
PRACTICE/CASE HISTORY

Human Dermatitis After Skin Exposure to *Jacobaea vulgaris* and Spectrum of Health Hazards Induced by This Plant to Humans and Livestock

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ABSTRACT. *Jacobaea vulgaris* is a biennial or perennial herb, reaching up to 200 cm, with pinnatifid leaves and numerous yellow flowerheads borne in flat-topped corymbs. The blooming season starts in June and lasts till September. The weed prefers waysides, railway embankments, pastures, and wastelands. While considered an indigenous herb of Europe and Western Asia, it is also widely found in North and South Americas, South Africa, India, Siberia, New Zealand, and Australia, where it poses a serious threat for agriculture and local ecosystems in the absence of natural insects and pathogen species. Although the plant was utilized in Early Modern Europe as a medicine for various purposes, it contains numerous harmful ingredients. Sesquiterpene lactones (STLs) are responsible for allergic dermatitis and phototoxic properties of the sap, while pyrrolizidine alkaloids (PAs) pose a serious threat to livestock after ingestion. *Jacobaea vulgaris* has been regarded as a noxious weed since the 19th century. In the present day, its eradication from pastures is regulated by law in many countries. Nevertheless, migrant workers might not be conscious that this weed is dangerous. In the summer of 2012, a young migrant male farm worker was seen in the University Dermatology Out-Patient Clinic in Poznan due to acute blistering *Jacobaea vulgaris*-induced dermatitis clinically resembling dermatitis herpetiformis (cutaneous manifestation of gluten intolerance). The biological/chemical/mechanical control of the plant in farmlands, as well as education at an early age about poisonous and injurious herbs, is advisable for preventing potentially serious health hazards, particularly to urban dwellers accidentally exposed to those plants at their urban stands.

KEYWORDS. Contact, dermatitis, senecio, sesquiterpenes

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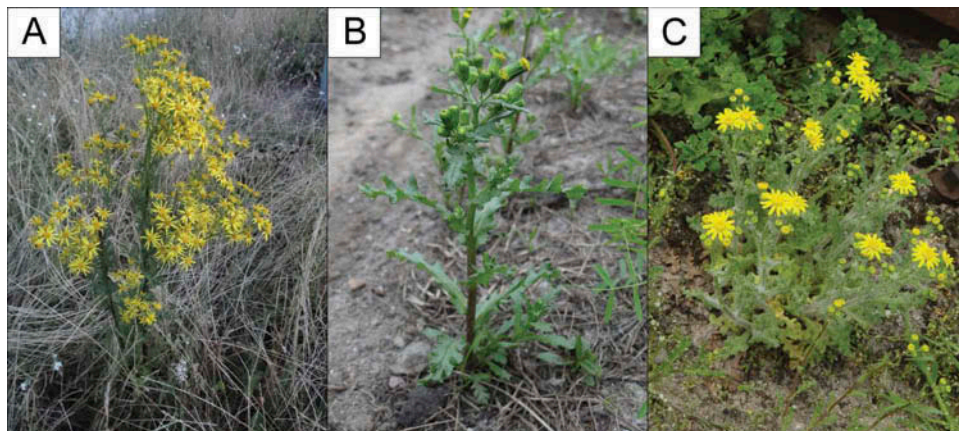
INTRODUCTION

Jacobaea vulgaris Gaertn., formerly syn. *Senecio jacobaea* L. (Compositae/Asteraceae family, Asteroideae subfamily, Senecioneae tribe), was mentioned first in Petronius' Satyricon, as a plant used for preparing satyrion aphrodisiac. It was utilized in Early Modern Europe as medicine for various purposes and in traditional fabric dyeing. It was granted many names, including common ragwort, ragweed, St. James wort, Stinking Willy, cushag, or, deceivingly, tansy ragwort, due to a superficial resemblance to common tansy (*Tanacetum vulgare*). Its taxonomy was described first in 1749 by Dalibard and Déséglise and then by Linnaeus in 1753 as *Senecio jacobaea* until Gaertner in 1791 gave its present name. The distinction of *Jacobaea* genus from *Senecio* genera was substantiated by genetic findings by Pelser et al.,¹ yet it is still controversial.^{2,3}

