

## Topical Melasma Treatments

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### Abstract

Known as the “pregnancy mask,” over six million Americans are impacted by hormonally induced melasma every year, making it one of the most common skin concerns in the United States. Affecting female patients in 90% of cases, melasma appears in large, dense patches of pigmentation, usually on the malar, mandibular and centrofacial areas of the face. Although melasma can affect anyone, it tends to affect women with a Fitzpatrick skin type of III-VI living in areas of intense Ultraviolet (UV) light exposure. By understanding the melanogenesis pathway, and utilizing diagnostic tools like the MASI scale and the Wood’s Lamp, clinicians can identify this frustrating condition and proceed with a progressive treatment approach. Addressing melasma using a variety of pigment-inhibiting and correcting ingredients, as well as gentle exfoliation methods, in both daily care regimens and professional treatments will ultimately lead to the desired results the clinician and patient intend to achieve.

**Keywords:** Melasma; Pregnancy mask; Hyperpigmentation; Melanogenesis inhibitors; Jessner’s solution; Alpha hydroxy acids; Trichloroacetic acid

### Introduction

Known as the “pregnancy mask” to many affected by the condition, over six million Americans are impacted by hormonally induced melasma every year, making it one of the most common skin concerns in the United States [1]. Affecting female patients in 90% of cases, melasma appears in large, dense patches of pigmentation, usually on the malar, mandibular and centrofacial areas of the face [2]. Although melasma can affect anyone, it tends to affect women with a Fitzpatrick skin type of III-VI living in areas of intense ultraviolet (UV) light exposure [5].

Treatment for this challenging condition is hampered by the fact that the etiology of melasma is not completely understood. Nevertheless, better treatment options are being researched and topical treatments today are leading to dramatic results.

### What is Melasma?

The process of melanogenesis is triggered by inflammation as well as hormonal stimulation. Once the process has been instigated, the Melanocyte-Stimulating Hormone (MSH) causes the enzyme tyrosinase to be released. The tyrosinase then binds with copper and induces the oxidation of tyrosine, an amino acid. This oxidation leads to L-DOPA production, or L-3-4-dihydroxyphenylalanine; L-DOPA is then oxidized to become DOPAquinone by the tyrosinase, followed by a conversion to eumelanin or pheomelanin. This melanin, or pigment, collects into packets known as melanosomes that are transferred along the melanocytic dendrites to the keratinocytes. An umbrella of melanosomes forms over the keratinocyte nuclei, protecting the DNA [16,17]. Understanding this process is imperative in order to identify which ingredients are best to counteract the steps of this pathway.

Those with this condition tend to have larger melanocytes with prominent dendritic processes in their epidermis, along with increased numbers of keratinocytes and significantly increased melanin in all layers of the epidermis [5]. The reason it’s often referred to as the “pregnancy mask” is because patients have high levels of estrogen receptors in their melanocytes as compared to nearby normal skin, making them sensitive to hormonal stimulation. This hormonal shift comes with pregnancy as well as lactation, menopause, contraceptive use, hormone replacement therapy and disorders of the thyroid or ovaries [6].

Sun exposure is another factor, as melasma patches worsen when unprotected from UV radiation [11-13].

### Diagnostic Tools

There are a variety of ways clinicians can diagnose melasma and successfully treat patients suffering from the condition. Developed 20 years ago, the Melasma Area and Severity Index, or MASI, gives providers a tool to consistently assess the severity of melasma cases, characterizing them from 0 to 4:

- 0 = no apparent melasma
- 1 = barely visible melasma
- 2 = mild melasma
- 3 = moderate melasma
- 4 = severe melasma

Along with this visual rating, the depth of the discolored patches must be accounted for as well, from epidermal to dermal, mixed or undetermined. A Wood’s Lamp can be used for this purpose, illuminating levels of hyperpigmented skin cells in varied colors depending on their depth [7]. While epidermal, dermal and even mixed melasma can be identified using this tool, indeterminate melasma cannot.

