

# Case report: Allergic contact dermatitis and new-onset asthma

## *Chromium exposure during leather tanning*

Leonard E. Lockman, MD, MB CHB(SA), MFAMMED(SA), CCFP

**O**ccupational asthma after exposure to simple chemicals is a rapidly growing phenomenon. Chromium, a potent sensitizer used in tanning, metal plating, and making cement, is a common contact allergen. The relationship between contact dermatitis and asthma as well as the pathophysiologic mechanisms are not well known.<sup>1</sup>

### Case report

Mrs D.G., a 41-year-old woman, first presented to our clinic with symptoms and signs of a rash on her neck and arms. During our initial clinical encounter, there was no history of atopia or family history of asthma. She was not taking any medications, had no medical history, and had no drug allergies. She presented with a fine reddish maculopapular rash on her neck, arms, and hands. I diagnosed her with allergy, and she responded to 25 mg of antihistamine (Atarax) twice daily and 1% hydrocortisone cream to be applied three times daily.

She came to me again approximately 2 weeks later with severe itching and rash on her neck, face, and arms, which started after she had stuffed a sofa at her workplace. I suspected allergic contact dermatitis and wrote a letter to the manager advising him of my suspicions. She was removed briefly from her current site of work and taken to a different department. She returned a week later to her original work site, and the rash and itchiness returned. She responded to histamine H<sub>1</sub>-receptor antagonist (Reactine), 10mg daily, and an emollient-skin protectant (Preveg Cream). She requested a leave of absence for 3 or 4 days.

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**Dr Lockman** is a family physician at the Dakota Medical Centre in Winnipeg, Man.

*This article has been peer reviewed.*

*Cet article a fait l'objet d'une évaluation externe.*

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She returned to my office a week later. In addition to the rash and itching, she also had chest tightness and breathing difficulties at work. She was having financial problems and could not change occupations. I faxed a letter to her manager requesting she be given protective clothing while at work. With the protective clothing her skin problems subsided, but her difficulty breathing and chest tightness persisted.

While at work she developed an acute episode of chest tightness and shortness of breath and was rushed to hospital. She was examined by an emergency room physician; results of chest x-ray, electrocardiogram, and clinical examination were normal. She was diagnosed with anxiety and sent home. During the next 2 weeks her itching, chest tightness, and runny nose persisted only when at work. In frustration, she consulted me yet again. I advised her to change jobs and also referred her to an allergy specialist. Results of an allergy test were positive for potassium dichromate, a chemical used in leather tanning and dyeing.

The diagnosis of occupational asthma was in accordance with National Institute for Occupational Safety and Health (NIOSH) criteria<sup>2,3</sup>:

- asthma first appeared during exposure to a recognized etiologic agent at work, eg, chromium;
- symptoms included recurrent acute episodes of wheezing and dyspnea;
- a temporal association existed between symptoms and work; and
- there was positive response to either bronchial provocation test or skin tests for allergy toward substances encountered at work.

We did consider other tests, such as peak expiratory flow rate, forced expiratory volume in 1 second, and methacholine or bronchodilator challenge, but the patient decided to change occupations before these tests could

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be done. When the patient changed jobs, all her symptoms and signs resolved. Her employer did submit a letter to the Workers' Compensation Board for the 2 weeks the patient was off duty while recuperating and looking for a different kind of work. My report and the allergy specialist's report were submitted in due course.

**Discussion**

This case report serves to illustrate three important points for family physicians.

1. Search for a temporal relationship between exposure and disease.
2. Try to establish a definite allergen by skin testing and link it to a patient's work site.
3. A history of contact dermatitis preceding the onset of respiratory symptoms, if present, might facilitate the recognition of occupational disease; however, the association of both manifestations is not the rule.<sup>4</sup>

For this discussion, a MEDLINE search was conducted from 1989 to 2001 using the following MeSH headings: "potassium dichromate," "tanning/dyeing of leather," and "allergic rhinitis or asthma." Our literature search revealed that a few cases of allergy to chromium had been reported in tannery workers as well as from leather shoes.<sup>5</sup> A few cases of contact dermatitis with occupational asthma had been described.<sup>1</sup>

It is clear from this patient's symptoms and signs experienced only at the workplace that she developed allergic contact dermatitis with occupational asthma. She showed no symptoms when away from work. She also had a positive skin patch test to potassium dichromate. It is well-known that chromium is a potent contact allergen. It joins easily to proteins through carboxylic and amino groups and in this way can be presented as a complete antigen to lymphocytes by antigen-presenting cells. The question that emerges is whether delayed hypersensitivity is involved. Contact dermatitis to chromium appears to be a preliminary condition to the development of bronchial asthma.<sup>1</sup>

The first report of chromium-induced asthma was in 1869. Since then, there have been several reports demonstrating that bronchoconstriction can be experimentally induced either by subcutaneous injection or by aerosol inhalation.<sup>6</sup> Most patients with chromium-related asthma reported in the literature also had some type of dermal involvement, either urticaria or allergic contact dermatitis, preceding the respiratory disease.<sup>1,7</sup>

Prevalence of occupational asthma in the workplace has been reported to be as low as 0.2% and as

**Editor's key points**

- This case report demonstrates an occupational allergy to potassium dichromate, a chemical used in tanning leather.
- The allergy involved not only contact dermatitis but new-onset asthma.
- Attention to the patient's entire life situation and careful observation of the evolving allergy enabled a family doctor to have a patient removed from a toxic job site. The family physician fulfilled two roles: diagnostician and patient advocate.

**Points de repère du rédacteur**

- Cet article décrit un cas d'allergie professionnelle au dichromate de potassium, une substance chimique utilisée dans le tannage du cuir.
- Les manifestations allergiques comprenaient non seulement une dermatite de contact, mais aussi un asthme développé *de novo*.
- Parce qu'il avait tenu compte de l'ensemble des conditions de vie du patient et qu'il avait bien suivi l'évolution de l'allergie, ce médecin de famille a pu obtenir que son patient soit muté d'un poste de travail à risque de toxicité. Le médecin est donc intervenu de deux façons: en posant le diagnostic et en plaidant la cause du patient.

high as 57%, depending on the occupation and the agents implicated. Patients who attribute their symptoms to occupational exposure often change jobs, and the number of occupational asthma cases in the workplace are underestimated in cross-sectional epidemiologic studies, ie, healthy worker effect.<sup>2</sup> Several factors of this case study make it unique: how quickly the symptoms and signs developed, the direct link between environmental exposure and disease, how the symptoms became worse and involved other parts of the body (eg, the lungs) with repeated exposure, and the coexistence of two different pathologies and the asthma symptoms following skin reaction.

**Conclusion**

This case report illustrates quite clearly the dilemma family physicians face in dealing with a complex situation and in negotiating a reasonable course among patient, illness, environment, illness experience, and social context and in finding common ground among all these.

In addition, occupational medicine is not a large portion of family medicine and as such is not always high on our list of activities in continuing medical

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education. Good history taking and common sense should alert family doctors to the possibility of occupational illness. ❁

### Competing interests

None declared

*Correspondence to: Dr Leonard E. Lockman,  
57 Litchfield Blvd, Winnipeg, MB R3P 2J4*

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