

INTRODUCTION



Neocollagenesis is the main stimulus for skin youthfulness. Collagen plays a crucial role in maintaining the structural integrity of connective tissues, including skin, bones, tendons and ligaments. The proper functioning of the metabolism is essential for a good response to treatments. Aging is a consequence of accumulation of reactive oxygen species (ROS). Cellular antioxidant systems undergoes a natural deterioration, however, the deficiency of hormones and vitamins, combine with external aggressors, contribute to intensify oxidative stress^{1,2}. The hormones and vitamins that act in neocollagenesis are: melatonin, cortisol, hormone D, sex hormones; vitamin A, C, E and B₃. Its supplementation can be topical or systemic. Some factors associated with aging cannot be changed, but others are manageable and can be modulated. Anti-aging treatments go far beyond offering clinical procedures and, therefore, require a global attention to health.

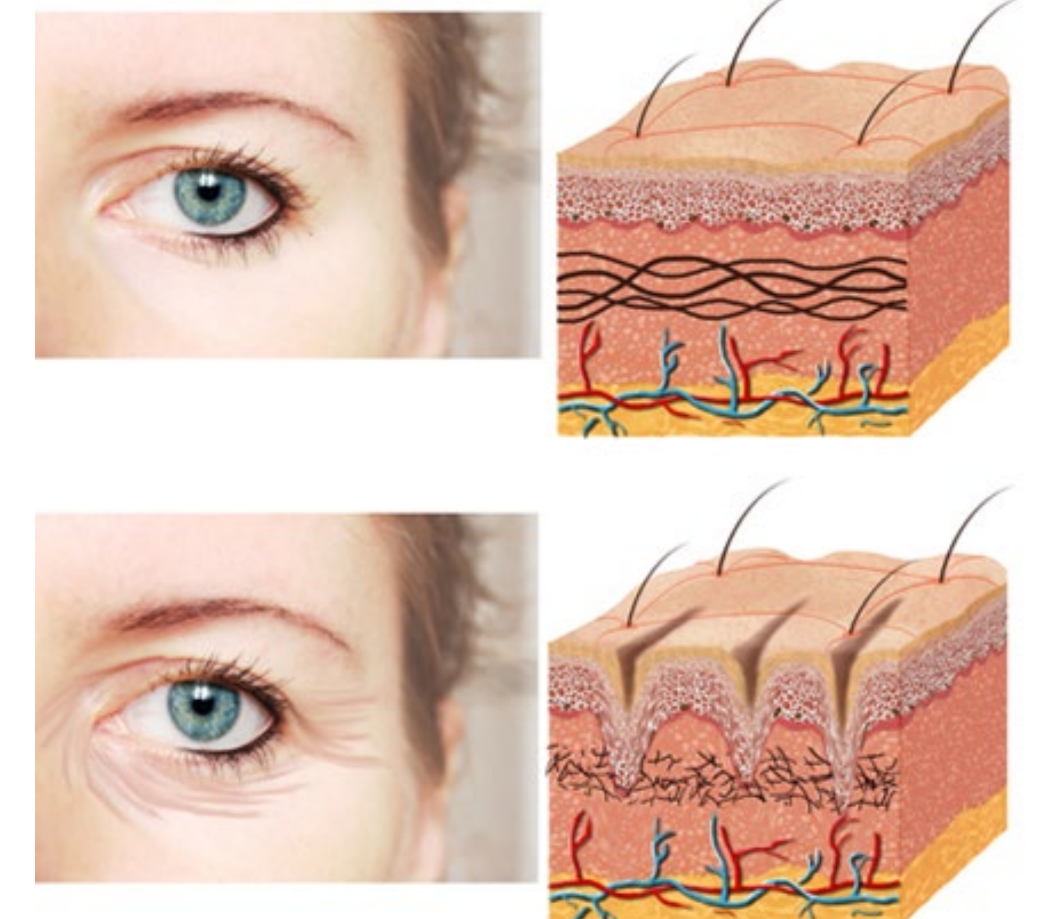


Figure 1. Structural change between young and aged skin
<http://dermatosaude.com.br/envelhecimento-da-pele/>

OBJECTIVE

The aim of this work is to describe the metabolic influence in neocollagenesis and anti-aging treatments.

METHODS

Articles published since 1975 were searched in the PubMed database. The keywords for the search were: hormones and vitamins associated with neocollagenesis, collagen biostimulating treatments and facial aging.

