Abstract

Endogenous Mesenchymal Stem Cell (MSC) Stimulation with Pulsatile Non-Thermal Radial Ultrasound

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Some energy-based devices (EBDs) are capable of stimulating endogenous stem cells through a mechanism based on the concept of **hormesis**. Hormesis is considered a "Theory of Everything" in biology: **low energy levels** of stimulation promote beneficial cellular responses such as proliferation, while **high energy levels** may trigger negative effects, including cellular inhibition or death.

Recent studies have shown that **low-energy HIFU** (High-Intensity Focused Ultrasound) can stimulate **adipose-derived stem cells (ADSCs)**, leading to increased cell proliferation. This suggests that many EBDs have the potential to enhance **facial volume** through similar pathways.

Among these, **Triple LDM®** ultrasound stands out due to its unique **multi-frequency pulsatile delivery**, which exerts **three primary biological effects**:

1. Stimulation of **cell proliferation**,
2. Induction of **collagen synthesis**, and
3. **Modulation of cell membrane** structure, permeability, and function.

In connective tissue, **fibroblasts and fibrocytes** play central roles.

- **Fibroblasts** are highly synthetic, producing extracellular matrix proteins like protocollagen and enzymes like collagenase.
- **Fibrocytes**, in contrast, are more metabolically inactive and maintain tissue homeostasis.

The **ratio of fibroblasts to fibrocytes** reflects the metabolic activity of the tissue and its regenerative potential.

We propose that **Triple LDM** can be precisely used for both **skin rejuvenation** and **facial volume augmentation**, particularly when applied at low energy settings to targeted regions such as the **buccal fat pad** and **lateral SOOF (Sub-Orbicularis Oculi Fat)** area, or other **localized depressions**. This approach may provide a **non-invasive, regenerative strategy** for aesthetic improvement by harnessing the body's own stem cell potential.
