Dermatitis from common ivy (*Hedera helix* L. subsp. *helix*) in Europe: past, present, and future

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Common ivy (*Hedera helix* subsp. *helix*) is a well-known native and ornamental plant in Europe. Reports on contact dermatitis from ivy have regularly appeared since 1899. Recently, it has been suggested that allergic contact dermatitis from the plant may be under-diagnosed, partly due to lack of commercial patch test allergens. The objective of the article is to present the results of aimed patch testing with the main common ivy allergen, falcarinol, during a 16-year period and review the newer literature. Consecutive patients tested with falcarinol 0.03% petrolatum from May 1993 to May 2009 were included. Cases published since 1987 were retrieved from the PubMed database. One hundred and twenty-seven Danish patients were tested with falcarinol and 10 (7.9%) tested positive. Seven were occupationally sensitized. Between 1994 and 2009, 28 new cases of contact dermatitis from ivy were reported, 2 of which were occupational. Only 11 of the 28 patients were tested with pure allergens. Falcarinol is not only widely distributed in the ivy family, but also in the closely related Apiaceae. Sensitization may occur in childhood or in adults pruning ivy plants or handling them in an occupational setting. In view of the ubiquity of falcarinol-containing plants and the relatively high prevalence of positive reactions in aimed patch testing, falcarinol should be the next plant allergen to be commercially available and included in the plant series worldwide.

Key words: allergic contact dermatitis; Apiaceae; Araliaceae; common ivy; English ivy; falcarinol; *Hedera helix* subsp. *helix*; occupational; patch test; plants; polyacetylenes. © John Wiley & Sons A/S, 2010.

Accepted for Publication 12 November 2009

As suggested by the colloquial name, common ivy (*H. helix* L. subsp. *helix*) is a ubiquitous plant in temperate regions where the evergreen trails the soil or climbs trees, walls, stone fences or rocks (Fig.1). The botanical name is aptly derived from Greek ‘helisso’, which means I twist myself around.

Since the first reports on dermatitis from common ivy in 1899 and 1900, new cases have been published at regular intervals. The early references from 1899 to 1949 as well as more recent studies from 1956 to 1987 were extensively reviewed by B. M. Hausen et al. (1). Most of the literature comprised descriptive clinical case reports. By and large, patch testing was not performed in these patients before 1930 and testing in controls was not always done in more recent studies; the distribution of allergic and irritant contact dermatitis is thus unknown. Hausen, however, considered four reports to meet the criteria for true contact allergy based on low test concentrations and a sufficient number of controls (2–5).

In the most recent case series, the authors suggested that allergic contact dermatitis from common ivy may be more common than previously believed, the main reason for this being lack of commercial patch test material (6).

The aims of this paper is to present the results of aimed patch testing with the main common ivy allergen, falcarinol, during a 16-year period from May 1993 to May 2009 and compare the findings with previous studies on contact dermatitis from common ivy, based on a review of newer literature with special emphasis on sensitizing potential, clinical features, and diagnosis.
Botany and Geography

Common ivy belongs to the Araliaceae family of plants, commonly called the ivy or ginseng or Aralia family. It comprises some popular pot plants such as Schefflera arboricola and Polyscias species, Fatsia japonica and the hybrid xFatshedera lizei.

Common ivy leaves on sterile shoots are three to five lobed (Figs 2 and 3), whereas leaves on fertile shoots are elliptical. The flowers are yellow–green and fragrant, the berries black.

The plant is native to Europe and the southwestern part of Asia (7). It has, however, been naturalized elsewhere (8) and has also been imported to the USA. H. helix plants will grow in the mountains at a height of up to 1200 m (7).

