

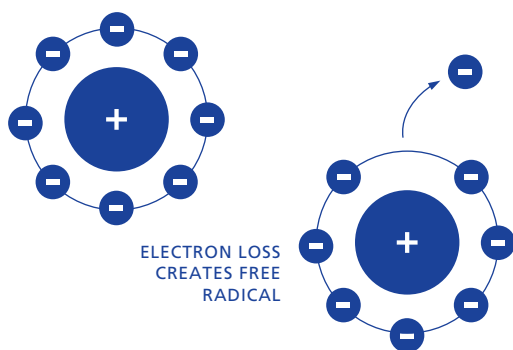
WHITE LIGHTENING™ COMPLEX ORAC STUDY

STUDY OBJECTIVE

WHITE LIGHTENING COMPLEX was developed initially for market demands related to pigment irregularities and hyperpigmentation. However, because of the multiple biologic pathways in the pigment process affected by this product – one of them being mitigation of inflammation – it is anticipated that WHITE LIGHTENING COMPLEX would also exhibit antioxidant activity. This study was undertaken to evaluate the ability of WHITE LIGHTENING COMPLEX to neutralize free radicals.

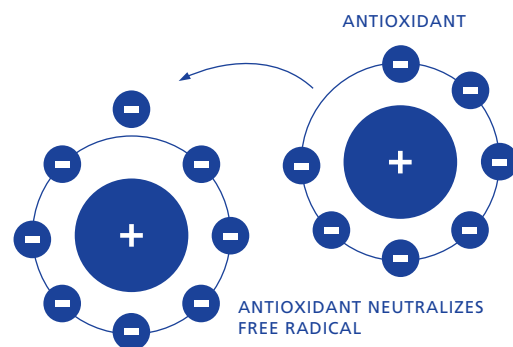
STUDY DESIGN

A variety of free radicals related to the oxygen free radical are present in the human body. This assay evaluated Oxygen Radical Absorbance Capacity (ORAC) against the five predominant reactive species: peroxy radicals both hydrophilic and lipophilic, hydroxyl radicals, peroxynitrite radicals, superoxide anions, and singlet oxygen species. The capacity to neutralize these types of free radicals, all of which are present in the human body, were expressed in a sum score – the ORAC or Oxygen Radical Absorbance Capacity.



Free radicals are highly reactive substances and contain an unpaired electron in their outer orbit.

The ORAC is performed by inducing free radical formation, thereby causing damage to a probe that can be quantitatively measured. The test substance is introduced into the system and its ability to absorb each of the generated free radical classes is quantified by measuring the actual radical damage to the probe against the amount of expected damage if no test substance were present. Trolox, a vitamin E analog, serves as the reference standard and units of measurements are given in Trolox equivalents. All of the major radicals present in the human body are included in this analysis and a summation score is given for comprehensive free radical protection afforded by the test substance.



Antioxidants neutralize free radicals by donating an electron to the reactive species.

SIGNIFICANCE OF STUDY

The ORAC gives a comprehensive measure of the total antioxidant power of the test substance. All the reactive species important in the human body are included in this assay and in the summation score. Each of these radicals has been clearly demonstrated to be important in intrinsic aging, photoaging, disease development, cancer development, and skin diseases – with the exception of superoxide anion which is important in cardiovascular disease alone.

WHITE LIGHTENING™ COMPLEX has been shown to be effective for hyperpigmentation. Studies have verified it decreases the production of melanin within the melanocyte by up to 37 percent. Its ingredients were selected to affect all the steps in the skin's process of pigmentation – including signaling related to trigger exposure, inflammation, melanin synthesis within melanocytes, transfer of melanin from melanocyte to keratinocyte (dendricity), and movement of pigment within keratinocytes upward in the epidermis to collect in the outer corneocytes of the stratum corneum. A strong ORAC score would objectively verify that WHITE LIGHTENING COMPLEX has potential activity in the anti-inflammatory pathways. Furthermore, some of the most popular products in the marketplace for hyperpigmentation contain hydroquinone which is cytotoxic to the melanocyte and therefore pro-inflammatory. A positive ORAC would further differentiate the mechanisms of action of WHITE LIGHTENING COMPLEX from hydroquinone containing products and verify the advantages of WHITE LIGHTENING COMPLEX over these other product types.

Furthermore, a positive ORAC score would also explain, verify, and further support the finding seen in before-and-after subject photos illustrating decreasing inflammation with product use.



Before-and-after subject photo showing decreased inflammation of cheek area with 90 days of product use.

RESULTS AND CONCLUSIONS

WHITE LIGHTENING COMPLEX exhibited ability to neutralize the following free radicals: peroxy radicals both hydrophilic and lipophilic, hydroxyl radicals, peroxy nitrite radicals, and singlet oxygen radicals. Neutralization of superoxide anions was not detected, but is of no consequence since superoxide anions are not implicated in skin aging and skin disorders but only important for cardiovascular disease development.

ANALYSIS RESULTS	
ORAC 5.0	1,414 μmole TE/gram

The comprehensive panel ORAC score for WHITE LIGHTENING COMPLEX measured 1,414. The free radicals measured are known to be involved in the pathogenesis of intrinsic aging, photoaging and disease states including cancer development and malignant potential. All of these free radicals contribute to a general condition termed "oxidative stress" which is important in length of disease-free interval, DNA and protein damage, and all inflammatory conditions and illnesses. For skin in particular, these radical species have been implicated in skin aging, photodamage, collagen breakdown, cancer development, chronic inflammation, lipid peroxidation and hydrophilic radical damage.

The ORAC result for WHITE LIGHTENING COMPLEX demonstrates broad antioxidant activity. Furthermore, its anti-inflammatory activity, critical in one of the five pathways of human skin pigmentation, is supported and verified. This result also sets WHITE LIGHTENING COMPLEX apart from other products for pigmentation which use pro-inflammatory and cytotoxic mechanisms of action. These other products are not expected to mitigate aging and other unregulated inflammatory conditions. In addition to the other benefits of WHITE LIGHTENING COMPLEX, including mitigation of hyperpigmentation, these results support WHITE LIGHTENING COMPLEX as a premium antioxidant product derived from diverse natural ingredients.

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