

OCCUPATIONAL CONTACT DERMATITIS TO *PHASEOLUS VULGARIS* IN A FARMER - A CASE REPORT

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**Abstract:** A case of occupational contact dermatitis in a farmer is described, caused among others by *Phaseolus vulgaris*. The patient's history of eczematous and vesicular and bullous skin reactions occurring after exposure to *Phaseolus* was confirmed by skin tests with native leaves of the plant. To the best of our knowledge, this is the first description of occupational contact dermatitis caused by leaves of *Phaseolus* plant.

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The genus *Phaseolus* belongs to the family *Papilionaceae* of the order *Leguminosales* (*Fabales*). The species *Phaseolus vulgaris* L., known as common bean or kidney bean, is cultivated in many countries for edible seeds [11]. The present paper describes a case of contact allergy to green parts of *Phaseolus vulgaris* in a farmer cultivating this plant.

## CASE DESCRIPTION

**Patient's history.** Patient Ś.R., white male, aged 41, was referred by a general practitioner to our department because of skin eczema. Patient's history was taken using the questionnaire previously described [12]. The patient had been running a private farm from the age of 21. His main activity was cultivation of sugar beet, kidney beans, cereals, potatoes and rape. He also tended cows, pigs, horses and poultry. In addition, during his work the patient was exposed to manure, pesticides, fertilisers, diesel fuel and detergents. First skin lesions appeared soon after starting work on the farm. Initially, these were inflamed, scaly patches disseminated over the body. Several years later, in his 35th year, a chronic hand eczema appeared. The skin lesions on the body showed a seasonal pattern with aggravations starting in spring,

reaching maximum intensity in summer, and gradually fading in the autumn after finishing field working on the farm. Hand eczema was present throughout the whole year with significant worsening of the skin status during the vegetation season (intensive field working). The patient indicated field work on *Phaseolus* plantation and threshing pods of the plant in order to recover kidney beans as activities particularly associated with skin problems. Approximately 2–3 hours after starting these activities, pruritus, and several hours later erythema of exposed skin appeared followed by the appearance of eczema and vesicles. While threshing *Phaseolus* pods the patient also experienced dyspnea. Another suspected activity was spraying pesticides, associated with burning sensation and worsening of hand eczema. The skin problems gradually became worse each year, and were present also at the patient's first visit to our Department. The patient attended our department regularly between 12 December 1998 – 14 March 2000 (34 consultations in total).

**Physical examination.** On the first visit, a pronounced hand dermatitis with hyperkeratosis, exfoliation and fissures was found (Fig. 1). In the ulnar fossae and inguinal areas, erythema, oedema with vesicles scattered



Figure 1. Hand eczema in described patient.

within the inflamed skin were present (Fig. 2). On further observation, in summer small bullae were also incidentally seen in these areas. The diseased skin was lichenified which is suggestive of chronic inflammatory process. On the patient's periorbital skin erythema, oedema and furfuraceous scaling were present (Fig. 3).

**Pathology examination.** A skin biopsy was taken from diseased skin during an eruption of vesicles and bullae. The microscopic examination of H+E stained skin section showed mononuclear infiltrate within dermis and epidermis, spongiosis and spogiotic vesicles within epidermis. This picture was typical of contact dermatitis and allowed us to exclude bullous diseases on differential diagnosis.

**Laboratory tests.** Routine laboratory test results, including urine test, blood smear, blood glucose, iron, transaminases, and total IgE, were all within normal range. Ouchterlony gel immunodiffusion test with allergens typical for farm environment (*Aspergillus fumigatus*, *Candida albicans*, *Saccharopolyspora rectivirgula*, *Thermoactinomyces vulgaris*, *Streptomyces albus*, *Arthrobacter globiformis*, *Pantoea agglomerans* (*Erwinia herbicola*), *Acinetobacter calcoaceticus*, chicken serum, duck serum, sheep serum) were all negative.

**Allergological skin testing.** A series of prick tests was carried out with allergens typical of farmers' working environment; the skin reaction was read after 20 min and interpreted according to the guidelines of the European Academy of Allergy and Clinical Immunology [2]. The allergens were purchased from Allergopharma Nexter, Katowice, Poland, and included mites: *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, *Acarus siro*, *Lepidoglyphus destructor*, *Tyrophagus putrescentiae*; moulds: *Alternaria tenuis*, *Aspergillus fumigatus*, *Botrytis cinerea*, *Cladosporium herbarum*, *Curvularia lunata*, *Fusarium moniliforme*, *Helminthosporium halodes*, *Mucor mucedo*, *Penicillium notatum*, *Pullularia pullulans*, *Rhizopus nigricans*,

*Serpula lacrymans*, *Candida albicans*, *Trichophyton mentagrophytes*; bacteria: *Pantoea agglomerans*; animal epithelia and feathers - epithelia of: cow, horse, swine, goat, rabbit, dog, cat, mouse, and rat, sheep wool, duck feathers, goose feathers, chicken feathers; cockroach *Blatella germanica*; and latex. These tests gave positive results with house dust mite *Dermatophagoides farinae* (+), while all others remained negative. In addition, prick tests with dust allergens (house dust, grain dust, straw dust and hay dust) purchased from Biomed, Kraków, Poland, were carried out - all remained negative.

