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CASE REPORT

Occupational hazards in agriculture – a severe case of lime sulphur-induced irritant contact dermatitis with characteristic skin manifestations

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Abstract

A 58-year-old female patient presented with erythema, swelling, erosions, yellow-white crusts, and severe pain in both hands for one day. Distinct from typical cases of allergic contact dermatitis, the condition progressed rapidly, characterized by leather-like crusts resembling adhered lime and scattered erosions. After one month of treatment, the lesions resolved almost completely, leaving residual scars and mild functional impairment. This case report describes occupational exposure to lime sulphur, a strongly alkaline pesticide known to cause severe irritant contact dermatitis, and emphasizes the importance of proper handling procedures, enhanced protective measures, and systematic clinical management following exposure.

Key words

occupational irritant contact dermatitis, lime sulphur, alkali burn

INTRODUCTION

Contact dermatitis, a common inflammatory skin condition, affects millions of people worldwide, significantly impacting their quality of life [1]. It encompasses two main types: irritant contact dermatitis and allergic contact dermatitis [2]. Irritant contact dermatitis, which accounts for approximately 80% of all contact dermatitis cases, results from direct damage to the skin by irritants, such as chemicals, detergents, or physical agents [3]. Agricultural workers are particularly vulnerable to irritant contact dermatitis due to frequent exposure to various irritants, including pesticides and fertilizers.

Lime sulphur, a widely-used agricultural chemical, has been recognized for many years as a potential irritant [4]. This traditional fungicide, insecticide, and acaricide is valued for its low cost and effectiveness, especially in resource-constrained settings [5]. However, its irritant properties and the severity of skin reactions it can induce have not been thoroughly investigated in the literature. The cutaneous toxicity of lime sulphur stems from its alkaline nature and its ability to cause saponification reactions, which can lead to significant tissue damage and inflammation [4].

Despite the known risks of agricultural chemicals, there is a lack of comprehensive studies on the acute and chronic effects of lime sulphur exposure on human skin. This case report presents a detailed account of severe irritant contact dermatitis caused by lime sulphur exposure, analyzing its clinical features, pathophysiological mechanisms, and treatment approaches. Additionally, the critical need is emphasized for preventive measures and public education to reduce the incidence of such occupational skin diseases, especially among agricultural workers facing elevated risks due to recurrent exposure to hazardous substances.

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CASE REPORT

A 58-year-old Chinese female presented with acute-onset erythema, swelling, erosions, and yellow-white crusts accompanied by severe pain on both hands for one day? The patient, newly-engaged in fruit farming, reported prolonged exposure to lime sulphur, an alkaline pesticide, during 2 consecutive spraying sessions (4 hours in the morning and 4.5 hours in the afternoon) while tending fruit trees. Despite wearing cotton gloves, the pesticide permeated the protective gear, predominantly soaking the left hand due to its elevated position during spraying. Immediate burning sensations prompted intermittent rinsing with running water, but residual irritants persisted. Post-exposure, mechanical scrubbing and application of vegetable oil, failed to alleviate the crusts, which were initially mistaken for adhered lime powder. By evening, progressive erythema, swelling, and intolerable pain developed, though systemic symptoms (e.g., fever, chills, cough, abdominal pain, or palpitations) were absent. The patient was previously healthy with no history of identical or similar chemical exposure, medication allergies, or similar dermatological conditions. Laboratory tests showed no significant abnormalities.

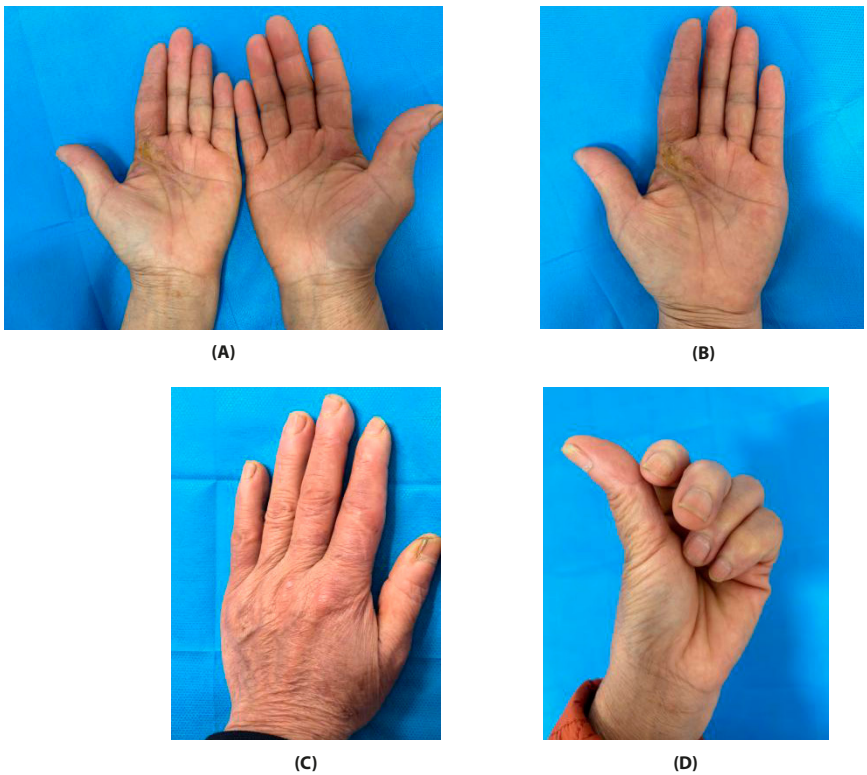
In the outpatient clinic, anti-inflammatory therapy was provided (oral and topical glucocorticoids, antihistamines, wound care, and infection prophylaxis, oedema control, analgesia, and adjunctive phototherapy (red light therapy).