Allergenicity

On the basis of chemical, laboratory, and clinical studies, Hausen et al. showed that common ivy was a strong irritant that also contained two moderate polyacetylenic sensitizers, falcarinol and didehydrofalcariol (Fig. 4) (1).
families of higher plants, and the majority of polyacetylenes has been isolated from the closely related plant families Apiaceae (formerly Umbelliferae), Araliaceae, and Asteraceae (Compositae) (9). The polyacetylenes of the Apiaceae and Araliaceae are most often aliphatic C\textsubscript{17}-polyacetylenes of the falcarinol-type derived from oleic acid (9, 10). Falcarinol-type polyacetylenes have antifungal activity and primarily function as pre-infectional compounds in Apiaceae and Araliaceae plants (9, 10), whereas in, for example, tomato plants (Solanaceae) they appear to be phytoalexins, that is compounds produced by plants in response to different kinds of stress, including microbial attacks (11). Some non-falcarinol-type polyacetylenes of the Apiaceae family as for instance cicutoxin from water-hemlock (\textit{Cicuta virosa} L.) are neurotoxic and lethal if ingested. The polyacetylenes of edible Apiaceae plants such as carrot (\textit{Daucus carota} L.) and parsnip (\textit{Pastinaca sativa} L.), including falcarinol, also show toxic properties in laboratory studies (10). However, when ingested from natural sources, the polyacetylenes seem to possess health promoting effects (10). Carrots are the main dietary source of falcarinol-type polyacetylenes in humans, and recent laboratory and clinical studies suggest that the cancer preventive effect of carrots primarily may be because of the content of falcarinol (10, 12).

Both falcarinol and didehydrofalcarinol are present in common ivy all the year round, but the concentration and the ratio didehydrofalcarinol:falcarinol varied considerably in the study of Hausen et al. (1), depending on climate and other conditions of growth. Falcarinol seemed to be the stronger sensitizer of the two. In the original study, four patients tested positive to falcarinol, while only two of three patients tested positive to didehydrofalcarinol: the variation in concentration may explain why the latter does not always induce contact allergy (1).

Furthermore, Gafner et al. (13) isolated a third allergen 11,12-dehydrofalcarinol (Fig. 4) from \textit{Hedera} species, which in animal tests seemed to be slightly less potent than falcarinol.

The allergenicity of falcarinol and related polyacetylenes is probably associated with their hydrophobicity and their ability to form stable carbocations (resonance stabilized) with the loss of water, thereby acting as very reactive alkylating agents towards, for example, thiol groups in proteins, forming hapten–protein complexes (antigens) (9, 10, 12). Therefore, cross-reactivity is expected between falcarinol-type polyacetylenes with a hydroxyl group at C-3 as they bear the same reactive chemical group, and have a similar size and spatial geometry to be recognized by the same receptor. Differences in the hydrophobicity and stability of the formed carbocations may explain differences in allergenicity between falcarinol-type polyacetylenes. The proposed mechanism for allergenicity of falcarinol-type polyacetylenes may also explain many of their bioactivities and hence their health promoting effects (9, 10, 12).

**Toxicology**

Common ivy contains up to 10% saponins such as \textit{\alpha}\textsubscript{-} and \textit{\beta}\textsubscript{-}hederin (14). Hederin is a strong irritant to the mucosal surfaces of the nose and throat (15). As mentioned above, the polyacetylenic compounds falcarinol and didehydrofalcarinol detected in stalks, leaves, and roots of common ivy may cause both irritant and allergic contact dermatitis (14). The leaves commonly contain more than 1% of the sensitizer which explains the risk of developing irritant contact dermatitis (14).

Although common ivy is mentioned in books on poisonous plants because of the berries, only a few anecdotal case reports on ingestion of leaves or a berry have been published – none were fatal (15).

