

Common Cutaneous Problems in Agricultural Workers

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Introduction

Farmers experience the same skin diseases as others, but there are some conditions which are seen more often in agricultural workers than the general population.

This paper will discuss several types of problems seen with a greater incidence in those engaged in agriculture. These have been grouped as follows: (1) contact dermatitis, (2) infections, (3) damage from sun and heat induced changes and (4) arthropod induced problems.

Contact Dermatitis

The majority of cases of contact dermatitis are due to the irritant effect of chemicals. If anyone's skin has enough exposure to an irritant, a dermatitis will develop. Most other instances of contact dermatitis are due to a specific allergy. Only certain persons who become sensitized, following exposure to a particular antigen, and are subsequently re-exposed will develop this form of dermatitis. Rarely, a contact dermatitis develops only if there is exposure to sunlight in the presence of the contactant. This is called photocontact dermatitis. Photocontact dermatitis may be either a phototoxic (nonallergic) phenomenon or photoallergic.

Farmers are exposed to many agents capable of eliciting a contact dermatitis. In fact most insecticides, herbicides, etc., are capable of producing an irritant contact dermatitis if there is significant exposure. The following discussion will just mention the agents which are more potent irritants, allergens or photosensitizers.

Of the insecticides, pyrethrum is one of the more potent allergic sensitizers. There are sometimes cross reactions between pyrethrum, chrysanthemum, shasta, daisy, and ragweed oleoresin. This means that someone who has been sensitized with pyrethrum might develop an allergic contact dermatitis if exposed to chrysanthemums. The synthetic chlorinated hydrocarbons such as aldrin, lindane, chlordane, and dieldrin rarely sensitize and usually do not cause irritant contact dermatitis if used properly. Chlordane and lindane have been reported to cause necrotizing vasculitis and the accidental ingestion of lindane has resulted in porphyria cutanea tarda, but such complications of insecticide use are rare. Phenothiazine is sometimes used as an insecticide. It can act both as a sensitizer and a photosensitizer. Furthermore, some persons who have become sensitized by cutaneous exposure to phenothiazine will develop dermatitis if they take a phenothiazine, by mouth, as a tranquilizer in the future. Tetramethylthiuram, which has been used to eradicate Japanese beetles is a moderately potent sensitizer. Its importance in this regard is increased by the fact that there are many other potential sources of contact with tetramethylthiuram. These include rubber, adhesives, soaps, shampoos, paints, preservatives, putty, rat repellent, rocket fuel, fungicides, and herbicides.

Fungicides may include mercury, a sensitizer; formaldehyde, an irritant and sensitizer; quaternary ammonium compounds which can rarely sensitize and tetramethylthiuram, which is discussed above.

Herbicides sometimes contain tetramethylthiuram; maleic hydrazide, which may sensitize; and trichloroacetic acid, a potent irritant. The commonly used herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) is not a potent sensitizer. It may, however, produce an irritant contact dermatitis if it is not used properly.

Most fumigants do not cause cutaneous changes if properly used. Sulfur dioxide, however, has been reported to cause urticaria in susceptible persons.

Animal feeds have additives which may include antibiotics and phenothiazines. Hence these may cause an allergic contact dermatitis or a photo-contact dermatitis.

Of the plants causing contact dermatitis the most important ones are in the rhus group. This includes poison ivy, poison oak, oak leaf poison ivy, and poison sumac. The term poison is actually misleading. The rash produced by these plants is due to an allergen: an oleoresin called urushiol. It is not a toxin or poison. These plants have several features in common. They have waxy, white fruit which is segmented like a peeled orange. They also have clusters of white flowers. With the exception of poison sumac, which has 7-13 leaflets, they have three leaflets with a common point of origin. They generally grow as vines or small shrubs, although occasionally these are large enough to resemble trees. Poison sumac is again the exception. It grows as a woodish shrub or small tree and never as a vine. Poison ivy grows in all sections of the United States except the Southwest and Pacific Coast. Poison oak is found along the Pacific Coast. Oak leaf poison ivy is found along the East Coast from New Jersey to eastern Texas. Poison sumac is usually found east of the Mississippi.