Jacobaea vulgaris (Figure 1A) is biennial or perennial herb reaching up from 20 to 200 cm. The erect branched stem is often purple-tinged and scantily hairy or glabrous. Ragwort leaves are rather evenly distributed—basal are lyrate-pinnatifid (with terminal lobes wider than proximal ones and divided into segments in two rows along a leaf axis), middle and

upper eared and pinnatifid. The flower heads are radiate (15–25 mm), numerous (10–60+), characterized by 13 narrow golden-yellow florets (8–12 mm), and borne in flat-topped corymbs (an inflorescences with all flowers at the same level, although the flower stalks arise at different levels). The dry fruits with silky pappi form airborne parachutes (crypsellae), resembling those seen in dandelion. The blooming season starts in June and lasts until September. The weed prefers waysides, railway embankments, pastures, wastelands, sparse woodland, and wood edges, from lowlands up to 1500 m. Although considered a native herb of Europe and western Asia, it is widely spread in North and South America, South Africa, India, Siberia, New Zealand, and Australia, where it poses a serious threat for agriculture (reduction of pasture yields; detrimental effect for animals—intoxication of livestock, usually with lethal results; reduction of butterfat production in cattle; intoxication of hay, crops, honey, and milk) and local ecosystems in the absence of natural insects and pathogen species.^{4–6} This report was conceived within the framework of continuing medical and dermatological education and self-education with an emphasis on intertwining medical and social aspects of the health hazards of *Jacobaea vulgaris* mentioned

FIGURE 1. *Jacobaea*/*Senecio* spp. seen at their urban stands. (A) *Jacobaea vulgaris*, ragwort (*Senecio jacobaea*). Wasteland, suburbia of Poznan, Poland. (B) *Senecio vulgaris*, common groundsel. Railway embarkment, Poznan city center, Poland. (C) *Senecio vernalis*, eastern groundsel. Roadside, Owinska, Poland.



briefly by us in a previous e-note (<http://www.endermatologia.pl/Reakcje-skorne-klinicznie-nasladujace-opryszczkowate-zapalenie-skory-indukowane-przez-Compositae,13030.html>).

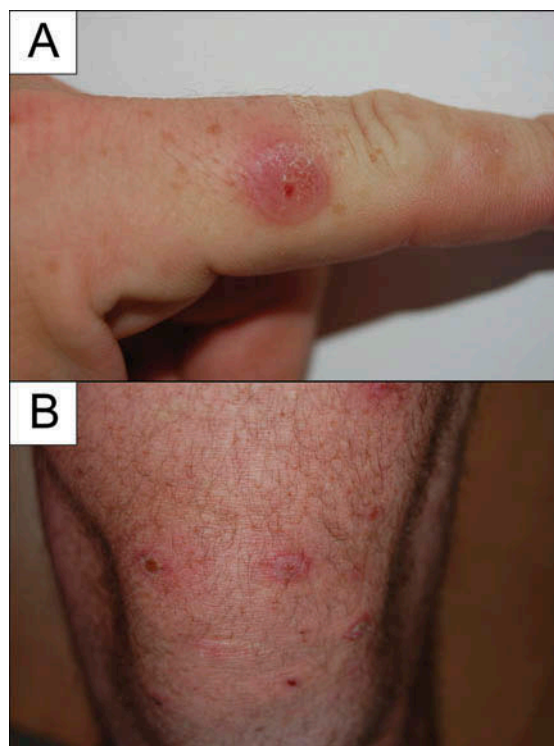
CASE REPORT

In summer of 2012, a young Polish male, without agricultural education in his homeland, presenting itchy hand and knee blisters and erosions, sought medical advice at a privately practicing dermatologist who directed him to the University Dermatology Out-Patient Clinic in Poznan with the tentative suspicion of dermatitis herpetiformis Duhring (DH) (cutaneous manifestation of gluten intolerance). The patient had worked as a farm worker in Ireland, where he had been removing weeds from the landlord's pasture without any prior knowledge of potential health hazards connected with this job, as the landlord did not explain them to him in understandable manner, but simply told him that these weeds were harmful to farm animals. Initially, the rash (Figure 2) caused diagnostic difficulties, but the diagnosis of *Jacobaea vulgaris*-induced acute blistering dermatitis was easily reached after taking a careful history. The diagnosis of DH was excluded after laboratory tests were done, since direct immunofluorescence of perilesional skin did not reveal immunoglobulin A (IgA), IgM, IgG, and C3 deposits, and serum examination with enzyme-linked immunosorbent assay (ELISA) showed the level of IgA antibodies to tissue transglutaminase within normal limit. The patient, notable for intertwining the social and medical aspects of *Jacobaea vulgaris* issue, had to return to Ireland quickly, and was advised, despite the fact that his dermatitis resolved, to have epicutaneous patch and photopatch tests with at least sesquiterpene lactones (STLs) done, and to take appropriate precaution measures in future.

DISCUSSION

Both *Senecio* spp. (Figure 1B, C) and *Jacobaea* spp. contain potentially noxious constituents characteristic for *Compositae*, namely

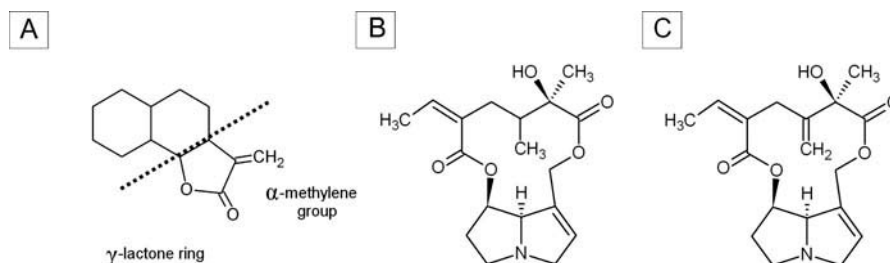
FIGURE 2. *Jacobaea vulgaris*-induced dermatitis in a young Polish migrant male farm worker. (A) An acute blistering on hand skin after contact with a sap. (B) Blisters and itchy erosions on knee clinically resembling dermatitis herpetiformis.