## Treatment

With a stubborn condition like melasma, patient expectations must be controlled from the start. Oftentimes the pigment issues can take months, even years to clear with the use of a consistent daily care regimen and regular professional treatments. For those with severe cases where the melanin deposits are deep within the skin, the treatment process will be long; those with pigment deep in the dermis may never be clear of it completely.

Each patient is a unique combination of their environment, hereditary background, lifestyle choices and product usage. Therefore, a treatment plan should be customized for each patient on an individual basis. Knowing the melanogenesis pathway discussed above, clinicians can look for appropriate ingredients to provide effective daily care and professional treatments to all melasma patients.

Some of the most powerful pigment-inhibiting ingredients when used alone and in combination include the following:

- Undecylenoyl phenylalanine inhibits the release of MSH early in the melanogenesis process [9,11].
- Arbutin, a natural derivative of HQ, inhibits tyrosinase activity and melanosome maturation [10,13,14].
- Kojic acid chelates the copper bound to tyrosinase, thereby inhibiting the melanogenesis process [10,14]. This ingredient also mitigates inflammation by decreasing melanosomes and melanocytic dendrites, while also inhibiting nuclear factor-kappa B activation in keratinocytes.
- Retinol plays multiple roles, not only inhibiting the activity of tyrosinase and decreasing melanosomes, inhibiting melanin transfer from melanocyte to keratinocyte; but also enhancing penetration of topically applied products through the stratum corneum, increasing cell turnover and accelerating the entire pigment-lifting process [14].
- Ascorbic acid prevents the binding of copper to tyrosinase while converting DOPAquinone back to L-DOPA [10,14].
- Lactic acid exfoliates melanin-filled keratinocytes while suppressing tyrosinase formation.
- Azelaic acid inhibits tyrosinase activity, has cytotoxic effects on melanocytes, and prevents DNA synthesis in abnormal, hyperactive melanocytes [10,14].
- Glycyrrhiza glabra extract (licorice) prevents inflammation and suppresses tyrosinase activity [12,14].
- Morus bombycis root extract (mulberry) is anti-inflammatory, providing antioxidant benefits along with inhibiting the conversion of L-DOPA to DOPAquinone [12].
- Phenylethyl resorcinol has antioxidant benefits and inhibits the conversion of tyrosinase to L-DOPA.15
- Hydroquinone, or HQ, suppresses the binding of copper to tyrosinase, interrupting the pigment depositing pathway; it decreases melanosome formation and promotes their degradation, inducing melanocyte-specific cytotoxicity [7,8,14].

To avoid inflammation and post-inflammatory hyperpigmentation, low percentages (2%) of hydroquinone should be used. As a precaution, patients who have not used hydroquinone should have a patch test administered prior to daily use to assess their tolerance.

To best address a melasma patient's specific concerns, consider a blended chemical peel that incorporates low percentages of trichloroacetic acid, alpha hydroxy acids, resorcinol or salicylic acid, along with retinol-based serums [16]. Jessner's solutions enhanced with pigment inhibitors are a gentle, effective choice [14]. Follow with anti-inflammatory and antioxidant agents, like ascorbic acid, to prevent cellular oxidation and inflammation both internally and externally. Other ingredients to consider include Epigallocatechin Gallate (EGCG) from green tea, and resveratrol, both of which help counter inflammation and free radical damage [5]. End your treatment with broad spectrum UV protection and stress the importance of daily protection from the sun to your patients – UV damage will reverse your progress and make the condition worse [14].

## Conclusion

As misunderstood and frustrating as it is, melasma can be treated using a progressive approach that does not exacerbate the condition. Drive home the importance of your patients' role in the clearing of their melasma—daily use of products designed to inhibit the melanogenesis pathway, calm inflammation, fight oxidation and provide broad spectrum UV protection will be the determining factors of how well and how long it will take for their pigmentation to clear. Gentle professional treatments coupled with melanogenesis inhibitors and the appropriate daily care products can lead to the desired outcome.

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