

Detergents and bleaches are sources of chromium contact dermatitis in Israel

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Total chromium levels were determined in 38 detergents and 12 bleaches on the market in Israel (45 locally produced, 5 imported). The samples were analyzed by Zeeman-corrected graphite furnace atomic absorption spectrophotometry. Chromium levels were higher than 5 ppm in 28 (56%) of the 50 products, from 1 to 5 ppm in 16 (32%), and lower than 1 ppm in only 6 (12%). Among the 5 imported products, only 1 had a chromium level below 1 ppm and the other 4 (1 from Germany, 3 from the USA) had high levels. Since almost 90% of the detergents and bleaches examined contained chromium levels higher than 1 ppm, it is concluded that these consumer products may be the cause of the high incidence of chromium sensitivity in Israel.

Key words: chromium sensitivity in Israel; chromium in detergents and bleaches; allergic contact dermatitis. © Munksgaard, 1998.

Accepted for publication 10 October 1997

In Israel, potassium dichromate is one of the most common, if not the most common, positive allergen on routine patch tests (1). This is especially true for housewives with hand eczema (2). The reason for this may lie in the prolonged exposure to the sun incurred by most of the population in Israel which has a hot, sunny climate for at least 8 months of the year: Wahlberg & Wenersten (3) clearly demonstrated a relationship between sun exposure and chromium sensitivity. On the other hand, since chromium sensitivity is very prevalent among housewives in particular, we hypothesized that the cause of the problem might lie in high levels of chromium in the detergents and bleaches marketed in this country. The present study was undertaken to test this assumption.

Materials and Methods

To maintain optimal objectivity, and in light of problems of sensitivity in the instrumental determination of chromium levels, all samples collected for study were sent to the Department of General Chemistry of the Royal School of Pharmacy, Copenhagen, Denmark, for analysis during the years

1993–1994. Using the single-blind method, we collected 38 detergents and 12 bleaches in popular use in Israel, of which 45 were domestic and 5 imported products. A 40 mg (or ml) sample of each product was sent by post in a sealed plastic bottle for chromium determination. Each sample was labelled by a running number, from 1 to 50, so that the tester (BG) would remain blind to the particular product being analyzed.

Table 1. Temperature program for chromium determinations

step	1	2	3	4	5	6
temp °C	120	500	1200	2300	2700	20
ramp S	10	10	10	0	1	5
hold S	30	10	30	4	2	15
read				–1		
record				–5		
int. flow				0		

Wavelength: 357.9 nm.	Graphite tube: procoated.
Lamp current: 15 mA.	Sample size: 20 µl.
Slit width: 0.7 LOW.	Detection: area.
Background correction: Zeeman.	Integration time: 4 s.
Apparatus: Perkin-Elmer Zeeman 5000 atomic absorption spectrophotometer. Perkin-Elmer HGA 500 programmer. Perkin-Elmer AS-40 autosampler. Perkin-Elmer R100A recorder.	

Analytical Method

All samples were analyzed by Zeeman-corrected graphite furnace atomic absorption spectrophotometry. The samples were diluted with or dissolved in ultrapure water (Millipore Corporation, USA) to appropriate concentrations. Standards were prepared by dilution of a Titrisol standard solution containing 1000 g Cr/l (Merck, Germany). Each sample was quantified by means of 2 standard additions (analyses were accepted only if the corre-

lation coefficient of the standard addition exceeded 0.9995). The detection limit, determined as the blank value+3 standard deviations ($n=30$), was $0.3 \mu\text{g/l}$. The accuracy of the method was validated by analysis of the standard reference material, NIST SRM 2670 freeze-dried urine. The result was $0.084 \mu\text{g/l} \pm 0.001 \mu\text{g/l}$ ($n=3$) (certified value $0.085 \mu\text{g/l} \pm 0.006 \mu\text{g/l}$). Precision corresponds to 1%. *Contamination control:* Before use, all utensils, containers, pipette tips, etc., were soaked in 4 M nitric acid for 1 week, followed by thor-

Table 2. Concentration of chromium in detergents and bleaches: levels higher than 5 ppm

Commercial name	Producer	Type	Cr concentration (ppm)
1. Plasiv	Nesher-domestic	detergent	128
2. Phenomen	Dalia-domestic	detergent	67
3. Kleen	Victo-domestic	detergent (dish washing liquid)	96
4. Sano	Sano-domestic	detergent (cleaning liquid)	43
5. Compact soft	Shemen-domestic		41
6. Sano shtichim	Sano-domestic	detergent	29
7. Fantastik	Kedem-domestic	detergent (spray & wash)	44
8. Vaxolit	Chimgat-domestic	detergent	9.2
9. Persil	Henkel-Germany	detergent	29
10. Trakleen	Victo-domestic	detergent	7.3
11. Kleenolin	Victo-domestic	detergent	52
12. Fantastik	Kedem-domestic	detergent (floor shampoo)	33
13. Formula super	Pisga-domestic	detergent	68
14. Ajax	Colgate, Palmolive-USA	detergent (laundry powder)	45
15. Oscar	Easy-domestic	detergent	83
16. Palmolive	Colgate, Palmolive-USA	detergent (dish washing liquid)	546
17. Sano polywix	Sano-domestic	detergent	12.9
18. Super 7	Neca-domestic	detergent	20
19. Fantastik	Kedem-domestic	detergent (super concentration)	27
20. Ritzpaz	Paschim-domestic	detergent	21
21. Fantastik	Kedem-domestic	detergent (bathroom cleanser)	23
22. Sano Bon	Sano-domestic	detergent	12.9
23. Kleen	Victo-domestic	detergent	73
24. Easy	Easy-domestic	detergent (spray)	35
25. Textile shampoo	Neca-domestic	bleach	13.1
26. Loven-Kleen	Victo-domestic	bleach	17.5
27. Easy	Easy-domestic	bleach	31
28. Sisi	Adria-domestic	bleach	8.4