RESULTS

Despite the increase in product options and high-end technologies, metabolism is crucial for a good response. Evaluating serum levels of hormones and vitamins and supplementing with individualized doses are essential for excellent aesthetic results. The metabolic factors emphasized are melatonin, cortisol, sex hormones, hormone D, glucose and vitamins (A, C, E and B₃). Measures such as improving sleep quality; stress control; hormonal modulation; healthy lifestyle; physical activity; balanced diet; and individualized vitamin supplementation; are part of a complete anti-aging treatment.

ANTI-AGING METABOLISM

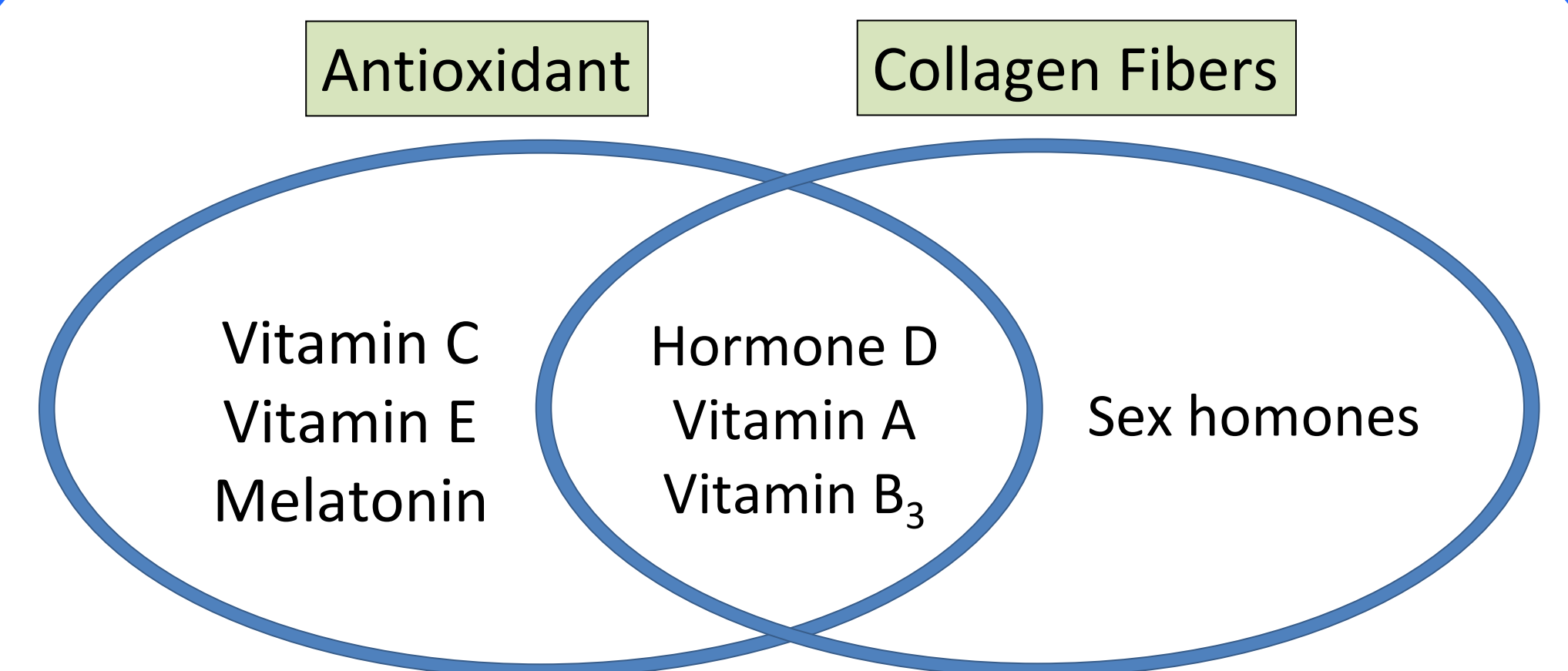


Figure 2. Division of metabolic factors according to their action in neocollagenesis.

DISCUSSION

TREATMENTS			
PROCEDURES	STIMULUS	PROS	CONS
Injectable collagen biostimulator	Foreign body reaction	High collagen induction; Stimulation and volumization	Absence of degrading enzyme
Solid collagen biostimulator (Threads)	Foreign body reaction	Absence of risk of vascular obstruction; Possibility of tissue repositioning; Can be used in regions where the injectable biostimulator cannot be used	Stimulus only around the thread; Need of many threads per region
Hyaluronic acid	Mechanical tension of fibroblasts	Versatile; Volumization; Existence of degrading enzyme	Low collagen stimulation
Ablative technologies	Trauma inflammation	Treats the outer layer of the skin (E.g. blemishes and scars)	Limitation by skin phototype; Removes stratum corneum; Traumatic
Non-ablative technologies	Heat inflammation	Security; Reaches different layers of the skin; Little invasive	High cost

Table 1. Collagen biostimulating treatments.

