

Anti-Aging & Anti-Wrinkle Agents

The study of skin aging focuses on two main streams of interest: the esthetic problem and its management and the biological problem of aging in terms of microscopic, biochemical, and molecular changes.

The skin and hair are subject to intrinsic or physiologic aging, and extrinsic or premature aging due to external factors. Intrinsic factors are related to individual genetic and epigenetic mechanisms with interindividual variation. Extrinsic factors that are well-established causes for skin aging include ultraviolet radiation of the sun rays and cigarette smoking.

Therefore, primary prevention starts with sun protection and avoidance of cigarette smoking. Secondary prevention includes the use of sun protecting agents, dermocosmetic substances, and anti-aging compounds. Finally, tertiary anti-aging measures include minimally invasive cosmetic procedures such as chemical peels, microdermabrasion, soft tissue fillers, non-ablative laser rejuvenation, radio-frequency techniques and botulinum toxin.

Targets of Anti-Aging Compounds

Modern anti-aging preparations feature a large variety of active ingredients against skin aging. Most of these ingredients are based on recent findings that in aging the balance between collagen synthesis and collagen fragmentation is altered. Environmental factors inducing oxidative stress and decreased estrogen levels during menopause are important factors for such changes in the connective tissue of the skin.

Hence, the major targets of anti-aging agents are oxidative stress and collagen metabolism. In addition, as it is known that a well-moisturized skin is less prone to oxidative injuries and premature aging, moisturizing agents form another important part of anti-aging agents.

Nowadays, there are several instrumental, clinical and experimental (e.g. cell culture) methods available that can be used to assess the effect of such agents. For example, the efficacy of antioxidants can be reliably determined by clinical micro-inflammatory models which assess the ability of a compound to reduce small oxidative skin injuries.

Natural & Synthetic Compounds

Over 60 botanicals are marketed in cosmeceutical formulations. The most important botanicals pertaining to cosmeceutical use include teas, soy, pomegranate, date, grape seed, pycnogenol, horse chestnut, German chamomile, curcumin, comfrey, allantoin, and aloe. All are documented to treat dermatologic conditions. However, only green and black tea, soy, pomegranate, and date have published clinical trials for the treatment of skin aging.

There is even a larger number of synthetic compounds that have been shown to have anti-aging properties. Many compounds have antioxidant functions or alter the collagen metabolism. There are, however, also new compounds that have a completely different mode of action to reduce aging or wrinkle formation. The table below gives a brief overview of the most widely used agents.

T. Bombeli, MD BBA

References:

Trueb RM. Aging of skin & hair. *Ther Umsch.* 2005; 62: 837
Glaser DA. Anti-aging products and cosmeceuticals. *Facial Plast Surg Clin North Am.* 2004; 12: 363-72
<http://www.specialchem4cosmetics.com>

Selection of Anti-Aging Compounds

Active Ingredient	Compound/Origin	Mode of Action
• Grape Seed Extract	Polyphenols & flavonoids from fruits extracts	Antioxidant
• Collagen, Hydrolyzed	Protein & protein fragments, animal/vegetable derived	Moisturizing, regenerating, anti-wrinkle
• Jojoba Protein	Protein, derived from Jojoba plant	Moisturizing, regenerating, repairing, anti-wrinkle
• Elastin	Protein, animal/plant/marine derived	Moisturizing, restructuring, anti-wrinkle
• Gelatine	Protein, animal/plant/marine derived	Moisturizing, restructuring, anti-wrinkle
• Chondroitin Sulphate	Polysaccharide, animal/plant/marine derived	Moisturizing, regenerating
• Oligopeptides	Oligopeptides, animal/plant/marine derived, synthetic	Stimulates collagen synthesis & skin cells growth (fibroblasts)
• Phytic Acid	Botanical extract	Antioxidant & chelating agent, scavenges free-radicals
• Spirulina Extract	Botanical extract from plankton	Antioxidant, immune-stimulating, moisturizing
• Calcium PCA	Mineral	Stimulates cell differentiation & synthesis of epidermal lipids
• Ceramides	Ceramides packed in milk-liposomes (lacto-ceramides)	Replenishes own skin-ceramides, recovers barrier function
• Zea Mays Kernel Extract	Botanical extract from Zea Mays Corn (rich in inositol)	Antioxidant
• DHEA	3-Beta-Hydroxy-5-androsten-17-one	Protective, regenerating
• Pullulan	Natural sugar (glucan) from fungus <i>A. pullulans</i>	Skin tightening effect, stimulates collagen synthesis
• Ferulic Acid	Phenolic compound, plant-derived	Antioxidant, antiinflammatory
• Hyaluronic Acid	Polysaccharide, derived from soy peptone & yeast extract	Moisturizing, promotes growth of skin cells, anti-wrinkle
• Genistein	Isoflavone compound, plant-derived (e.g. soya, tofu)	Antioxidant, protective
• Kojic Acid Dipalmitate	Natural product derived from Japanese mushroom	Toning, invigorating, skin-lightening/whitening
• Phyllanthus Emblica	Polyphenols & flavonoids from fruit extract	Antioxidant, skin-lightening/whitening
• Coenzyme Q10	Ubiquinone (vitamin-like compound), plant-derived	Antioxidant, promotes collagen & elastin synthesis
• Ectoin	Natural compound derived from halophilic bacteria	Skin-relaxing, moisturizing, protects from cell damage
• TIMP2	Protein, biotechnologically produced	Inhibits enzymes that degrade collagen in the skin
• L-ascorbic acid (Vit. C)	Natural derived or synthetic	Antioxidant, stimulates collagen synthesis, skin-lightening
• Argireline	Peptide (acetyl hexa-peptide-3)	Anti-wrinkle (inhibits facial skin muscle tightening)
• Dipalmitoyl Hydroxyproline	Amino acid combined with palmitic acid	Contracts collagen, moisturizing, inhibits "age enzymes"
• Retinol Palmitate (Vit. A)	Natural vitamin, synthetically produced	Regenerating (promotes skin cell growth), anti-wrinkle
• Provitamin B5	Natural vitamin, synthetically produced	Moisturizing, improves skin elasticity, regenerating