The sensitizing oleoresin is not present on the surface of intact rhus plants. There must be some injury to the plant to allow it to escape. It then quickly dries on whatever it contacts and may maintain its antigenicity for many months. Although it is best removed from clothing by a cleaning solvent, ordinary laundering is usually sufficient. The oleoresin does not vaporize, but may be carried by windborne particles in smoke. The urushiol may therefore get on one's skin by direct contact with the plant, from contaminated objects which touch the plant (e.g. clothes, pets, tools, etc.), or by small airborne particles arising from the burning of the plants. The rash begins six hours to seven days following contact with the oleoresin. Usually the interval is about two days.

The initial cutaneous changes are erythema and edema. Vesicles quickly form in many of the involved areas. The vesicles usually rupture producing

a serous drainage. This does not spread the rash. The increasing extent of the dermatitis is due to some areas having gotten less oleoresin, to subsequent acquisition of oleoresin from contaminated objects, or to resistance of areas of skin with a thicker stratum corneum. Careful observation will frequently reveal one or more areas of linearity. This is helpful in diagnosing rhus dermatitis. The rash is very pruritic.

The severity of rhus dermatitis depends on the quantity of antigen which contacts the skin and the sensitivity of the person. The most frequently involved persons are children and workmen who do their jobs in fields and woods. It is less common in old persons, probably because of decreased exposure and the reduced immune competence associated with old age. It is also less common in blacks.

Other plants are also capable of eliciting allergic contact dermatitis. A group of the Compositae family including chrysanthemums, pyrethrum, and daisies may act as sensitizers. There are hundreds of species of primula most of which are nonsensitizing. *Primula obconica* and *Primula malacoides* contain allergens.

The common ragweed (*Ambrosia artemisiifolia*) is best known because of its protein antigen which causes allergic rhinitis in the late summer and fall. This plant also has an antigenic oleoresin which is carried on the pollen and may cause an airborne allergic contact dermatitis. This results in dermatitis of exposed areas without any sparing of shaded areas (e.g. under the chin, behind the ear lobule) as is seen in photosensitive dermatoses. Sometimes there is an accentuation in flexural creases and at the edges of clothing. The first sign is usually redness and swelling of the eyelids. This problem is most prevalent in August and September. For the individual patient there is a tendency for the annual recurrences to be more persistent and after several years the patient may become affected throughout the year. A vicious itch scratch cycle probably serves to perpetuate the rash during the months when the pollen is not in the air. Ragweed oleoresin cross reacts with

chrysanthemums, pyrethrum, marsh elder and linseed oil. It may also produce a photoallergic contact dermatitis.

Bulb fingers is a condition found in those who sort and pack dried tulip, hyacinth, onion and garlic bulbs. Patients with this problem present with redness, tenderness, and tingling of their finger tips. Continued exposure results in scaling and fissuring. It is thought that this may be produced by the bulbs directly or by chemicals on the bulbs such as fungicides.

Many vegetables can produce dermatitis. The most notorious are carrots, but artichokes, asparagus, celery, chicory, cucumbers, horse radish, kidney beans, lettuce, mustard greens, parsnips, potatoes, spinach and tomatoes are also capable of producing a contact dermatitis.

Wood can cause dermatitis. The usual mechanism is primary irritation due to mechanical trauma, e.g., wet sawdust. Domestic woods known to cause an irritant contact dermatitis include pine, oak, poplar, acacia, birch, cedar, and spruce. Some imported woods may produce an allergic contact dermatitis, e.g., satinwood and teak. Lichens may also ellicit an allergic contact dermatitis.

The term phytophotodermatitis refers to the nonallergic response on the skin produced by juices from certain plants in combination with sunlight. It presents as irregularly shaped bullae with a bizzare arrangement. The lesions heal leaving hyperpigmentation which usually persists for months. Phytophotodermatitis is produced by chemicals called furocoumarins. Most of the plants with furocoumarins are in the Umbelliferae family or the Rutaceae family. Plants in the Umbelliferae family with furocoumarins include parsley, celery, parsnip, dill and fennel. Limes and lemons are furocoumarin producing members of the Rutaceae family.

Farmers may also be exposed to creosote which is used as a wood preservative. It is a powerful irritant and photosensitizer.

