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UNUSUAL COMPLICATIONS AFTER OCCUPATIONAL EXPOSURE TO GIANT HOGWEED (*HERACLEUM MANTEGAZZIANUM*): A CASE REPORT

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Abstract
Exposure to giant hogweed brings about the risk of serious skin damage, usually in the form of phytophotodermatitis. Initially, skin changes are signaled by a burning sensation, followed by a vesiculobullous rash and long-term hyperpigmentation. Usually, skin disorders improve after the application of topical and oral corticosteroids. In extremely rare instances, full skin thickness burns or epidermal necrosis occur. The study presents a case of occupational exposure to hogweed, which resulted in extensive skin lesions leading to the disablement of a 27-year-old man. The principles of procedure to be followed when contact with giant hogweed is an occupational hazard are also outlined.

Key words:
Necrosis, Giant hogweed, Skin burns, Phytophotodermatitis

INTRODUCTION

Over 20 species of the genus *Heracleum* (Apiaceae) have been variously recorded in Europe. Out of these, *Heracleum mantegazzianum* Somm., *Heracleum sosnowskyi* Manden and *Heracleum persicum* Desf. are considered to make up a group of plants known as giant hogweeds [1]. Sometimes *H. sosnowskyi* is considered only as a subtaxon of *H. mantegazzianum* and therefore, it is not listed among weedy flora of Western European countries [2]. Giant hogweeds are invasive biennial plants that grow to a height of 3–5 m and are native to the western Great Caucasus. The main mechanism of their introduction into Europe (in the 19th century) was related to the fact that they were treated as an ornamental curiosity. Towards the mid 20th century, *H. mantegazzianum* was also introduced in some countries as a crop. By the end of the 20th century, it had spread over considerable areas, also invading natural habitats [2].

It is well known that *H. mantegazzianum* causes phytophotodermatitis, a skin inflammation resulting from the activation, under UV radiation, of compounds contained

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in the plant's sap [1]. The major phytotoxic principles are linear furanocoumarins or psoralens, mainly 5-methoxypsoralen and 8-methoxypsoralen. The plant's toxicity is a consequence of the cross-linking of the furan ring with pyrimidine bases of DNA in the presence of ultraviolet light [3]. The concentrations of furanocoumarins in *H. mantegazzianum* are maximal in fruits, medium-level in the leaves, and minimal in the stem. Psoralen is the most prevalent substance in the leaves [4]. The content of phytophototoxic substances may change seasonally, and may also drastically increase during exposure to stress factors: low or high temperature, UV irradiation, infections or grazing [5]. In the near future, problems resulting from exposure to giant hogweed will increase because the plant is invasive and continues to colonize new habitats, both in Europe and North America [2].

In the present case report, the authors describe some unusual complications resulting from occupational skin exposure to *H. mantegazzianum*.

CASE STUDY

A 27-year-old man was admitted to ER with a pruritic erythematous vesiculobullous rash on his lower legs and on the dorsal surface of both hands. These skin changes had resulted from occupational exposure (approx. 2 h) to *H. mantegazzianum* under conditions of sunlight, high temperature (24–26°C) and humidity during weed mowing without protective equipment.

The patient was discharged with a recommendation to treat the affected areas with a steroid cream (1% hydrocortisone). Several dozen hours after exposure, the symptoms intensified significantly, in particular in the areas that had been treated with the steroid cream – on the lower legs (Photo 1) and the dorsal part of the right hand (Photo 2); the patient had not applied any ointment to the other affected areas. He was immediately transferred to the center for burn treatment and plastic surgery.

