

Brief Note

Induction of Contact Sensitivity to Chromium Compounds in Guinea Pigs

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Key words : potassium dichromate — chromium chloride — contact sensitivity — chromium sensitivity

The chromium dermatitis is one of the most important occupational dermatoses and is becoming more widespread with the increasing use of chromium in different industries. It is known that cement dermatitis is also due to a hypersensitivity to chromium compounds, which can be traced in various types of cements. In the present experiment, we attempted to produce contact sensitivity to chromium compounds in guinea pigs in order to clarify the mechanism of the dermatitis.

Inbred strains 13, 2 and JY-1 guinea pigs, weighing from 400 to 500 g, each received 2 mg potassium dichromate ($K_2Cr_2O_7$) in 0.2 ml Freund's complete adjuvant intramuscularly into the thighs and the neck.¹⁾ Two weeks later, all animals were given epicutaneously with 0.02 ml of a 1% $K_2Cr_2O_7$ solution in 1% Triton x-100 to the flank. The epicutaneous application was then repeated weekly. Application of 0.01 ml of 0.5 and 1% solutions of $K_2Cr_2O_7$ and chromium chloride ($CrCl_3$) in 1% Triton x-100 were given to the shaved back skin by spreading with a glass rod across a circular area 1 cm in diameter 6 weeks after the sensitization by injection of $K_2Cr_2O_7$. The contact reactions were read 1, 2, 3 and 5 days after challenge. Contact reaction was graded on an arbitrary scale as follows: 0.5, isolated red spots; 1, diffuse slight redness; 2, marked redness and slight swelling; 3, deep redness and considerable swelling. The degree of contact sensitivity to $K_2Cr_2O_7$ was taken to be the total of two readings in each animal. Student's t-test was used to assess differences in reactivity; P value of less than 0.05 was considered significant.

TABLE. Induction of contact sensitivity to chromium compounds with $K_2Cr_2O_7$ in guinea pigs

Guinea pigs	Contact reaction to					
	$K_2Cr_2O_7$			$CrCl_3$		
	Positive		Score	Positive		Score
1%	0.5%	1%		0.5%		
JY-1	3/6	3/6	0.9 ± 0.4	0/6	0/6	0
Strain 13	3/5	2/5	0.9 ± 0.4	0/5	0/5	0
Strain 2	4/6	4/6	1.3 ± 0.4	0/6	0/6	0
Normal controls						
JY-1	1/6	0/6	0.2 ± 0.2	0/6	0/6	0

The guinea pigs sensitized with $K_2Cr_2O_7$ were tested by epicutaneous application of $K_2Cr_2O_7$ and $CrCl_3$ 6 weeks after the initial sensitization. Positive contact reaction was detected in at least 50% of animals in each strain to $K_2Cr_2O_7$, but not to $CrCl_3$ (Table). Evidences against these results have been reported by Polak *et al.*¹⁾ It was shown by them that of strain 2, 80% became sensitized to $K_2Cr_2O_7$ but none of strain 13 to the compound. Furthermore, they reported that a half of the guinea pigs sensitized with $K_2Cr_2O_7$ also induced a positive contact reaction to $CrCl_3$. From the cross-reaction with $K_2Cr_2O_7$ and $CrCl_3$, the hypothesis that the hexavalent chromium is reduced to trivalent in the skin was proposed. Further studies should be done in this experimental area.

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