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## Accidental bullous phototoxic reactions to bergamot aromatherapy oil

Steven Kaddu, MD, Helmut Kerl, MD, and Peter Wolf, MD *Graz, Austria*

Oil of bergamot is an extract from the rind of bergamot orange (*Citrus aurantium* ssp *bergamia*) that has a pleasant, refreshing scent; until a few years ago it had been widely used as an ingredient in cosmetics but was restricted or banned in most countries because of certain adverse effects. More recently, oil of bergamot preparations have been gaining renewed popularity in aromatherapy. Oil of bergamot possesses photosensitive and melanogenic properties because of the presence of furocoumarins, primarily bergapten (5-methoxypsoralen [5-MOP]). However, 5-MOP is also potentially phototoxic and photomutagenic. Despite its increasing application, there are only a few recent reports of phototoxic reactions to bergamot aromatherapy oil. We describe two patients with localized and disseminated bullous phototoxic skin reactions developing within 48 to 72 hours after exposure to bergamot aromatherapy oil and subsequent ultraviolet exposure. One patient (case 2) had no history of direct contact with aromatherapy oil but developed bullous skin lesions after exposure to aerosolized (evaporated) aromatherapy oil in a sauna and subsequent UVA radiation in a tanning salon. This report highlights the potential health hazard related to the increasing use of psoralen-containing aromatherapy oils. (*J Am Acad Dermatol* 2001;45:458-61.)

refreshing scent and easily blends into perfume formulations, it had long been used as an ingredient in cosmetics until a few years ago when its use in perfumery was restricted or banned in most countries because of the report of adverse effects, primarily phototoxicity and Berloque dermatitis.<sup>1</sup> More recently, oil of bergamot is gaining renewed popularity in aromatherapy.<sup>2</sup> The photosensitizing and melanogenic properties of oil of bergamot are due to the presence of furocoumarins, mainly bergapten (5-methoxypsoralen [5-MOP]).<sup>3-5</sup> Apart from potential phototoxic effects, 5-MOP has also been shown to be photomutagenic and photocarcinogenic.<sup>6-8</sup> Consequently in Europe, 5-MOP-containing cosmetics have been banned or restricted to certain concentrations. However, currently there are no official limits to 5-MOP concentrations in aromatherapy oils and no strict legal requirement for placing warning labels on these products in some countries.

In this report, we describe two patients in whom bullous phototoxic reactions developed after unintended contact to bergamot aromatherapy oil and subsequent UVA exposure in sunlight in one patient and in a tanning salon in the other.

## CASE REPORTS

### Case 1

A 54-year-old woman of Fitzpatrick skin type III presented with painful, red, edematous, sharply demarcated areas with bullae and crusting on the face in a butterfly-like distribution (Fig 1). She gave a history of having unsuspectingly used a bergamot aromatherapy oil preparation 3 days earlier and subsequently stayed outdoors for several hours on a sunny day. She denied a history of using any other creams or taking any medications.

A sample of bergamot aromatherapy oil, which the patient had used, was available for analysis of 5-MOP concentration. High-performance liquid chromatography (HPLC) performed on the aromatherapy oil preparation revealed a very high 5-MOP concentration of 2400 ppm, well above 5-MOP levels officially permitted in cosmetics and tanning agents (0.1 ppm) in Austria.

The patient was treated with a topical steroid cream. Within 7 days, the skin lesions had improved significantly, except for the persistence of mild swelling and blistering on some areas of her face. These lesions also resolved over the next 2 weeks without any complications. The patient was instructed to avoid sun exposure for the next few weeks to prevent postinflammatory hyperpigmentation. Follow-up examination at 1 year revealed no residual hyperpigmentation on the face in the previously affected areas.



**Fig 1.** Case 1. Facial phototoxic reaction, with red, edematous, sharply demarcated lesions displaying butterfly-like distribution. The patient holds the bottle containing the bergamot aromatherapy oil preparation that she had used.