**Clinical Features**

The old references state that ivy dermatitis may be similar to dermatitis from the unrelated poison ivy (\textit{Toxicodendron radicans} (L.) Kuntze): a florid streaky vesiculo-bullous eruption on exposed skin (8). Hausen et al., in their review, list hands and/or forearms as the sites most commonly affected, followed by face, but more widespread dermatitis was also described (1). Most cases were a result of pruning of ivy plants (1). Since 1987, another 28 cases of contact dermatitis from common ivy have been reported (Table 1). Again involvement of hands and forearms was most commonly...
reported, followed closely by involvement of face and neck. However, Jones et al. in their case series commented that only 50% of the patients had hands as the primary site of dermatitis (6). Only 2 of the 28 patients were occupationally exposed to common ivy cultivars (16, 17); a third patient was occupationally sensitized to carrot, parsley, and celery with (false) cross-reactivity to ivy because of the presence of falcariol in all these species (18). None of the patients were described as atopics, but a 38-year old man with allergic contact dermatitis from carrot had a 30-year history of recurrent dermatitis, especially on the hands (19), and a 57-year old chef had positive radioallergosorbent test results (class II) to carrot and parsley (18). A case of occupational contact urticaria from common ivy was reported in 2008 (24), and Oka et al. reported positive patch tests to *H. helix* leaves in five Japanese patients who were sensitized to *Dendropanax trifidus* of the Aralia family, presumably because of cross-reactivity (25).

**Own Studies**

**Material and methods**

In connection with a study of dermatitis in gardeners and greenhouse workers from 1992 to 1994, falcariol 0.03% in pet. was prepared at our hospital pharmacy (26). No positive reactions were recorded in 35 consecutive controls. When the study was over, falcariol was included in our plant series and used for aimed patch testing. The syringe of falcariol was manufactured before 1996. The falcariol – and ivy leaves and stalk – were applied to the back for 2 days using Finn chambers® (Epitest Ltd Oy, Tuusula, Finland) on Scanpor® tape (Actavis Norway AS, Vennesla, Norway) and readings made on day (D) 3–4 and possibly D5–7, according to the International Contact Dermatitis Research Group criteria (27). Usually, both the upper side and the underside of ivy leaves were tested.

**Results**

During a 16-year period from May 1993 to May 2009, 127 persons, including controls, were patch tested with falcariol and 10 tested positive (Tables 2 and 3). Unfortunately, information on one of the patients with positive reaction could not be retrieved. The clinical features of the other nine patients are described in the following case reports.

**Case 1**: A 51-year old female greenhouse worker was called in as a participant in a study of occupational dermatitis in gardeners (28). She had worked in a nursery producing ivy cultivars for about 6 years. Her main task was making cuttings. After 3 years, she developed a periorbital eczema and the following year dermatitis of the neck and finally also a vesicular hand eczema as well as dermatitis of the forearms. The symptoms disappeared when
she began using gloves and cuffs to protect hands and forearms.

**Case 2:** A 47-year old female greenhouse worker was referred on suspicion of either irritant or allergic contact dermatitis from common ivy. She had no previous history of skin disease and no family or personal history of atopy. She had worked in different nurseries for 4 years before she was hired at a nursery producing *H. helix* plants. At the end of the first month of employment, she developed a severe, vesicular, oozing eczema on the back of the hands, fingertips, and lateral aspect of fingers. In the following days, the eczema spread to involve volar aspect of forearms, neck, face and later, in a patchy manner, trunk and lower legs. The use of gloves and mild topical corticosteroid cream was of limited value and after 5 months the patients gave in her notice. The eczema gradually cleared, but on one occasion, 2 months later, the patient moved a bowl arrangement that included a *H. helix* plant and immediately had a flare-up of hand eczema.

**Case 3:** A 48-year old man was referred by a dermatologist because of suspected plant contact allergy. The patient had developed severe hand eczema on both palmar and dorsal aspects with recurrent eruption of vesicles and later involvement of forearms. He took care of a large garden/ground and 3–4 days before the symptoms appeared, he had planted out 3–400 raspberry bushes. He denied contact with common ivy. Later the skin lesions, which continued to recur in the following years, were considered to be self-inflicted.

**Case 4:** A 30-year old man was referred by his general practitioner because of persistent rash for 2 weeks. The patient had pruned ivy growing on his house, while he was wearing a T-shirt and shorts, 14 days earlier. Within 24 hours he developed a red, itchy, vesicular dermatitis on skin surfaces that had been in contact with the plant. Treatment with topical and systemic corticosteroids had limited effect. At the time of referral, the patient had a scattered, locally streaky, red dermatitis on hands, forearms, and the legs, clinically typical of plant dermatitis.