(A) **(B)** (C)

Figure 1. (A) Pre-treatment palmar lesions; **(B)** pre-treatment lesions on the left hand; **(C)** marked swelling of the left hand

(A) **(B)** **(C)**

Figure 2 (A) Palmar lesions at two-week post-treatment; **(B)** Left-hand lesions at two-week post-treatment; **(C)** Significant resolution of left-hand swelling compared to baseline



(A) **(B)**

(C) **(D)**

Figure 3. **(A)** Palmar lesions one month post-treatment; **(B)** left-hand lesions one month post-treatment; **(C)** complete resolution of left-hand swelling; **(D)** left index finger presented with mild flexion limitation.

Two weeks post-treatment: partial detachment of yellow-white crusts revealed trench-like ulcerations with significant reduction in swelling. Superficial erosions had re-epithelialized, and no new lesions emerged (Fig. 2).

One month post-treatment: near-complete resolution of crusts and ulcers observed, with residual scarring and mild flexion limitation in the left index finger (Fig. 3).

DISCUSSION

Lime sulphur, a traditional and economical fungicide, insecticide, and acaricide, is widely utilized in agricultural practices, particularly in resource-limited regions, due to its simple preparation method and low production cost [6]. This reddish-brown aqueous solution, characterized by a pungent hydrogen sulphide odour, is synthesized by boiling sulphur powder and quicklime at a ratio of 2:1:10 – 15 [7] (sulphur:calcium oxide:water). As a strongly alkaline compound, its primary constituents include sulphur and calcium oxide (CaO), which hydrolyzes to form calcium polysulphide (CaSx) and Calcium hydroxide ($Ca(OH)_2$), contributing to its corrosive and irritant properties [8]. The cutaneous toxicity of lime sulphur arises not only from its alkaline nature but also from saponification reactions, which exacerbate tissue damage through protein denaturation, lipid hydrolysis, and fatty acid saponification, compounded by localized thermal injury. Lipids, as essential components of cell membranes, undergo saponification, disrupting membrane integrity and triggering cellular content leakage. This process intensifies local inflammation and may lead to deep tissue necrosis. Consequently, cutaneous exposure to lime sulphur promptly induces irritant contact dermatitis. As illustrated, both characteristic dermatological manifestations – including rapidly developing, well-demarcated erythema and erosions were observed following exposure [9] – as well as severe cutaneous presentations, such as tissue coagulation, whitening, and induration of the skin, which may be readily misidentified as superficial lime powder deposits.

The patient exhibited a definitive history of lime sulphur exposure, with localized cutaneous damage emerging shortly after contact, indicative of classic irritant contact dermatitis. The presence of sulphur in lime sulphur likely contributed to the malodour observed at the lesion site. Insufficient and delayed irrigation allowed prolonged retention of the irritant on the surface of the skin, triggering saponification of surface lipids and subsequent deposition of fatty acid salts. This process exacerbated the disruption of the skin barrier. Persistent saponification reactions facilitated the progression of tissue damage from the epidermis to the dermis and deeper layers, amplifying injury severity. Initial clinical manifestations included erythema and oedema, rapidly progressing to yellow-white crusts and leather-textured erosions/ulcers without vesicles.

Post-healing scarring on the left palm and mild flexion limitation of the index finger suggested subcutaneous tissue involvement. Based on the clinical presentation and alkali burn classification criteria, this case aligns with a third-degree alkali burn.

The management of acute irritant contact dermatitis from lime sulphur exposure requires immediate irrigation with copious lukewarm water for 15–20 minutes, avoiding scrubbing or acidic neutralization that may exacerbate tissue damage [10]. Initial care should focus on gentle debridement of adherent particles using mineral oil, followed by application of silver sulfadiazine cream 1% for deep ulcerations, as seen in the presented case. Medical therapy includes oral NSAIDs for pain control, topical/oral corticosteroids (e.g., prednisone 0.5–1 mg/kg/day) to reduce inflammation, and antihistamines for pruritus. Adjunctive red light therapy (as implemented here) promotes wound healing, while physical therapy addresses potential functional impairments.

CONCLUSIONS

This case report presents a severe instance of irritant contact dermatitis induced by lime sulphur exposure, highlighting its clinical progression, management, and implications for public health awareness. The patient's rapid disease onset, characterized by erythema, swelling, erosions, and yellow-white crusts with significant pain, underscores the potent irritant properties of lime sulphur.

The treatment approach, incorporating anti-inflammatory corticosteroids, antihistamines, wound care, edema control, analgesia, and adjunctive phototherapy, demonstrated effectiveness in resolving lesions and restoring skin integrity, with near-complete remission achieved within one month.

This case highlights the critical need for a comprehensive occupational health management strategy for lime sulphur exposure, integrating mandatory safety training (including proper handling techniques and early symptom recognition), employer-provided PPE (nitrile rubber gloves, full-body aprons, and sealed goggles), regulatory oversight (workplace inspections and exposure monitoring), and post-exposure medical surveillance. Such a multi-stakeholder approach – engaging workers, employers, and health authorities – is essential for preventing severe dermatological injuries and long-term disability in agricultural workers. Additionally, further investigation into the cutaneous toxicity mechanisms of lime sulphur and the efficacy of various treatment modalities is warranted to improve clinical outcomes and reduce the burden of occupational skin diseases.

Ethical Statement

Ethical approval was not required for this case report, and the images provided do not allow for patient identification.

Informed Consent Statement

Written consent for the publication of the case and photographs, both online and in print, was obtained from the patient.

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