Treatment of Contact Dermatitis

The management of rhus dermatitis will be discussed first since it is the most frequent and severe form of contact dermatitis which affects farmers. Furthermore, some of the principles involved in treating rhus dermatitis are applicable to the treatment of contact dermatitis from other agents.

Washing with soap and water immediately following contact with the oleoresin will reduce the extent and severity. If this is not accomplished within about 20 minutes of exposure, it is of little value, but probably still worth trying.

If rhus dermatitis is mild, symptomatic treatment with compresses and 1% phenol in calamine lotion will usually suffice. Systemically administered antihistamines are of some value. Corticosteroid creams are frequently used, but are not very effective for this type of dermatitis.

Severe rhus dermatitis is usually best managed with systemic corticosteroids. Forty milligrams of prednisone daily in divided dosage is often an appropriate starting dose. When new vesicles are no longer forming the dosage may be reduced by 5 milligrams every day. Occasionally it is necessary to continue the systemic steroids for up to three weeks. Compresses, colloidal baths, and calamine lotion are helpful adjuncts, even when steroids are administered.

There are many over-the-counter topical preparations intended for the treatment of rhus dermatitis. The ones containing anesthetics and antihistamines should be avoided since they sometimes sensitize.

There is lack of agreement on the efficiency of attempts to hyposensitize persons sensitive to urushiol. The procedure provides only partial protection at best and may produce side effects such as pruritus ani. Nevertheless, it is probably worth a try in those who cannot avoid exposure and

are quite sensitive. The hyposensitization process involves the ingestion of gradually increasing amounts of urushiol. It must be started two to three months before the expected exposure. Best results are obtained with continued ingestion of small amounts of the oleoresin after the routine course has been completed.¹

Eradication of rhus plants is best accomplished with herbicides or by grubbing.² Herbicides are best used in the spring after maximum foliage development. However, it can be done less effectively up to three weeks prior to the first frost. Retreatment of the plants with herbicides is almost always necessary. Grubbing is useful if there are not too many plants. It is best done in the early spring when the ground is wet. Methods such as mowing, sickling, etc., which leave the roots, are ineffective. Plants which are removed should be buried or burned with care to avoid the smoke which may contain debris-carrying oleoresin.

The management of other forms of contact dermatitis is usually centered around topical corticosteroids. The occlusion of topical corticosteroids with a thin plastic seal such as Saran Wrap (R) markedly increases their cutaneous absorption. Principles of treating dermatitis in general should always be remembered such as soaks and compresses for weeping lesions and lubrication for dry scaling lesions.

Steps to reduce the incidence of contact dermatitis developing on farms should include the following:

1. Label directions should be followed when using insecticides, herbicides, etc.
2. Washing exposed areas before lunch and at the end of the work day.
3. Wearing clean uniforms and gloves when appropriate.
4. Protective clothing should be worn when working with known sensitizers or potent irritants.
5. Airplane spraying should be done when workers are not in the field.

Most of the preceding information is contained in "Occupational Contact Dermatitis".³ This excellent book may be consulted for a more detailed discussion of many of the problems discussed.

Infection

A few types of infection are much more common in farmers. These include "animal ringworm", orf, and milker's nodules.

"Animal ringworm" refers to a fungal infection acquired from animals.⁴ This can of course be caused in urban dwellers by Microsporum canis acquired from cats and dogs. The farm acquired "animal ringworm" is usually due to Trichophyton verrucosum, Trichophyton mentagrophytes or Microsporum gypseum. These sometimes infect livestock and horses as well as cats and dog. Furthermore, Microsporum gypseum is frequently acquired from the soil. In areas of dense terminal hair such as the scalp and beard, it presents as fluctuant, purulent lesions. On less hairy skin it may be manifested by less inflamed, red, scaling lesions with a tendency for central clearing or by more inflammatory lesions which present as patches of spreading erythema with the formation of multiple small pustules. The diagnosis of the dermatophyte infection can be diagnosed by potassium hydroxide mounts and/or cultures. Hair is used when the lesions are in the hairy areas and the scales or pus are examined when the lesions are on less hairy skin.

Treatment is best carried out with griseofulvin (microsize) 500 mg. daily. When hairy areas are involved, measures to reduce inflammation such as the epilation of loose hair, compresses, systemic antibiotics (for secondary bacterial infection), and even a short course of systemic corticosteroids are helpful. These measures reduce the chances of scarring hair loss. Small areas of less inflamed animal ringworm occurring on less hairy skin can simply be treated with a topical antifungal agent.