**Case 5:** A 25-year old female greenhouse worker was referred on suspicion of allergic contact dermatitis to ivy. On her very first working day, she developed an itchy papular dermatitis on hands and forearms after handling and cutting ivy plants. In the following days, the dermatitis progressed to a severe vesicular eczema that spread to the trunk. She was treated with topical and systemic corticosteroids and on examination more than 2 months later only discrete post-inflammatory hyperpigmentation remained. The patient had not had eczema or contact with ivy plants previously.

**Case 6:** An 18-year old female gardener apprentice was referred by her general practitioner because

<table>
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<tr>
<th>Case number</th>
<th>Occupational exposure</th>
<th><em>H. helix</em> ‘as is’</th>
<th><em>H. helix</em> ‘as is’</th>
<th>Falcarinol 0.03% pet. Reading D3/4</th>
<th>Falcarinol 0.03% pet. Reading D7</th>
<th>Other contact allergens</th>
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<td>Yes</td>
<td>+F/F+/F. leaf</td>
<td>?+/− leaf</td>
<td>+</td>
<td>?+</td>
<td>Nickel sulfate, epoxy resin, 2-bromo-2-nitro-1,3-propanediol, Chlorhexidine, Nil</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td>NT</td>
<td>NT</td>
<td>+ + +&lt;sup&gt;a&lt;/sup&gt;</td>
<td>+&lt;sup&gt;a&lt;/sup&gt;</td>
<td>2-bromo-2-nitro-1,3-propanediol, Chlorhexidine, Nil</td>
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<tr>
<td>3</td>
<td>No</td>
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<td>NT</td>
<td>F.</td>
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<tr>
<td>4</td>
<td>No</td>
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<tr>
<td>5</td>
<td>Yes</td>
<td>+ + / + + leaves and ++ stalks of seven cultivars</td>
<td>+ + / + + leaves and ++ stalks of 7 cultivars</td>
<td>++</td>
<td>+</td>
<td>Nickel sulfate</td>
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<tr>
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<td>NT</td>
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<td>9</td>
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<td>++</td>
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H.h., *Hedera helix*; /, reactions of the upper side and under side of the leaf, respectively; F., follicular reaction; ?+, doubtful positive; NT, not tested.

<sup>a</sup>Treated with topical corticosteroid.
After sick leave, the patient stopped working at the of latex gloves did not offer sufficient protection. Hedera of practical tasks with the foreman, the patient was engaged in all kinds of volar aspect of forearms and periorbital area. As involvement lateral aspects of fingers, back of the hands, and finger webs. The dermatitis gradually spread to the dorsal aspect of hands and later arms, face, trunk, legs, and soles. The dermatitis of the hands was less transient than in other regions. The patient denied contact with ivy plants prior to her apprenticeship. She gave up the education due to the severe contact allergy.

Case 7: A 30-year old female greenhouse worker, with a family history of atopy and previously positive skin prick test to wheat flour and dog dander, was referred for a medical certificate from a dermatologist. She had potted Hedera cuttings at a nursery for about 1 month, and 1–2 days before she stopped working she developed a vesicular eczema on the dorsal aspect of fingers, fingerwebs, and volar aspect of wrists. She was treated with topical corticosteroids and the eczema cleared in 14 days.

Case 8: A 32-year old male gardener was referred from with suspected allergic contact dermatitis from common ivy. After working with Hedera plants for 3 months, he developed itching erythema in the finger webs. The dermatitis gradually spread to involve lateral aspects of fingers, back of the hands, volar aspect of forearms and periorbital area. As a foreman, the patient was engaged in all kinds of practical tasks with the Hedera plants. The use of latex gloves did not offer sufficient protection. After sick leave, the patient stopped working at the nursery.

Case 9: A 32-year old woman was referred by her general practitioner because of vesicular hand eczema. She had had problems with occupational hand eczema for 2–3 years. She reported that she had worked at a large Hedera nursery for a short time 1 year previously and that she developed severe hand eczema and facial dermatitis after 2–3 weeks. Skin prick test showed a positive reaction to cat dander.

