



Comprehensive Study on Stress Related Hair Loss in Stem Cell Secretome

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DESCRIPTION

Living things are constantly exposed to a variety of internal and external stimuli, which may have an impact on how they behave emotionally, psychologically, and physically. Stress can alter brain chemistry, impair functional memory, and cause a variety of illnesses, including a variety of skin conditions, including alopecia areata, telogen effluvium, psoriasis, and acne. Human body cells called stem cells are undifferentiated and unspecialized. They can self-renew (proliferate quickly) through symmetrical division, are plastic (able to differentiate into other types of organism cells through asymmetrical division), and are clonal (come from the same clone).

Depending on their ancestry, stem cells are divided into five main categories: adult somatic stem cells, foetal stem cells, amniotic epithelial cells, umbilical cord epithelium, and Embryonic Stem Cells (ESCs). Both adults and embryos have them. Stem cells were the focus of research as potential treatments for various diseases and are typically used in regenerative and reparative therapy because they have the capacity to give rise to numerous lineages and because of their paracrine and trophic effects. Any state known as stress causes a person's physiological and psychological balance to be adversely disturbed homeostasis. The brain regions with the greatest involvement in the regulation of the autonomic and HPA axis (Hypothalamic-Pituitary-Adrenal) stress response mechanisms are the hippocampal, amygdala, and prefrontal cortex areas.

Stressful events cause these areas to change both physically and functionally. Synapse turnover, dendritic remodelling, and neuron replacement are examples of structural alterations. Glucocorticoid hormone and excitatory neurotransmitters, such as glutamate, change the synaptic density of neurons and dendritic retraction and extension. In fact, a number of ailments, such as increased fat mass, osteo-sarcopenia, frailty, cellular dehydration, persistent systemic inflammation, and conditions relating to the skin are brought on stress. The largest bodily organ is the skin. It contains a higher concentration of peripheral nerve endings, keratinocytes, mast cells, and immune cells. Additionally, it is a crucial component in the

manufacturing of HPA axis components. It is therefore regarded as actively contributing to the stress response.

As a result, people may develop a variety of stress-related skin conditions, such as psoriasis, atopic dermatitis, vitiligo, acne, and Alopecia Areata (AA). Psychological stress might act as a catalyst or aggravating element for AA. The most often used Mesenchymal Stem Cells (MSCs), in particular Adipose-Derived Stem Cells (ADSCs), are used to treat ailments such skin problems. The most promising treatment for stress-induced alopecia recently emerged from MSCs and their paracrine factors, secretome. The latter is distinguished by immunological abnormalities that impact the Hair Follicle (HF) and cause hair loss. Being able to prevent complement activation, dendritic cell development from monocytes, and lymphocyte proliferation, MSCs were consequently thought to as natural immune suppressants. They are frequently utilized for hair regeneration as a result of stressful circumstances.

The soluble substances produced by stem cells and used for cell communication are known as "stem cell secretome." It consists of substances released into the extracellular space, such as proteins, Extracellular Vesicles (EVs), and nucleic acids. Serum proteins, growth factors, angiogenic factors, hormones, cytokines, extracellular matrix proteins, extracellular matrix proteases, and even genetic material that are thought to be encoded by about 10% of the human genome are all represented in the secretome. Conditioned Medium (CM) is the name given to the nutritive medium that contains these paracrine substances and the stem cells. These chemicals are produced by stem cells using both traditional and novel processes, including protein translocation, exocytosis, and vesicle or exosome encapsulation.

Stress is a psychological issue that triggers a number of diseases. Chronic stress, especially alopecia areata, causes hair loss. The hair follicles are destroyed by the auto-reactive cells, which results in hair loss and the development of alopecia areata symptoms. Hair loss and alopecia areata may be treated using stem cells and the secretory components they produce. For this therapy to be most effective, further human trials must be conducted. To achieve complete recovery without relapse, the number of injections, dose, and time between them should be optimized.

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