Aging is associated with immunological alteration and imbalance between inflammatory and anti-inflammatory mechanisms, leading to chronic low-grade inflammation, known as the "inflammaging" state³. Hormones are chemical messengers that maintain metabolic homeostasis and its deficiency causes a global health imbalance. Estrogen prevents collagen depletion, increases water retention, improves epidermal barrier function, and decreases elastosis, whereas testosterone is associated with a higher concentration of collagen⁴. It is possible to restore collagen to premenopausal levels within 6 months of starting hormone replacement therapy⁵. Hormone D and melatonin are essential hormones to counterattack the highly oxidizing extracellular environment^{6,7}, whereas excess of cortisol has the opposite action. Indirectly, cortisol acts on the skin by increasing glucose levels, facilitating collagen glycation, and increasing oxidative stress, and, directly, cortisol accelerates protein catabolism, causing changes in collagen fibers and making the subcutaneous tissue fragile⁸. In addition to collagen, glucose can bind to antioxidant enzyme proteins, lowering the defense against free radicals. It is almost impossible to repair glycated collagen, so preventing its formation is the best way⁹. Current knowledge provides a basis for the medical recommendation of hormone replacement therapy, especially for postmenopausal women, and dietary advice. Potential treatment options for already damaged skin involve the use of topical antioxidants and compounds that help repair DNA and stimulate collagen synthesis¹⁰. Vitamin A, C and E are potent antioxidants. In addition, retinol, a derivative of vitamin A, is a nutrient that acts on cell renewal, inhibits collagenases and promotes collagen synthesis, which makes it a powerful asset against skin aging. Vitamin B₃ also contributes with antioxidant action, however, its greatest benefit is as an alternative for patients who have skin irritation with the topical use of retinol. It increases collagen production and reduces transepidermal water loss (due to ceramide synthesis) promoting hydration and restoration of the skin barrier. Vitamin levels should be obtained through diet, but the increasing difficulty of a balanced diet results in malnutrition and the need for supplementation.