Among the 23 persons with doubtful positive reactions, 8 were participants in the above-mentioned gardener study, 9 were tested because of occupational exposure to plants, 4 were suspected of non-occupational plant dermatitis, while the remaining 2 were controls. At least seven were diagnosed with irritant occupational dermatitis from common ivy. Among these, a female greenhouse worker, with a follicular reaction on D3 and a doubtful positive on D7 to falcarniol, allegedly tested positive to 11 of 12 ivy cultivars prior to referral, and another tested positive to stalk and doubtful positive to leaves of ivy wetted with ethanol.

Discussion

The steady flow of new case reports on contact dermatitis from common ivy supports the view that the ivy family is dermatologically important. Furthermore, contrary to studies before 1987, several of the newer cases have been proved to be truly allergic based on testing with the allergens. The prevalence of sensitization in the Danish case series, using falcarniol for aimed patch testing, is 7.9% which is low compared to a prevalence of 28.6% in aimed testing for Compositae allergy (29), but probably high compared to other plant families. Even though common ivy is ubiquitous, it is unlikely that wild-growing plants in nature and low-maintenance indoor potted plants are handled to any extent by non-professional persons. The risk is thus present in both occupational and non-occupational pruning of outdoor ornamental ivy plants, and occupational handling of indoor ivy plants by gardeners and greenhouse workers. This view is supported by the results of a Danish questionnaire-based study that showed a higher prevalence of skin symptoms among gardeners working with common ivy and weeping fig (Ficus benjamina) compared to a control group (30). However, the obvious causal relationship between plants and dermatitis in gardeners may explain the scarcity of case reports in those occupationally exposed before 1987 (1). Likewise, as pointed out by Jones et al., the low prevalence in lay people could also be because of the fact that milder cases of ivy dermatitis are not referred to dermatologists because the diagnosis is made by the patient or the general practitioner (6). Another reason for the low prevalence may be under-diagnosing based on, for example, lack of a commercial screening material (6), inadequate history taking or mixed exposure pattern.

Ivy dermatitis developing in an occupational setting offers an opportunity of exploring aspects of both sensitizing properties and clinical development of contact allergy. In the present case series, there was a large variability in the cumulative exposure time from slight dermatitis developing after 3 years and preventable by using gloves and cuffs (case 1) to severe dermatitis after 1 day at work (case 5). Most of the gardeners and greenhouse workers had worked for 1–4 weeks before symptoms appeared, one of them had worked for 3 months. This may reflect intensive exposure leading to either irritant contact dermatitis and subsequent sensitization, quickly occurring sensitization or previous sensitization as in case 5, possibly case 6 and the case described by Jøhnke and Bjanarson (16). Jones
et al. (6) reported that one of their patients had had recurrent, summer-related rashes since the age of 9 and she remembered frequently climbing ivy-covered trees. Sensitization to ivy was also reported in a 9-year old boy with concomitant Compositae contact allergy (31).

On the basis of the number of contact allergies, the patients in the Danish and British case series seem to be less susceptible to contact allergy than other groups of eczema patients: five out of nine patients in Denmark and 9 of 12 in the UK had no other contact allergies. On the other hand, none of the individual case reports mention other contact allergies (16–23). The British patients were positive to primin, colophonium, and coriander leaf, which belongs to the Apiaceae and contains unidentified polyacetylenes, probably reflecting that these patients were keen amateur gardeners. The Danish patients were not sensitized to other plant allergens, which may reflect the effect of a heavy exposure to one culture only. The same may apply to the patients in the individual case reports whether they were sensitized by ivy plants in their gardens or by falcarkinol-containing vegetables. When common ivy is the primary sensitizer, seasonal variation in allergen concentration as well as contact with wet or crushed leaves may be crucial in terms of risk of sensitization (1, 15). However, a cumulative exposure time of 1–2 weeks before development of occupational dermatitis is short for a moderate sensitizer as falcarkinol. Another possibility is sensitization to falcarkinol from alternative sources. Gafner et al. suggest that dermatitis from umbelliferous plants, usually considered to be caused by psoralsens, may in some cases be elicited by falcarkinol (13). As mentioned above, falcarkinol-type polyacetylenes occur in the Araliaceae and Apiaceae plant families. The latter comprises well-known weeds such as hogweed (Heracleum sphondylium L.) and goutweed (also known as ground-elder) (Aegopodium podagraria L.), vegetables such as carrot (D. carota L.), celery/celeriac (Apium graveolens L. var. dulce/var. rapaceum) and parsnip (P. sativa L.), herbs such as caraway (Carum carvi L.), dill (Anethum graveolens L.) and parsley (Petroselinum crispum (Mill.) Nyman ex A. W. Hill.) and medicinal plants such as greater burnet saxifrage (Pimpinella major (L.) Hud.) and Angelica acutiloba Kitagawa var. acutiloba Kitagawa used in Chinese folk medicine (10, 32). All these contain falcarkinol (10, 32).