Intracutaneous tests with wood dusts (European beech, pine, cembran pine, walnut, European silver fir, European common spruce) and plant fibres (cotton, common flax and kapok) were all negative. The test substances were obtained from Allergopharma Nexter, Katowice, Poland.

Patch tests with European Standard Series purchased from Chemotechnique Diagnostics AB, Malmö, Sweden, (potassium dichromate 0.5%, 4-phenylenediamine base 1.0%, thiuram mix 1.0%, neomycin sulfate 20.0%, cobalt chloride 1.0%, benzocaine 5.0%, nickel sulfate 5.0%, quinoline mix 2 × 3.0%, colophony 20.0%, parabens 12.0%, N-isopropyl-N-phenyl-4-phenylenediamine 0.1%, wool alcohols 30.0%, mercapto mix 2.0%, epoxy resin 1.0%, balsam Peru 25.0%, 4-tert-butylphenol formaldehyde resin 1.0%, mercaptobenzothiazole 2.0%, formaldehyde 1.0%, fragrance mix 8.0%, sesquiterpene lactone mix 0.1%, Quaternium 15 1.0%, primin 0.01%, Kathon CG 0.01%) showed positive reactions to neomycin sulfate (D3+++), balsam Peru (D3++, D4++, D5+++), and fragrance mix (D3++, D4++, D5++).

Patch tests with Plant Series purchased from Chemotechnique Diagnostics AB, Malmö, Sweden, (*Chamomilla romana* 1.0%, diallyldisulfide 1.0%, *Arnica montana* 0.5%, *Taraxacum officinale* 2.5%, *Achillea millefolium* 1.0%, propolis 10.0%, *Chrysanthemum cinerariaefolium* 1.0%, sesquiterpene lactone mix 0.1%, alpha-methylene-gamma-butyrolactone 0.01%, *Tanacetum*



Figure 2. Skin changes in ulnar fossae.



**Figure 3.** Skin changes in periorbital area.



**Figure 4.** Positive result of patch test with native leaf of *Phaseolus*. An infiltrative reaction with small papules and vesicles is visible which exceeds area of contact to the leaf fragment.

*vulgare* 1.0%, alantolactone 0.1%, lichen acid mix 0.3%) showed strong positive reactions to propolis (D3+++, D4++++, D5++++) which needed to be treated with a topical steroid already on the third day of testing.

Patch tests with Pesticide Series prepared by Department of Pathology of the Institute of Agricultural Medicine, Lublin, Poland, according to Luty *et al.* [7] (bromfenvinphos 1.0%, chlorfenvinphos 1.0%, deltametrin 1.0%, dichlorvos 1.0%, phenitrothion 1.0%, captan 1.0%, malathion 1.0%, MCPA 1.0%, simazine 1.0%, atrazine 1.0%, chlorotoluron 1.0%, 2,4-dichlorophenoxyacetic acid 1.0%, *pp'*-DDT 1.0%, dicamba 1.0%, dinoseb 1.0%, carbaryl 1.0%, karbendazim 1.0%, lindane 1.0%, trichlorfon 1.0%, cypermethrin 1.0%, promethrin 1.0%) showed a positive reaction to the pesticide dichlorvos (D4?+, D5+).

Patch tests with Rubber Component Series purchased from Edmund Jaworski Co, Katowice, Poland, (mercaptobenzotiazole 1.0%, thiuram 1.0%, tiohexam 2.0%, accelerator DM 1.0%, antioxidant AR 1.0%, antioxidant IPPD 1.0%) showed contact allergy to IPPD (D3++, D4++++, D5++++).

Patch tests with Corticosteroid Series purchased from Chemotechnique Diagnostics AB, Malmö, Sweden, (budesonide 0.1%, betamethasone-17-valerate 1.0%, triamcinolone acetonide 1.0%, tixocortol-21-pivalate 1.0%, alclometasone-17,21-dipropionate 1.0%, clobetasol-17-propionate 1.0%, dexamethasone-21-phosphate disodium salt 1.0%, hydrocortisone-17-butyrate 1.0%) showed positive reactions to betamethasone (D3+, D4+, D5+), triamcinolone (D3+, D4+, D5+), tixocortol (D3+), alclometasone (D3+), clobetasol (D3+), and dexamethasone (D3+).

**Allergological skin testing with *Phaseolus*.** Because the patient's history was suggestive of sensitisation to *Phaseolus*, special tests were undertaken in order to confirm this suspicion. To test for type I allergy, a prick-to-prick procedure with *Phaseolus* was performed. Briefly, fresh leaf and stem of the plant were pricked with special lancets (Allergopharma). Then, the lancets with

fresh *Phaseolus* sap were used for pricking ventral forearm skin of the patient. The skin reaction was read after 10, 20 and 30 minutes. The results of the test were negative. Next, a fragment of *Phaseolus* leaf was fixed to the skin using adhesive tape. The skin reaction was read after 15, 30 and 60 minutes and after 24 and 48 hours. The skin test result was positive (++) after 24 and 48 hours (Fig. 4). No reaction was seen in healthy control subject (one of the authors).