STLs, e.g., neoadenostylone, and pyrrolizidine alkaloids.^{6–8} STLs (Figure 3A) are C₁₅ compounds diverse in structure and biological activity. Their presence in *Compositae* is very prominent, although they occur also in other families. STLs are toxic, phototoxic, and allergenic. These with exocyclic α -methylene group bound to γ -lactone ring or other reactive groups may link with body protein sulphhydryl groups starting allergization. Renewed exposure to STLs leads to allergic dermatitis, known as *Compositae* dermatitis, featured by erythema and swelling, whereas constant exposure in horticulture leads to occupational dermatitis.^{6–9}

Pyrrolizidine alkaloids (PAs) or “*Senecio* alkaloids,” considered to be leading plant toxins, have proven carcinogenic effect on animals if ingested.¹⁰ They often occur in the plant as N-oxides and are esters of amino alcohols

FIGURE 3. Diagram of a sesquiterpene lactone and chemical structures of main pyrrolizidine alkaloids of *Jacobaea vulgaris*. (A) Sesquiterpene lactone. An α -methylene group attached to the γ -lactone ring is necessary for sensitization. (B) Senecionine. (C) Seneciphylline.



with necic acids (mono- or dicarboxylic acids, e.g., tiglic acid and angelic acid). The composition of PAs in *Jacobaea vulgaris* varies geographically. Senecionine (Figure 3B) and seneciphylline (Figure 3C) seem to be the major PAs in most plants, yet others are also known—jacobine, jacozone, jacoline, jaconine, erucifoline, senecivernine, eruciflorinae, intergerrimine, retorsine, spartioidine, usaramine, riddeline, senkirkine, and many others.^{6,8,11,12} PAs are present in comparable quantities in both *Senecio vulgaris* and *Jacobaea vulgaris* (0.2–0.3% of dry weight). There are reports on the presence of PAs in honey as well as in goat and cow milk.⁶ Chronic intake of PAs, metabolized in the liver into toxic dehydropyrrolizidines, may cause severe heart and liver injury (hepatic veno-occlusive disease) in mammals.^{6,12} The first symptoms of PA poisoning in humans are nonspecific—loss of appetite, exhaustion, and abdominal pain. Clinical signs of poisoning in animals include loss of appetite, weight loss, weakness, colic, cramps, diarrhea, tenesmus, bloody feces, rectal prolapse, paresis, central nervous system involvement, hepatomegaly, icterus, and ascites.¹³ Except in cases of shortage of other food, livestock generally avoid *Jacobaea* spp. and *Senecio* spp. due to their bitter taste, although animals may consume hay or silage contaminated with this weed. Thus, the cases of horse, cattle, and pig poisoning are not rare, and the mortality rate is high. Interestingly, sheep and goats rarely suffer from PA poisoning, supposedly due to specific beneficial rumen microflora, lower absorption, or intestinal metabolism.⁶

The recognition of *Jacobaea vulgaris* as a noxious weed dates back to the 19th century.⁴ Nowadays, landowners are put under regulations imposed by the state to eradicate the weed from the pastures. This concerns many countries or their states (United Kingdom, Ireland, New Zealand, The Netherlands, Australia, United States, and Canada).^{4,14,15} The ragwort is responsible for 90% of complaints from injurious weeds in the United Kingdom.¹⁶ Only the ingestion of PAs causes PA poisoning. Luckily enough, the belief that contact with the skin—e.g., when handling ragwort—may cause liver injury is just a common myth. Also, there are suggestions that STLs can reduce tumorigenesis in humans.¹⁷ Although the risk posed by *Jacobaea vulgaris* is known to local agriculture workers, migrants working as farm workers might not be conscious of the consequences of contact with the weed, particularly if they are not informed by their supervisors.

The noxiousness of *Jacobaea vulgaris* is not an argument for complete eradicating the plant. The biological, chemical, and mechanical control should be done in farmlands, whereas eradication should be performed in places where the plant can be hazardous to humans (playgrounds, nurseries, kindergartens). When removing *Jacobaea vulgaris* and *Senecio* spp., protective clothing should be used to minimize the risk of injury. Last but not least, school education about poisonous and injurious herbs at an early age is important for better knowledge of local plants to prevent further potentially serious health hazards, particularly to uneducated city dwellers, especially children, who may be

accidentally exposed to those plants even in urban locations (Figure 1A–C).

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