**AC Cinnamon Liposome**

**BACKGROUND**
Cinnamon, one of the oldest known spices, is obtained from the inner bark of several trees that are native to Sri Lanka. This spice was highly prized among ancient nations and regarded as a gift. *Cinnamomum aromaticum*, called cassia or Chinese cinnamon, is an evergreen tree that is primarily known for its aromatic bark, which is used as a spice. The bark of this type of tree is thick with a much rougher texture than other types. Cassia is used in traditional Chinese medicine to cure the common cold and is considered one of the most fundamental herbal prescriptions. This type of cinnamon has a slight, distinct odor and taste that has led to its widespread use in commercial baking.

**SCIENCE**
Several laboratories have found *Cinnamomum cassia* to be a safe, natural skin lightening agent. Many traditionally used skin lighteners such as, hydroquinone and corticosteroids have effectively been used to reduce hyperpigmentation. However these synthetic products have been associated with negative effects, such as cell toxicity, the reason why they are tightly regulated or banned. This has led to the search for more natural and safe plant based skin solutions. *Cinnamomum cassia* bark was found to have natural skin lightening properties relating to its capacity to inhibit tyrosinase activity.

Tyrosinase is a copper containing enzyme that plays in key role in melanin production. Copper is the essential cofactor of tyrosinase and is required for it to carry out catalytic activity. The copper atoms in tyrosinase interact with oxygen to form a highly reactive intermediate in the initial oxidation reaction of melanogenesis. At the beginning of the melanogenesis pathway, tyrosine is converted to dihydroxyphenylalanine (DOPA) with tyrosinase acting as the catalyst. DOPA is then converted to DOPA-quinone and eventually melanin is produced through a combination of polymerization and oxidation. *Cinnamomum cassia* bark has natural tyrosinase inhibiting components that restrict the process of melanogenesis through an unusual mechanism. These natural components, linderanolide B and subamolide A, have been shown to exhibit effective anti-pigmentation abilities.

**Benefits of AC Cinnamon Liposome:**
- Safe, Natural Skin Lightening
- Sequesters Copper to Down-Regulate Tyrosinase Activity
- Balances Skin Tone For a Flawless Glow
- Antioxidant Protection
- Enhanced Delivery
AC Cinnamon Liposome

The carbonyl group of linderanolide B and subamolide A interact with copper, which is located at the active sites of tyrosinase. The oxygen atoms of the carbonyl group act as an electric sink enabling these components to bind with the copper ions thereby deactivating tyrosinase. Effective inhibition of pigmentation requires a multifaceted approach and *Cinnamomum cassia* provides just that. In addition to its ability to inhibit tyrosinase activity, it also demonstrates strong antioxidant properties.

A water soluble *Cinnamomum cassia* bark extract was applied to the skin of volunteers to evaluate its lightening capacity however the extract did not significantly reduce melanin production. Incorporating it into a liposome allowed the active components of *Cinnamomum cassia* bark to improve their compatibility with the skin. This heightened epidermal compatibility increased effective anti-tyrosinase activity thus preventing the production of melanin. Liposomes are a small unilamellar vesicle (SUV) that are exceptionally stable delivery systems formed by a high shear processing method.

**BENEFITS**

Incorporate AC Cinnamon Liposome into finished formulas to lighten and even skin tone while incorporating potent antioxidant properties for increased functionality. AC Cinnamon Liposome is stable at a pH between 4-7 and should be incorporated into formulations during the cooling phase or at temperatures below 50°C.

Reveal the natural glow of your skin with the purifying properties of cinnamon. This sweet, savory spice which is often associated with the warmth of the holidays and exotic locales, is now being used to balance skin tone and leave you with a flawless complexion. AC Cinnamon Liposome is an innovative ingredient that effectively delivers antioxidants to the skin while sequestering copper to down-regulate tyrosinase activity.

**EFFICACY**

An Oxygen Radical Absorbance Capacity (ORAC) assay was conducted to assess the antioxidant capacity of AC Cinnamon Liposome. The results showed very potent antioxidant activity even at low concentrations. AC Cinnamon Liposome’s ability to intercept Reactive Oxygen Species (ROS) before they can activate melanogenesis is a key proactive method to promote an even skin tone. Downstream tyrosinase inhibition is achieved through a combination of copper sequestration and competitive inhibition of the later non-enzymatic oxidative steps of melanogenesis. This provides a novel cosmetic solution to a common problem.

![ORAC Assay](image_url)

**Figure 1.** Antioxidant capacity of AC Cinnamon Liposome at different usage levels.

An *in-vitro* study was also conducted to determine the effects of AC Cinnamon Liposome on tyrosinase inhibition. Studies were conducted on isolated mushroom tyrosinase utilizing UV-Visible Spectrophotometry and the absorbance was measured after treatment with AC Cinnamon Liposome and Kojic Acid, which was used as a positive control. The results indicate that 2% AC Cinnamon Liposome inhibits tyrosinase activity by 40.6% and 5% AC Cinnamon Liposome inhibits tyrosinase activity by 65.4%.
An *in-vivo* study was conducted with five volunteers (M/F) between the ages of 24-33. Volunteers were asked to apply 2 mg of a base lotion containing 2% **AC Cinnamon Liposome** to their volar forearms twice daily for 14 days. To provide more perspective, an area was left untreated as a control and another area was treated with the base lotion (Vaseline Aloe Fresh Hydrating) with no additives.

The test areas were analyzed for melanin values 3 days, 8 days and 14 days after the start of the study using a DermaLab Combo Skin Lab equipped with a pigmentation probe. Melanin was calculated and is measured as an index. When compared to the base cream **AC Cinnamon Liposome** reduced the concentration of melanin by 10% after a period of 14 days and when compared to the untreated control it was capable of reducing melanin by 12%.

Incorporating **AC Cinnamon Liposome** into a finished formula has a significant impact on melanin levels. Please note that skin lightening products can be used in over the counter applications however they cannot be claimed as the active ingredient. Incorporate **AC Cinnamon Liposome** into finished formulas to lighten and even skin tone while incorporating potent antioxidant properties for increased functionality.

![Changes in Melanin](image-url)