Allergic contact dermatitis from carrot and dill has been reported, most often after occupational sensitization (19, 33). Compared to ornamental plants and weeds of the Apiaceae family, the edible plants have a relatively low concentration of polyacetylenes and therefore it probably takes heavy exposure, as in an occupational setting, to become allergic to falcarkinol-containing vegetables and herbs (10).

Concerning weeds, it is a theoretical possibility that phytophotodermatitis from hogweed or wild-growing parsnip is accompanied by simultaneous sensitization to falcarkin present in the plants – or that the ‘phytophotodermatitis’ is indeed caused by falcarkin in the first place as suggested by Gafner et al. (13). Another possibility is sensitization from goutweed (A. podagraria): falcarkinol has been detected in roots and young shoots (34, 35). Even though Kemp (35) states that the concentration is only 36 µg/g fresh tissue, it must be much more common that amateur gardeners uproot goutweed – probably without realizing the medicinal and culinary potential of the plants – than they prune common ivy. Goutweed could be a source of sensitization and common ivy the eliciting plant as a result of a higher concentration of falcarkinol in the latter, at least in Denmark where goutweed is naturalized and a common weed.

According to Hausen, the leaves of common ivy are in pharmacopoeias and extracts of these are used in both topical and systemic preparations and in herbal cosmetics (7). However, the concentration of falcarkinol is considered too low for induction of sensitization and cases of elicitation of dermatitis in individuals with pre-existing contact allergy to ivy have not been reported (1). Likewise, contact dermatitis from P. major or A. acutiloba has not been documented, and it is thus unlikely that herbal medicine or cosmetics are a major source of sensitization to falcarkinol.

The clinical features are similar to those of plant dermatitis in general with predominant involvement of hands, forearms, face, and neck. However, any site in contact with plant material may be affected such as trunk when carrying an armful of trimmings (21) or legs when pruning ivy plants wearing shorts (case 4). Gloves and long sleeves protect locally, but dermatitis may still appear in other sites (6, 17). In the present case series, some of the occupationally sensitized initially developed dermatitis on the thin skin of the back of the hands, lateral aspect of fingers, finger webs, volar aspect of wrists, and periarticular area. Likewise, in the detailed case report by Özdemir et al. (22) the erythema first appeared on the back of the hands with later vesicular involvement of the palms. This pattern of itching erythema progressing to a vesicular eczema in a few days is apparently common in ivy dermatitis (case 5, 16, 21, 22). Widespread dermatitis is probably because of conveyance of allergen by hands or clothes. Roed-Petersen (2) reported a case of allergic contact dermatitis from ivy and positive patch test reactions to ivy plants in 3 of 138 consecutive
controls. One of the controls had an urticarial reaction that cleared after avoidance of plant contact (2). In the Danish case series, patient no. 6 reported an urticaria-like dermatitis, but the first documented case report on contact urticaria from common ivy with positive histamine release test is the one from 2008 (24). Immediate, possibly allergic, reactions from common ivy causing rhinitis and asthma have been reported, although rarely, and the majority of mucosal symptoms in gardeners are probably irritant, perhaps caused by hederin (30, 36, 37).

