

# Dihydroxyacetone in a New Formulation – A Powerful Therapeutic Option in Vitiligo

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## Key Words

Vitiligo · Dihydroxyacetone

## Abstract

**Background:** Most treatment protocols for vitiligo require a long treatment duration and usually do not result in complete repigmentation. Therefore, cosmetically acceptable and easily to handle alternatives are warranted. **Objective:** To evaluate the properties of dihydroxyacetone (DHA) in a new formulation for the treatment of vitiligo on exposed areas. **Methods:** We treated 10 patients suffering from vitiligo affecting the face and/or hands with a newly introduced, commercially available self-bronzing cream containing DHA 5%. DHA was applied every second day. **Results:** The characteristic pigmentation showed very satisfactory cosmetic results in 8 out of 10 patients after 2 weeks of treatment. **Conclusion:** The new DHA formulation is a practical and well-accepted treatment modality.

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## Introduction

Vitiligo is a depigmentation disorder of the skin with a worldwide prevalence of 0.5–4% [1], mostly affecting young people. In about 50% of the patients, the onset of the skin disease is before the age of 20 years [1]. In most cases, the hands, the feet and the face are affected. The

psychological impact of vitiligo is of great importance, especially in dark-skinned people. Vitiligo brings marked distress to patients with regard to social encounters [2]. Therapeutic approaches should therefore primarily aim to achieve acceptable cosmetic results. To date, most treatment protocols in vitiligo are unfortunately time consuming and do usually not result in complete repigmentation. At present, the most common treatments are topical steroids and photochemotherapy, e.g. psoralen-UVA. However, parts of the body, e.g. the distal extremities, often remain resistant to therapy. The widely used camouflage is time consuming and has the disadvantage of textile staining. Therefore, cosmetically acceptable alternatives are warranted.

## Patients and Methods

Ten patients with vitiligo affecting the face and/or hands were treated with Autohélios®, a newly introduced, commercially available self-bronzing cream containing 5% dihydroxyacetone (DHA) in an oil-in-water emulsion basis. DHA leads to brown-staining of the stratum corneum through oxidation of the amino acids histidine and tryptophan of peptides and proteins of the corneocytes [3]. Patients were instructed how to use Autohélios and photographs were taken before and after 2 weeks of treatment. The patients were followed up after 1 and 2 weeks and treatment continued thereafter.

Autohélios was applied every second day, usually overnight. Prior to application, the lesions were cleaned with water and gently rubbed with a towel in order to get rid of loose scales. A thin layer of the cream was applied with a finger, a q-tip or a paintbrush depending on the size and location of the lesions. The finger had to be cleaned immediately after application to avoid staining. During the first

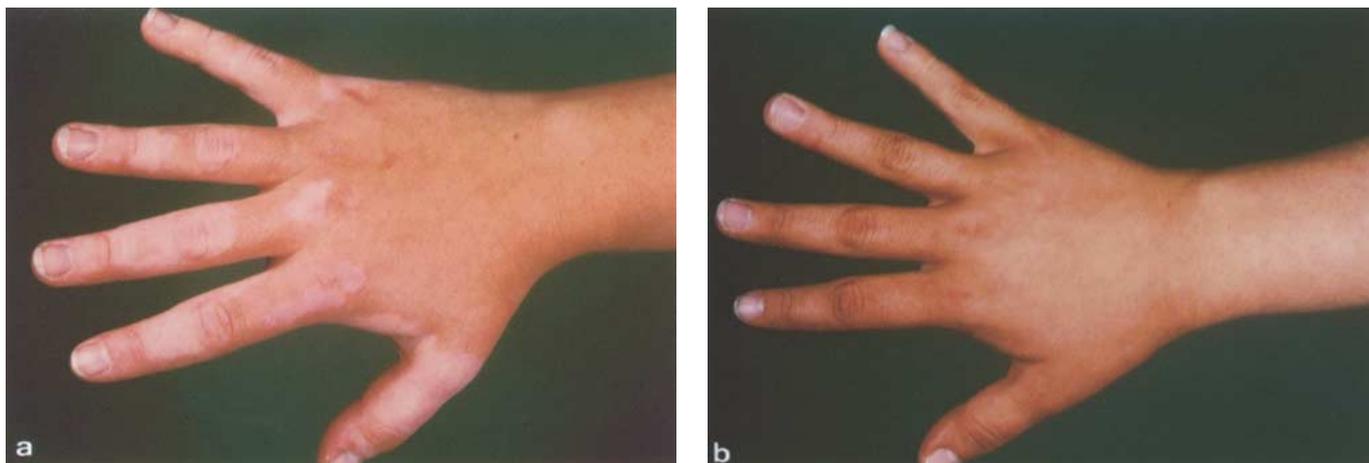
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**Fig. 1.** Vitiligo affecting the hand prior to (a) and after 2 weeks of treatment with DHA (Autohélios; b).

30 min, contact with textiles was avoided, and over 2 h no water contact was allowed. Due to the missing UVB-protecting effect of Autohélios, sunprotection with potent sunscreens of a high UVA and UVB protection factor was recommended during periods with high UV exposure.

## Results

The characteristic brown-staining was already visible after 3 applications in 9 cases (90%) and showed very satisfactory cosmetic results in 8 out of 10 patients (80%) after 2 weeks of successive treatment (fig. 1b). Patchy discoloration was avoided through thin and homogeneous application of the cream. An invisible borderline between affected and healthy skin was successfully achieved by additional treatment of the adjacent unaffected skin. Once the desired natural tan appeared, it could be maintained by reducing the treatment frequency. In 1 case, the brown-staining of the hands was already far too dark 12 h after the first application. The patient had been pretreated with khellin + UVA resulting in a thickened stratum corneum. In another case, in spite of daily application of Autohélios, no brown-staining of the face was achieved.

## Discussion

The self-tanning properties of DHA, a 3-carbon sugar and intermediate in the metabolism of carbohydrates in animals, were first discovered in 1957 by the pediatrician Dr. Eva Wittgenstein [4]. Shortly after, the first self-tanning formulations appeared on the market in the USA,

and in 1960 the first scientific articles on the subject were published [5, 6]. Therefore DHA is not a new pigmentary substance, but Autohélios represents a new stable DHA-containing formulation leading to a natural tan.

Compared to commercially available camouflage, DHA has the advantage of being water resistant and having a high substantivity to the skin [7]. Therefore the staining does not cause discoloration of clothing. As DHA reacts solely with the stratum corneum [8], the intensity of the tan directly correlates with the thickness and compactness of the horny layer [7]. Rougher, hyperkeratotic skin takes up the color more unevenly as does older or mottled skin. Loose scales have to be removed by mechanical rubbing or peeling prior to application of DHA. Hair and nails may color, whereas mucous membranes do not [8]. As the DHA-derived polymers in the skin do not absorb significant amounts of short-wavelength UV light [9], additional application of sunscreens is required for protection against UVB radiation. However, to some extent DHA can be considered as a UVA sunscreen [10]. In vivo studies in mice revealed very low acute toxicity and no mutagenic or carcinogenic effects [11]. To date only 2 cases of DHA sensitivity have been suspected [12].

Autohélios with its good cosmetic acceptability gives a more naturally appearing brown or golden hue, compared to an off color orange observed with older formulations.

The new formulation offers an additional treatment option in vitiligo with rapid and cosmetically satisfying brown-staining. Especially on the hands where conventional photochemotherapy often fails, excellent treatment results are achieved.

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