Orf^{5,6} is caused by a virus which is usually acquired from newborn lambs with "scabby mouth". It most commonly presents as a solitary lesion on the hands, which passes through many stages: a red papule, a hemorrhagic pustule or blister, a red weeping surface, a dry crust with black dots, small papillomas, and finally a thick crust with decreasing size of the papillomas and flattening of the lesion. Orf heals spontaneously in above five weeks. When the lesion is moist, compresses are helpful and systemic antibiotics are indicated if secondary bacterial infection develops. The healing time can be reduced by about 50% if the lesion is treated early with curettage and electrodesiccation.

Milkers nodules^{5,6} are also of viral cause. The infection is acquired through contact with the udders of infected cows. The incubation period is about one week. The presence of two to five nodules on the hands is most characteristic. The lesions are inflammatory papules initially. They progress to reddish-brown or violaceous nodules. These nodules may become crusted, verrucoid, or granulomatous, but they do not vesiculate or ooze. Regional lymphadenopathy and secondary bacterial infection often occur. Milkers nodules disappear spontaneously in one to two months. Systemic antibiotics are sometimes helpful in treating superimposed bacterial infection.

Sun and Heat Induced Changes

The sun is a significant factor in inducing cutaneous changes. Aside from ordinary sunburn, the majority of these are due to the chronic cumulative effects of ultraviolet light from the sun. The photobiology of skin is a very complicated subject, but in simple terms, the rays which produce sun burning are the same ones which cause chronic cutaneous changes. The most common of the chronic sun induced cutaneous changes are actinic keratoses and skin cancers. These both have a higher incidence in lightly complexioned individuals. Actinic keratoses present as red lesions with a gritty scale. These are found primarily on the face, neck, ears, backs

of the hands, and the extensor aspect of the forearms. If untreated, some will eventually progress to skin cancers. They are usually treated by curettage and electrodesiccation or liquid nitrogen freezing when few in number. Multiple actinic keratoses are most commonly treated with topical 5-flourouracil solution.

The two most common types of skin cancer are basal cell carcinomas and squamous cell carcinomas. Basal cell carcinomas occur with greatest frequency on the face, neck, and ears. They may present in several different ways but the most common is the nodular form. This begins as a pearly nodule which enlarges while the center becomes eroded. The margin in a classic basal cell carcinoma is rolled, translucent, and telangiectatic. Many modes of therapy are effective in treating this type of lesion. The most commonly used form is curettage and electrodesiccation. Basal cell carcinomas almost never metastasize, but they can be quite locally destructive, if untreated.

Squamous cell carcinomas are less common than basal cell carcinomas. They occur with the same sites of predilection as actinic keratoses. They usually begin as crusted firm lesions with a red base. More advanced lesions may be nodular and ulcerated. The treatment is similar to that for basal cell carcinomas. About 2% of squamous cell carcinomas do not remain localized.

The use of a wide-brimmed hat and a good sunscreen, such as 5% p-amino-benzoic acid in alcohol, will help to reduce the incidence of sunburn, actinic keratoses, and skin cancers.

Miliaria rubra (prickly heat) develops in hot, moist environments. It presents as uniform, minute erythematous papules or vesicopapules. Because they are regularly spaced, the lesion may appear to be located in the hair follicles. Closer observation, however, will reveal that the lesions lie between hair follicles. It has a predilection for body folds areas, sites of pressure, and areas of friction. The process is caused by obstruction of sweat ducts. Although it is disputed, some believe that pathogenic

bacteria play an etiologic role.⁷ Removal from the hot humid environment is the most important factor in the management of miliaria. Topical steroid cream, particularly in combination with neomycin, are also helpful.

Arthropod Problems

Agricultural workers are also exposed to hordes of arthropods some of which may bite, sting, or infest the skin. The cutaneous response to most types of bites, stings and infestations varies considerably with the degree of sensitization. Generally the initial exposure results in little or no reaction. Then as the person develops sensitivity, red macules, papules, purpuric lesions, or blisters may develop. Finally the sensitivity may wane. A complete discussion of all forms of medical problems in farmers caused by bugs is beyond the scope of this paper. Some of the more common, characteristic, or serious ones are discussed below.