Table 3. Concentration of chromium in detergents and bleaches: levels between 1–5 ppm

Commercial name	Producer	Type	Cr concentration (ppm)
1. Kleenpaste	Victo-domestic	detergent	2.1
2. Steps	Pisga-domestic	detergent (floor cleanser)	1.5
3. Sano	Sano-domestic	detergent (lemon scented)	2.0
4. Neca-Lee	Neca-domestic	detergent	4.9
5. Phenomen	Dalia-domestic	detergent (window cleanser)	3.8
6. Al-Ovesh	Kedem-domestic	detergent	3.1
7. Pisga-Ktifa	Dalia-domestic	detergent	3.2
8. Pisga	Pisga-domestic	detergent (floor wash)	3.1
9. Fantastik	Kedem-domestic	detergent (window cleanser)	2.9
10. Ram-Special	Sano-domestic	detergent	2.4
11. Compact-Sud	Shemen-domestic	bleach	2.1
12. Baby-Pisga	Pisga-domestic	bleach (baby skin care)	2.0
13. Tinokleen	Victo-domestic	bleach (babies, items)	2.2
14. Compact-Tiv	Victo-domestic	bleach	4.0
15. Pisga-Micro 2001	Dalia-domestic	bleach	2.6
16. Soflin	Colgate Palmolive-USA	bleach (flower scented)	4.4

Table 4. Concentrations of chromium in detergents and bleaches: levels lower than 1 ppm

Commercial name	Producer	Type	Cr concentration (ppm)
1. Sanoclear	Sano-domestic	detergent	0
2. Kleen-gel	Victo-domestic	detergent	0.4
3. Sintabon	Neca-domestic	detergent	0.6
4. Badin	Victo-domestic	detergent	0.6
5. Ultratide	Procter and Gamble-USA	bleach	0.6
6. Kleen	Victo-domestic	bleach (laundry powder)	0.8

ough rinsing in ultrapure water. For the temperature program for chromium determination, see Table 1.

Results

The results are presented in Tables 2–4. For accuracy (see *Discussion*) we classified the products into 3 groups: group 1 (Table 2), those with chromium levels higher than 5 ppm; group 2 (Table 3), those with chromium levels between 1 to 5 ppm; group 3 (Table 4), those with chromium levels lower than 1 ppm.

Group 1: 28 consumer products (56% of total products): 24 detergents (63% of total detergents) and 4 bleaches (33% of total bleaches).

Group 2: 16 consumer products (32% of total products): 10 detergents (26% of total detergents) and 6 bleaches (50% of total bleaches).

Group 3: 6 consumer products (12% of total products): 4 detergents (10.5% of total detergents) and 2 bleaches (16.6% of total bleaches).

Discussion

Feuerman (2) in the early 70s found that a high proportion (91.6%) of a group of Israeli housewives with eczema, patch-tested positively to potassium dichromate. Recently, potassium dichromate was reported to be one of the most common allergens. This high frequency has rarely been reported by others (4). In a study of chromium concentration in Swedish detergents, Wahlberg (5) found that this was low, usually less than 1 $\mu\text{g/g}$ and in no case exceeding 4 $\mu\text{g/g}$. The recently published Technical Report no. 45 of the European Chemical Industry Ecology and Toxicology Centre (ECETOC) (6) indicated a clear decrease in the incidence of allergic sensitivity to chromate over the past 2 decades. This report stated “there is no evidence that detergents used in Israel have a higher chromate content than those used elsewhere”, and further noted that in most European countries and in North America, only trace levels of chromate can be found in detergents and bleaches. The ECETOC and others (7) recommended that chromium concentrations in consumer products be lower

than 5 ppm, with manufacturers aiming for a concentration of no more than 1 ppm.

In view of the above, the results of the present study are surprising. The chromium concentration was above 5 ppm in 56% of the consumer products tested (63% of the detergents and 33% of the bleaches); in 32%, there were concentrations between 1 to 5 ppm, and in only 12% were concentrations less than 1 ppm. Of the 5 imported consumer products (1 from Germany, 4 from the USA), only 1 had a chromium concentration of less than 1 ppm, whereas 3 (Persil from Germany, Ajax and Palmolive from the USA) had very high concentrations (29, 45 and 546 ppm respectively). We also found that the active ingredients were indicated on the package of only 16 of the 45 domestic products and only 2 of the 5 imported products. The list of ingredients was often incomplete and/or unclear. On 13 products, the manufacturer stated that the product is “safe” or “hand protecting” even though in 10 of these (77%) the chromium concentration was very high (546 ppm in one case). In only 1 of these products was the concentration less than 1 ppm.

Conclusions

The high chromium levels found in 90% of the detergents and bleaches marketed in Israel may be the cause of the high incidence of chromium-sensitive contact dermatitis among Israeli women. Since high levels were also noted in 4 of 5 imported products, high chromium levels in detergents and bleaches may also be causing contact dermatitis in Europe and North America. The labelling of the consumer products with regard to active ingredients was insufficient in most cases.

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