### Case 2

A 41-year-old woman with Fitzpatrick skin type II presented with disseminated, painful, red, edematous, sharply demarcated areas with bullae mainly on the face, neck, arms (Fig 2, A), palms, and thighs. Smaller erythematous lesions displayed a linear distribution (Fig 2, B). She gave a history of a visit to a sauna 2 days previously where she was exposed to a bergamot aromatherapy oil preparation. According to the patient, the aromatherapy oil, initially dissolved in water, was poured on a hot stone to vaporize for inhalation. Within a few minutes, the patient was exposed to UVA radiation in an adjacent tanning salon. The skin lesions developed gradually within 48 to 72 hours. The patient denied a history of taking medications before her visit to the tanning salon. She was treated with a topical steroid cream and oral analgesics and was instructed to avoid sun exposure. Significant improvement was observed within 5 days except for the persistence of swollen and blistered areas of the neck and palms, which also resolved after several days, leaving no residual hyperpigmentation.

## DISCUSSION

The use of aromatherapy oil has increased in recent years, primarily because of a growing interest in aromatherapy, a form of alternative medicine involving application of essential oils often in combination with massage to achieve therapeutic effects.<sup>9</sup> Despite the growing popularity, to our knowledge



**Fig 2.** Case 2. **A**, Phototoxic reaction on the lower arm shows red, edematous, sharply demarcated lesions with bullae. Lesions developed after exposure to aerosolized aromatherapy oil in a sauna. **B**, Phototoxic reaction on the thighs shows erythematous lesions with a linear arrangement.

there are only two reports documenting accidental phototoxicity to oil of bergamot-containing aromatherapy preparations.<sup>4,10</sup>

Phototoxic reactions in our two cases developed within 48 to 72 hours after contact with bergamot aromatherapy oil and UV exposure. This time interval is consistent with that of phototoxic reactions arising after local application or ingestion of psoralens.<sup>11,12</sup> Conversely, phototoxic reactions from other substances, such as phenothiazines, have a relatively shorter induction time interval. Therefore this report emphasizes the importance of considering the possibility of a phototoxic reaction to bergamot aromatherapy oil in all patients presenting with bullous lesions within a few days after a visit to a sauna and tanning salon or after contact with aromatherapy oil.

The skin lesions of case 1 occurred exclusively on the face, consistent with a local phototoxic reaction to oil of bergamot. However, in case 2 the lesions were disseminated, some of which displayed a linear distribution. The severity of phototoxic reactions to oil of bergamot have been shown to depend on several factors, including vehicle used, skin site, interval between application of psoralen and irradiation, hydration of the skin, and the degree of constitutive or sun-induced pigmentation.<sup>12</sup> In this case, high hydration of the skin from vaporized water in the sauna may have played a special role by increasing

local penetration of psoralens. Localization of the skin lesions at different body sites may have been influenced by mechanical factors. Similar phototoxic lesions displaying a linear arrangement have also been observed in another case of phototoxic reaction to aromatherapy oil.<sup>3</sup>

Long-term follow-up in our two cases showed no evidence of hyperpigmentation in previously affected areas. This observation implies that in cases of phototoxic reactions to bergamot aromatherapy oil, hyperpigmentation such as that occurring in Berloque dermatitis might be prevented by the use of topical steroid creams and subsequent avoidance of sun exposure.

In this report, we have highlighted yet another adverse reaction related to sunbeds, especially those with adjacent saunas in which bergamot aromatherapy oil is applied. In addition to the possible link of the use of UVA-tanning devices to melanoma,<sup>13</sup> several authors have also reported several acute cutaneous reactions including burns, erythema, pruritus, polymorphous light eruption, as well as phototoxic and photoallergic reactions.<sup>14-18</sup> Accidental phototoxic burns occurring after UVA exposure have been observed after local application of psoralen-containing cosmetics or ingestion of psoralen-containing food and medications.<sup>16,19,20</sup> Severe, extensive, life-threatening phototoxic reactions, such as the case of a woman who died of a massive phototoxic skin

reaction, have been described after ingestion of food and medication containing psoralen and subsequent exposure to artificial UV radiation.<sup>16</sup> Despite health education and warnings about possible short- and long-term harmful effects, tanning salons are still popular in Europe.

In conclusion, our two cases provide evidence that commercially available bergamot aromatherapy oil may cause serious bullous phototoxic reactions. In our opinion, there is a need for the public to be made more aware of these potential dangers and a necessity for strict governmental surveillance and scrutiny of these increasingly popular preparations.

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