HORMONES

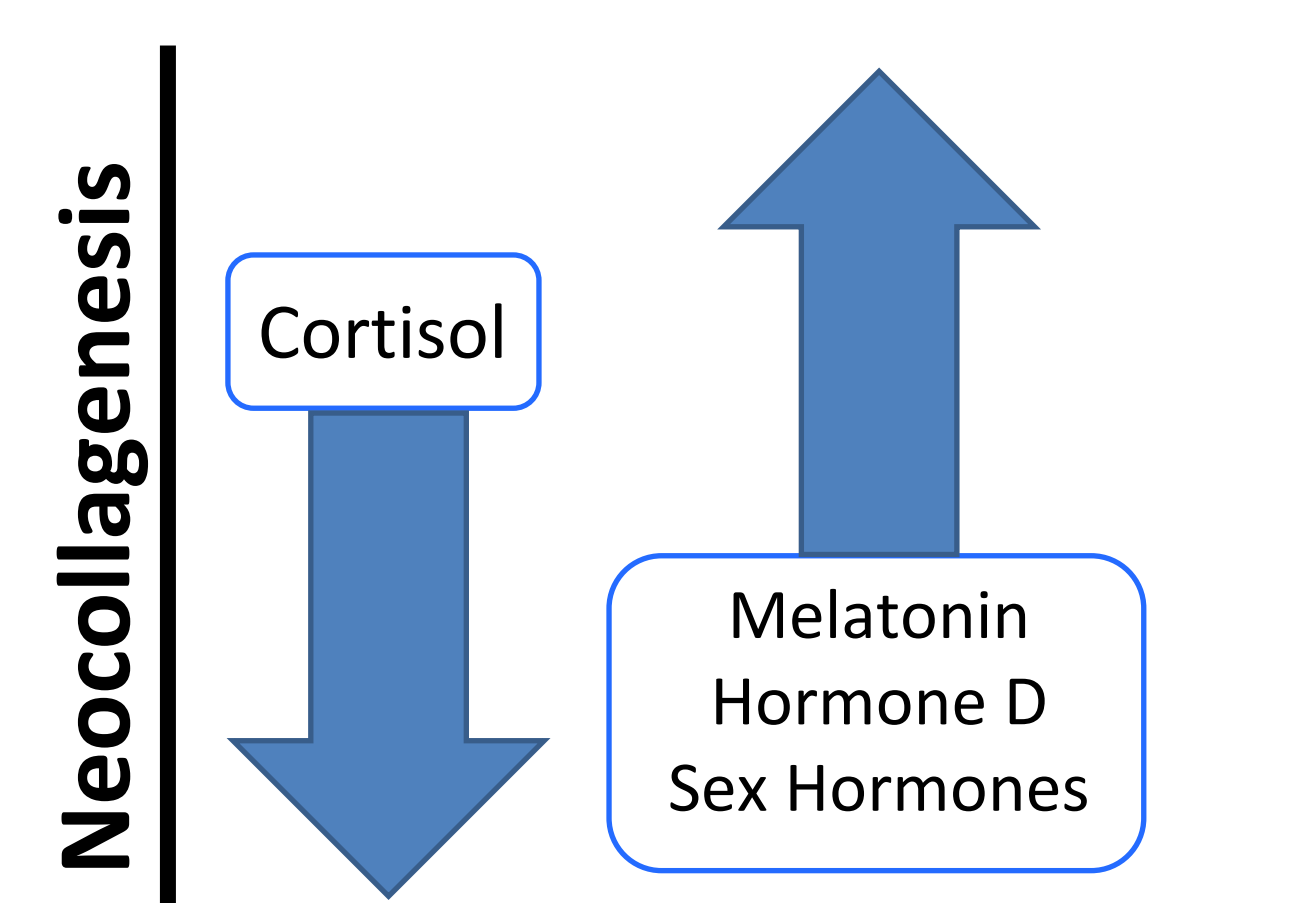


Figure 3. Contribution of hormones to neocollagenesis.

CONCLUSION

The current literature review demonstrated the direct impact of free radicals and the role of hormones and vitamins for neocollagenesis. In conclusion: 1. Hormonal factors must be considered in treatments that seek neocollagenesis; 2. Antioxidant factors are extremely important to restrain the signs of aging; 3. Preventing exogenous factors is the best anti-aging method; 4. Supplementation of hormones and vitamins proved to be effective when associated with clinical procedures.

REFERENCES

- Baumann L. Skin ageing and its treatment. *The Journal of Pathology: A Journal of the Pathological Society of Great Britain and Ireland* 2007; 211(2): 241-251.
- Kohl E, Steinbauer J, Landthaler M, & Szeimies RM. Skin ageing. *Journal of the European academy of dermatology and venereology* 2011; 25(8): 873-884.
- Bocheva G, Slominski RM, & Slominski AT. The Impact of Vitamin D on Skin Aging. *International journal of molecular sciences* 2021 aug; 22(16): 9097. <https://doi.org/10.3390/ijms22169097>

- Shuster SAM, Black MM, & McVitie EVA. The influence of age and sex on skin thickness, skin collagen and density. *British Journal of Dermatology* 1975; 93(6): 639-643.
- Affinito P, Palomba S, Sorrentino C, Di Carlo C, Bifulco G, Arienzo MP, Nappi C. Effects of postmenopausal hypoestrogenism on skin collagen. *Maturitas* 1999 dez; 33(3): 239-247.
- Slominski A, Zbytek B, Nikolakis G, Manna PR, Skobowiat C, Zmijewski M, Li W, Janjetovic Z, Postlethwaite A, Zouboulis CC, Tuckey RC. Steroidogenesis in the skin: implications for local immune functions. *The Journal of steroid biochemistry and molecular biology* 2013 set; 137: 107-123. <https://doi.org/10.1016/j.jsbmb.2013.02.006>
- Bocheva G, Slominski RM, Janjetovic Z, Kim TK, Böhm M, Steinbrink K, Reiter RJ, Kleszczynski K, Slominski AT. Protective Role of Melatonin and Its Metabolites in Skin Aging. *International journal of molecular sciences* 2022 jan; 23(3): 1238. <https://doi.org/10.3390/ijms23031238>
- Rodrigues AC, Perez CL, Da Silva DP. Influência do cortisol nas disfunções estéticas. *Revista Saúde em Foco* 2019; 11: 1120-1138.
- Danby FW. Nutrition and aging skin: sugar and glycation. *Clinics in dermatology* 2010; 28(4): 409-411.
- Martin KI & Glaser DA. Cosmeceuticals: the new medicine of beauty. *Missouri Medicine* 2011 Jan-Feb; 108(1): 60-63.