In rare instances fatal anaphylactic responses have followed stings by Hymenoptera. This group includes bees, wasps, hornets, and yellow jackets. Usually a sting by one of these insects produces only a local or mild systemic response. Hyposensitization is very effective in preventing serious reactions and is recommended in those who have had any degree of systemic involvement following a sting by Hymenoptera. This would include those who have developed generalized hives, wheezing, fainting or shock. Hypo-sensitization is usually not advised for those who simply develop local pain and swelling at the site of the sting.⁸ Persons with a history of significant allergic reactions following Hymenoptera stings can also be given advice on how to reduce their chances of being stung and what to do if they are stung. They should wear light, nonflowery clothing, stop using scented preparations, avoid places and activities where these insects are likely to be encountered, keep an insecticide aerosol handy, and if they are stung they should take diphenhydramine 50 mg and ephedrine 25 mg immediately and go to the nearest medical facility.

The puss caterpillar has fine hollow tubes interspersed among its body hairs. Irritants are secreted through the tubules as the caterpillar crawls across the skin. This secretion produces an urticarial reaction with a grid-like pattern. Although this eruption is itchy and painful, it is of no great significance.

Chiggers are mites which frequently infest farm people. The larval form is only about 0.25 mm. long. For the most part, they feed on low vegetation, but require a source of animal protein for further development. One such source is man. The larvae injects saliva into the skin of man which digests the skin enzymatically. The larvae simply lie in this defect and feed for one to four days before falling off. The clinical appearance varies with the type of clothing worn and the degree of sensitivity. The most characteristic appearance is the presence of erythematous papules around the belt line or in other areas where clothing is tightly opposed to the skin. Chigger "bites" disappear spontaneously. It is claimed that clear nail polish provides rapid relief from the itching.

Farmers performing jobs in which they handle grain, straw, or hay may be infested with the grain mite. These mites burrow into the epidermis of man and produce lesions which vary according to the degree of sensitization. The lesions may present as red macules, petechiae, papules, small blisters, or pustules. It results in a very annoying, burning pruritus which may be accompanied by fever. This condition can be treated by applying a 1% lotion of gamma benzene hexachloride following a shower and leaving it on the skin for 24 hours. This should be applied just one time.

Diethyltoluamide is probably the best all purpose repellant for insects and mites. Most insect bites require no treatment, but occasionally because of their number, over-reaction on the part of patients, secondary infections, etc., it is sometimes appropriate to treat insect bites. The use of a topical steroid aerosol often provides good symptomatic relief. Another simple form of therapy is to wet the involved skin and sprinkle a papain

containing meat tenderizer over the lesion.^{9,10} This is effective if used early and works by enzymatically destroying protein and polypeptide secretions which can act as allergens or irritants. Systemic antihistamines are of some value in reducing the pruritus associated with multiple bites. If secondary infection supervenes antibiotics, usually systemic, are indicated.

Bibliography

1. Epstein W.L., et al: Poison Oak Hyposensitization. Arch Dermatol Syphilol 109:356-360, 1974.
2. Farmer's Bulletin No. 1972, U.S. Department of Agriculture, U.S. Government Printing Office.
3. Adams R.M.: Occupational Contact Dermatitis. Philadelphia, J.B. Lippincott, 1969, pp. 171-192.
4. Carney R.G. Sr.: Dermatology for the Student and Physician. Iowa City, University of Iowa, 1970.
5. Fitzpatrick T.B., et al: Dermatology in General Medicine. New York, McGraw-Hill, 1971.
6. Rook A, Wilkinson D.S., Ebling F.J.G.: Textbook of Dermatology. Philadelphia, F.A. Davis, 1972.
7. O'Brien J.P.: The Etiology of Poral Closure. J Invest Dermatol 15:102-127, 1950.
8. Sheldon J.M., Lovell R.G., Mathews K.P.: A Manual of Clinical Allergy. Philadelphia, W.B. Saunders, 1967, 321.
9. Arnold Jr. H.L.: Immediate Treatment of Insect Stings. JAMA 220:585-586, 1972.
10. Loder J.S.: Treatment of Jellyfish Stings. JAMA 226:1228, 1973.

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