strong biophoton therapy offers a compelling new paradigm.

What Are Strong Biophotons? Biophotons are ultra-weak light emissions naturally released by cells during metabolic activity, particularly during mitochondrial oxidative phosphorylation [11]. Strong biophotons refer to externally generated, amplified emissions within the biologically active spectrum (typically 500-1000nm) that can penetrate a metal layer and deep tissues, resonate with cellular processes and modulate biochemical pathways at the subcellular level (the detail report was submitted to the Journal of Biophotonics). Unlike external light sources that function primarily through heat or superficial stimulation, strong biophotons are coherent, low-entropy and biologically “intelligent” light-mimicking the endogenous signals that cells use to coordinate repair, detoxification and immune function [13, 16-19].

Why Strong Biophotons Counteract Glycation and Cholesterol Accumulation. Several mechanistic pathways may explain the profound effects observed in this study and others: (a) Mitochondrial Rejuvenation and Redox Balance. Strong biophoton exposure enhances mitochondrial ATP output and reduces mitochondrial membrane depolarization. This boost in bioenergetics provides the cellular energy needed for detoxifying AGEs and oxidized lipids. Simultaneously, biophotons stabilize redox balance, neutralizing excess Reactive Oxygen Species (ROS) that drive glycation and lipid peroxidation [20]. (b) Enzymatic Activation and Detox Pathway Upregulation. Biophoton therapy appears to stimulate enzymes involved in glucose metabolism, lipid breakdown and phase II liver detoxification. This may include activation of glyoxalase systems (which detoxify AGE precursors), lipases and transport proteins responsible for cholesterol efflux. (c) Cellular Coherence and Repair Signaling. By restoring coherent photonic communication between cells, strong biophotons may synchronize cellular detox responses. This intercellular “light language” enhances immune coordination, directs macrophages to clean up plaque deposits and promotes membrane repair. (d). Microcirculatory Enhancement.

Improved microvascular flow, observed through live blood imaging, reflects decreased blood viscosity and normalized red blood cell spacing. This not only improves oxygen delivery but also accelerates the removal of metabolic waste, including glycation byproducts and lipid fragments.

Biophotons and SIRT1: A Key Mechanism in Anti-Aging Regulation. One of the central molecular pathways involved in anti-aging is the Sirtuin 1 (SIRT1) pathway [21,22]. SIRT1 is a NAD⁺-dependent deacetylase that plays a pivotal role in cellular longevity, DNA repair, mitochondrial function, circadian rhythm regulation and resistance to oxidative stress. Its activity is widely regarded as a molecular signature of youthfulness and cellular resilience. Biophoton therapy may influence SIRT1 expression and activity through several interconnected mechanisms:

- a) **Mitochondrial Enhancement→Increased NAD⁺→SIRT1 Activation.** Biophoton exposure improves mitochondrial respiration and reduces oxidative damage. Since mitochondria are the primary source of nicotinamide adenine dinucleotide (NAD⁺), a crucial coenzyme required for SIRT1 activity, enhanced mitochondrial function naturally increases NAD⁺ availability. Upgradation of SIRT1-dependent pathways that promote autophagy, DNA stability and metabolic repair [23-27].
- b) **Hormetic Photonic Stress Mimics Caloric Restriction.** Biophoton fields generate a mild, non-damaging stimulus that resembles hormesis, the beneficial stress signal induced by fasting, exercise, or low-dose toxins. This type of stress has been shown to stimulate SIRT1 transcription, reinforcing cellular defenses and promoting regeneration. Activation of longevity-associated transcription factors (e.g., FOXO, PGC-1 α) that work synergistically with SIRT1 [24].
- c) **Suppression of NF- κ B-Mediated Inflammation.** Chronic inflammation suppresses SIRT1 expression through the overactivation of NF- κ B. Biophoton therapy downregulates inflammatory markers and promotes tissue repair, creating a cellular environment that favors SIRT1 stability and expression. Rebalancing of pro-inflammatory and anti-inflammatory gene networks via SIRT1's deacetylation functions.
- d) **Epigenetic Stabilization via Coherent Field Exposure.** Biophotons improve the electromagnetic coherence of DNA, supporting proper transcriptional regulation. As SIRT1 is a gene that responds sensitively to environmental and energetic cues, enhanced coherence in the nuclear environment may support stable, rhythmic expression of SIRT1 and its downstream targets. Result: Preservation of youthful gene expression patterns through light-mediated epigenetic support.
- e) **Circadian Alignment and Neuroendocrine Regulation.** SIRT1 is also closely tied to the regulation of the circadian clock and melatonin synthesis. Biophoton therapy, when delivered in alignment with natural light-dark cycles or during sleep, may enhance the chronobiological rhythms that preserve SIRT1's natural oscillation and feedback loops.

Improved sleep-wake cycles, hormonal balance and nocturnal repair-all dependent on SIRT1 integrity.

These mechanisms suggest that biophoton therapy may exert some of its strongest anti-aging effects by maintaining or

reactivating the SIRT1 pathway, which acts as a master regulator of metabolic health, DNA stability and regenerative signaling.

A New Era of Anti-Aging: Non-Invasive, Light-Based Cellular Renewal. What makes strong biophoton therapy revolutionary is its non-invasive, side-effect-free nature and its ability to restore homeostasis rather than suppress symptoms. Rather than targeting specific molecules like drugs, biophotons restore order to the energetic foundation of biological systems. The ability to reverse glycation and de-cholesterolize tissues suggests a future where aging may not only be slowed but functionally reversed-at the molecular, cellular and systemic levels. Biophoton therapy thus stands as a potential pillar in next-generation regenerative medicine, integrative longevity programs and precision detoxification strategies.

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