**Alkaline resistance test** was carried out using 2% solution of NaOH applied under occlusion to the forearm skin for 10, 20 and 30 min with reading reaction in 10th, 20th and 30th minute, as well as after 24 hours. The test showed normal buffering capacity of the skin.

## DISCUSSION

Allergological tests in the described patient showed a multiple contact allergy to various agents. Non-occupational



**Figure 5.** Inflammatory bullous skin reaction in a patient who came into close contact to *Phaseolus* during pastime gardening. Most probably it could be either contact dermatitis or photocontact dermatitis caused by *Phaseolus*. As the patient presented only twice and was not interested in more detailed testing, no further evidence for this is available.

contactants were all but one topical drugs, which suggests that sensitisation to these was secondary and took place while the patient was receiving treatment for his skin disease. As the patient had never worked as a beekeeper, allergy to propolis is most probably caused by using it as a "natural" drug which is very popular in Poland. The only contact allergen which is neither occupational nor a topical drug was the fragrance mix. We assume that also in this case allergisation could be rather secondary to the occupational disease as a consequence of damaged skin barrier.

Occupational allergens causative of the patient's skin disease are dichlorvos, IPPD and Phaseolus. Luty *et al.* estimated that dichlorvos shows a relatively weak allergising potential [8]. The allergisation to the rubber component IPPD may be due to frequent use of protective rubber boots while working on the farm. Rubber boots are a known source of IPPD [3]. The most interesting was patient's sensitisation to Phaseolus. He reported the appearance of skin lesions after contact with green parts of the plant during harvesting and threshing of the legumes. This relationship was later verified by the positive skin patch test with a leaf of *Phaseolus vulgaris*. To the best of our knowledge, this is the first described case of confirmed allergy to green parts of Phaseolus plant.

*Phaseolus vulgaris* is a plant grown as a food source that only in rare cases may show harmful effects to human health. Kidney beans – edible germs of Phaseolus – contain a toxalbumin phasin which shows weak toxic potential and is destroyed during boiling. Raw or inadequately cooked kidney beans, especially if unripe or germinating, may cause after ingestion phasin intoxication with epileptoid convulsions, and narrowing of pupillae (myosis). Phasin is also known to cause irritation of the gastrointestinal tract [4].

In laboratories, *Phaseolus vulgaris* is a source of phytohemagglutinin (PHA-P). It does not seem to show allergenic potency as no allergic reactions to it were reported among workers engaged in preparation of PHA-P and among laboratory staff using it for assessing immune competence *in vitro* [6].

Little is known of the Phaseolus influence on the skin. Ingestion of kidney beans was considered a cause of Riehl's melanosis in a period of poor nutrition during wartime [10]. Available data about allergising or irritating potential of *Phaseolus vulgaris* are scarce and pertain to edible seeds, not the plant itself. Contact sensitisation to kidney beans seems extremely rare. Hjorth and Roed-Petersen in a study involving members of the Trade Union of kitchen staff in Denmark, have identified 33 cases of contact dermatitis to food, but in no case were kidney beans identified as a causative factor [5]. Similarly, Veien *et al.* found among 180 food handling workers in Denmark 25 patients with protein contact dermatitis caused by meat or vegetables; however, none of them was found to be allergic to kidney bean [13]. So-called "kidney bean itch" in food processing workers was

mentioned by Henneberg and Skrzydlewska, who suggested an allergic etiology, without however, giving any proof or closer description of cases [4]. The only documented report of contact dermatitis to kidney bean was published by Cronin, who found positive skin reaction to kidney bean in one of 47 caterers with occupational hand dermatitis [1].

In our patient, the morphology of skin reaction elicited on patch testing included erythema and infiltration of the exposed skin with presence of small papules turning gradually to vesicles, which was suggestive of contact dermatitis. Also of interest is a vesicular and bullous reaction seen on the patient's inner forearm skin during observation. Microscopic examination revealed spongiosis in the epidermis, which is often found in dermatitis. Previously, we observed also a bullous reaction on forearms in another patient who came in close contact with Phaseolus during pastime gardening (Fig. 5). The localisation of skin lesions on forearms suggests that the lesions are provoked by an immediate contact with green parts of the plant. On the other hand, periorbital changes in our patient (Fig. 3) may suggest that some volatile agents of the plant might also cause airborne dermatitis. This assumption seems to be supported also by observation of Marshman and Lovell, who described a case of contact urticaria from runner bean (*Phaseolus multiflorus*) – a species closely related to *Phaseolus vulgaris* [9]. In the cited work, pruritic erythema and oedema developed after picking runner beans on patient's inner forearms and eyelids.

From the legal point of view, this case fulfils the criteria of occupational disease set by Polish law. It is caused by agents present in the working environment of the farmer; there is correlation between work and aggravation of skin symptoms, and the disease is listed on the official list of occupational diseases.

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