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CHROMIUM DERMATITIS AMONG WORKERS IN THE TANNING INDUSTRY IN BAGHDAD

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Key words: Chromium, Contact dermatitis, tanning industry.

الخلاصة:

اجرى فحص الحساسية التلامسية على ٥٢ عاملا في معمل الدباغة في بغداد ووجد ان ١٧ منهم اظهروا حساسية تلامسية موجبة لشانتي درومات البوتاسيوم بينما الفحص السريري والبيانات المسجلة في البطاقة الصحية تدل على ان عدد العمال المشخصين باصابتهم بالتهاب الادمية هو ٢٩ عاملا. هذه النتائج تدل على ان العمال المشتغلين في المعمل معرضين بصورة عالية للاصابة بحساسية الكروم وان فحص الحساسية التلامسية يجب ان يتم على العمال للتفريق بين هذا النوع من الحساسية والتهاب الادمية التي قد تحدثه بعض المواد المخدشة، كما يفيد البحث لاتخاذ الاجراءات اللازمة لمنع حدوث حساسية التلامس لمادة الكروم في المستقبل.

SUMMARY:

A patch test study was performed on 52 male workers of a tanning industry. Seventeen of the 29 workers who gave a history of dermatitis showed a positive skin reaction to potassium dichromate. This indicates that the workers are at high risk to develop chromium sensitivity and that patch testing should be done to differentiate between allergic and irritant dermatitis.

INTRODUCTION:

The tanning industry in Baghdad was established in 1945, yet no patch testing study was performed on the workers in different departments of the industry, to investigate the exact cause of the reported dermatitis in these workers.

Basic chromium sulphate is used in the tanning process together with other chemicals (acids, alkali, enzymes ... etc.) to complete the tanning effect on the leather. The role of chromium in dermatitis and its ability to induce a hypersensitivity reaction is extensively documented⁽¹⁻⁵⁾. The other chemicals used might have an irritant effect⁽³⁾. Therefore, we found it necessary to perform a patch testing study on all the workers in the industry who are exposed to chromium in an attempt to see the prevalence of chromium dermatitis and to differentiate between the cases of primary irritation and those of sensitization. This can also be used as a one stage screening test at the primary level of prevention in the future.

WORKERS AND METHODS:

Workers of the tanning industry: All workers of the chromium tanning department, prepainting and painting departments (except a few who were on leave etc.) were patch tested. Fifty two male workers were thus included in this investigation. They ranged in age from 22 to 59 years (mean 39.9 years).

Control workers: Twenty seven male workers who were not exposed to chemicals were included. Their ages ranged from 22 to 55 years (mean 39.8 years).

Patch Testing: The Al-test patches, free from sensitizers, were used (mecob Sodertälje, Sweden). The test concentration for potassium dichromate ($K_2Cr_2O_7$) was 0.5% in petrolatum. The test concentrations for other patch test materials that were available were 1% of Ethylenediamine Dihydrochloride, Epoxy Resin and Paraphenylenediamine, and 2.5% for Nickel sulphate, all compounds in petrolatum. A small amount of each of the test substances was applied on the filter paper discs and placed against the skin of the back by means of plaster. The test strips were removed after 48 hours, 24 hours prior to reading. A second reading was done at 5 days and a third reading at 7 days. The test reactions were graded as follows:

- + redness, palpable oedema
- ++ redness, oedema, papules
- +++ redness, oedema, papules, vesicles.

A ++ (or more) reaction was considered as positive. None of the workers had had active eczema for at least two weeks prior to testing.

RESULTS:

Twenty nine (55.8%) workers had a history of dermatitis but only 17 (58.6%) of those affected workers showed a positive patch test reaction to potassium dichromate (Table 1). The dermatitis involved mainly the hands, forearms and feet. Three of the latter 17 workers had a positive patch test reaction to nickel sulphate in addition. One worker in the chromium tanning department showed a positive reaction to paraphenylenediamine and to potassium dichromate while one worker in the painting department reacted only to paraphenylenediamine. None of the workers showed a positive reaction to the other available patch test materials. Skin test reactions of all the control (non-exposed) workers as well as exposed without a history of dermatitis, were all negative (Table 1).

DISCUSSION:

The leather is subjected to several procedures during the tanning process. In the chromium tanning department, chromium basic sulphate is added to rotating drums which contain the hides and kept overnight. Fifteen workers (46.9%)

Table 1: Skin reactivity to patch testing with 0.5% potassium dichromate in 52 exposed workers of tanning industry and of 27 control (non-exposed) workers

Department	Workers No.	Working period mean $\pm$ SE (range) years	workers with a history of Dermatitis		workers with a positive Patch Test	
			No.	%	No.	%
Chromium tanning	32	8.6 $\pm$ 1.5 (1-28)	15	46.9	10	31.3
Pre-painting	9	14.5 $\pm$ 6 (2-29)	6	66.7	5	55.6
Painting	11	7.1 $\pm$ 2.5 (1-28)	8	72.7	2	18.2
Total	52	10.0 $\pm$ (1-29)	29	55.8	17	32.7
Control	27	14.5 $\pm$ 3 (2-30)	0	0	0	0

of this department gave a history of dermatitis while only 10 of these workers (31.3%) were patch test positive to potassium dichromate. The dermatitis in the five workers with a negative skin reaction could have been due to the irritant effect of acids (formic and sulphuric acids) which are added to the leather during the picking process. However, the dermatitis could have also been due to sensitizers other than those available in our patch test material. In the prepainting department the procedures include pressing, spitting and shaving of the tanned skin to get rid of the excess unbound chromium and to get a uniform thickness. Such a process allows more contact of the workers with chromium. Thus of the six workers (66.7%) who gave a history of dermatitis, five (55.6%) showed a positive patch test reaction to potassium dichromate. It can be noted here that there is more correlation between dermatitis and skin testing since no irritants were used in this department. In the painting department, the tanned prepared leather is subjected to synthetic dyes (pigments, analine, and urethane) to give it its final color. Only two (18.2%) of the 11 workers showed a positive skin reaction to potassium dichromate which might indicate a lower exposure of the workers to chromium. On the other hand eight of the workers (72.7%) gave a history of dermatitis which again could have been due to an irritant effect or due to sensitivity to other substances. One of these workers had a positive skin reaction to paraphenylenediamine. Thus 17 (32.6%) of the 52 workers of the tanning industry have developed allergic contact dermatitis to chromium compounds. This is a high prevalence and precautions should be taken to minimize exposure of the workers to chromium. However, the reported dermatitis is much higher than this figure (29 out of 52 workers, 55.3%). Therefore, patch testing should be performed to verify the cause of dermatitis⁽⁶⁾. The Lymphocyte transformation test could have been of great help to further confirm the results⁽⁷⁾ but it was not performed due to lack of some materials. The results of this study further prove that trivalent chromium compounds can sensitize and induce dermatitis⁽⁸⁻¹²⁾.

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