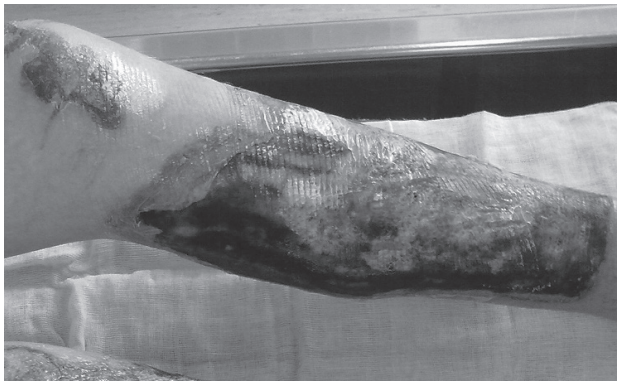

Photo 1. The left lower leg 48 h after exposure to giant hogweed

Photo 2. The right hand 48 h after exposure to giant hogweed

The wounds were surgically dressed and a pharmacological procedure was introduced (analgesic treatment, balanced intraintestinal feeding, cytoprotection of the alimentary tract, targeted antibiotic therapy and antithrombotic prophylaxis). Bacteriological tests revealed an abundant growth of mixed flora: *Enterobacter cloacae*, *Staphylococcus aureus* and *Enterococcus faecalis* D on the wounds. Due to expanding necrosis (confirmed histologically), a necrectomy, supplemented by a dermatomic (own) skin graft was performed. Following the applied treatment, a distinct regression of pathological changes on the right hand and right lower leg were observed. However, despite surgical intervention an evident spreading of the lower leg necrosis was noted.

On the 19th day of hospitalization, secondary bacterial superinfection was suspected. An abundant growth of

Photo 3. The right lower leg 8 months after exposure to giant hogweed

Pseudomonas aeruginosa, *Citrobacter freundii* and *Enterococcus faecalis* was confirmed, and targeted antibiotic therapy was applied.

On the 37th day of hospitalization, a final dermatomic skin graft was performed, which led to the complete healing of changes on the hand and, partially, on the left lower leg. Yet, despite all these measures, necrosis on the right lower leg became persistent.

On the 71st day of hospitalization, the patient was discharged at his own request, with a recommendation for ambulatory treatment and rehabilitation. In successive months, the initial injury on the right lower leg penetrated transfascially to the calf biceps, causing progressive necrotic damage thereof (Photo 3).

Due to the fact that the therapy (repeated surgical debridement) had failed, the decision to amputate the right lower leg was taken.

DISCUSSION

Hogweed usually causes a phototoxic reaction (photodermatitis), which initially resembles sun burn with accompanying swelling, sometimes with pruritus, and evolves into skin discolorations that disappear over a few weeks [6]. Lagey et al. [7] presented 3 cases of partial skin thickness burn following exposure to giant hogweed which were successfully treated with local debridement and daily dressings of silver salazine. A similar therapy was effective in the case of a 10-year-old boy, who experienced a full thickness burn on the right pretibial area following exposure to hogweed [8]. In the case described herein, several circumstances contributed to cause a particularly severe phytophotodermatis: the contact with the plant took place at the height of its vegetative season, under strong insolation, high temperature and considerable air humidity. In addition, the employee responsible for mowing did not have any personal protective equipment or protective clothing. As opposed to the instances described by Lagey et al. [7], the burnt skin of the patient described in the present study underwent dynamic changes, attaining deep necrosis over a short time. This is an exceptionally rare complication of photodermatosis. As described by Chan et al. [8], necrotic skin changes following contact with hogweed occurred only 2 weeks after exposure, while the therapy applied brought about positive effects within a short time. The considerable depth of the tissue damage and the evident retardation of the healing process of post-surgical wounds would suggest that the effect of furanocoumarins was not limited exclusively to the physical damage of successive skin layers. In all probability, it led to a disturbance of the repair mechanisms of rapidly splitting cells at the level of replication processes in coding proteins or at the level of nucleic acids. The histological picture obtained from the tissue fragment collected during the surgical procedure appears to confirm this hypothesis. It seems that such an extremely severe clinical course and adverse outcome were also related to bacterial superinfection.

It is worth noting that the patient had had no professional training regarding work in contact with hogweed. Therefore, as by law employers are responsible for the health and safety management in the workplace, they should also be aware of the health risk posed by skin exposure to giant hogweed.

Proposed rules of procedure
in the event of occupational exposure to hogweed

Certification for work in contact with plants from the *Heracleum* species should take into consideration the risk of occurrence of skin changes.

1. When working in contact with plants use personal protective equipment that secures the skin both against burns and exposure to solar radiation.
2. If plant sap contaminates the skin, terminate the exposure immediately and protect the skin against insolation.
3. Wash the sap off the skin and delicately stroke it dry.
4. Cover the exposed skin with a dry dressing and protect it against infection.
5. Do not use any ointments or creams before a medical assessment is performed.

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