When the concentration of falcarinol in ivy plants is high, there is a risk of false positive reactions when patch testing both with plant material ‘as is’ and extracts of these. This makes testing in controls mandatory to establish a diagnosis of allergic contact dermatitis. Although the histories in the cases published between 1989 and 2009 are highly suggestive of allergy from common ivy, only 11 of the 28 patients were tested with allergens and 1 with an extract negative in controls, and thus proved allergic to the plant (17, 18, 20, 22, 23). According to Hausen, falcarinol and didehydrofalcarinol are soluble in acetone, but less so in alcohol and insoluble in water (7). Nevertheless, García et al. (17) recorded a positive reaction to a 1% aqueous extract of common ivy, while Sánchez-Pérez et al. (20) saw a negative reaction to a 1% water:alcohol extract of common ivy. Likewise, patch testing with ivy plants in sensitive persons elicits positive reactions whether the plant materials are wetted with water or alcohol (Table 3). These contradictory results probably reflect the variable concentration of allergens in the plant material: if the concentration is high, even aqueous extracts will elicit positive reactions—perhaps even false positive. The potential irritancy of fresh plant material may also explain the positive patch test reactions to ivy ‘as is’ in two of the Danish patients who tested doubtful positive to falcarinol. In the majority of the Danish cases, however, there is accordance between patch test reactions to ivy plants and falcarinol. The most reliable diagnostic tool is testing with falcarinol—didehydrofalcarinol—in non-irritant and non-sensitizing concentrations of 0.03% pet. and 0.3% pet., respectively. Although falcarinol is unstable being sensitive to heat, daylight, and to air-oxidation (10), the incorporation of the compound into pet. seems to convey great stability to the allergen: García et al. used falcarinol and didehydrofalcarinol stored for more than 6 years, Sánchez-Pérez et al. tested with allergens that had been stored at −26°C for more than 10 years, Hafejee mentions 20-year old material, and the last Danish patient testing positive (in 2007) was tested with a syringe that was at least 11 years old (kept at 5°C) (17, 20, 23).

Hausen et al. noted ‘a certain similarity’ between falcarinol and the long side chain of the poison ivy (Toxicodendron radicans (L.) Kuntze) allergen, and a few cases of sensitization to both common ivy and poison ivy in the same person have been published (1, 4, 38). Cross-reactivity between common ivy and poison ivy has therefore been suspected. Incidentally, in the Japanese study of sensitization from the evergreen plant D. trifidus (Araliaceae) and its main sensitizer, an C18-analogue of falcarinol that seems to cross-react with other Araliaceae plants, including common ivy, in accordance with its close similarity with falcarinol with regard to chemical structure and mechanism for allergenicity, four controls with known contact allergy to Toxicodendron spp. were tested with urushiol and the allergen from D. trifidus: none reacted to the latter, suggesting that urushiol does not cross-react with the falcarinol-analog (25). Urushiol contains two phenols groups (ortho) as the reactive part of the molecule, and therefore both the reactive chemical group and the spatial volume of urushiol are too different to that of the falcarinol-analogue to produce a cross-allergic reaction in accordance with the test results. Therefore, cross-reactivity between common ivy and poison ivy is unlikely.

In conclusion, common ivy is a ubiquitous plant that contains the strongly irritant and moderately sensitizing polyacetylene falcarinol. The latter is not only widely distributed in the ivy family, but also in the closely related Apiaceae. Sensitization may occur in childhood from contact with plants when climbing ivy-covered trees and in adults pruning ivy plants or handling them in an occupational setting. Even though several cases of allergic contact dermatitis to common ivy have been published in the past 15 years, this is probably a minimum figure since the allergen is not commercially available. Large-scale isolation of polyacetylenes is possible (10) and falcarinol seems to be very stable when incorporated into pet. and kept in a refrigerator or a freezer so it seems obvious that falcarinol should be the next plant allergen to be commercialized and included in the plant patch test series worldwide.

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