

Has European Union legislation to reduce exposure to chromate in cement been effective in reducing the incidence of allergic contact dermatitis attributed to chromate in the UK?

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Accepted 12 July 2011

ABSTRACT

Objective Hexavalent chromate (chromate) in cement is a well-recognised cause of allergic contact dermatitis (ACD). Consequently in January 2005, following European Union legislation (EU Directive 2003/53/EC), the use or supply of cement containing >2 ppm of chromate was prohibited in the UK (COSHH 2004). This analysis of work-related ill-health surveillance aims to evaluate the effectiveness of this legislation.

Method Changes in the incidence of work-related ACD cases returned to The Health and Occupation Reporting network by dermatologists were analysed taking in to account attribution to chromate and occupation.

Results There was a significant decline in the incidence of both ACD attributed to chromate (incidence rate ratio 0.48, 95% CI 0.36 to 0.64) and ACD not-attributed to chromate (0.76, 95% CI 0.69 to 0.85) between the time period preceding the EU legislation (2002–2004) and the postlegislation period (2005–2009). However, the decline in ACD attributed to chromate was significantly greater ($p=0.006$). This decline was further increased in workers potentially exposed to cement (incidence rate ratio 0.37, $p=0.001$). The majority of the decline in incidence occurred during 2005.

Conclusion The timing of this significant decline in the UK incidence of chromate attributed ACD, and the greater decline in workers potentially exposed to cement strongly suggests that the EU Directive 2003/53/EC was successful in reducing exposure to chromate in cement in the UK.

INTRODUCTION

Since 1950, hexavalent chromate ions (chromate) in cement have been a recognised common cause of allergic contact dermatitis (ACD).¹ The addition of ferrous sulphate to cement to reduce the level below 2 ppm became compulsory in Denmark in 1983 and was followed by a significant reduction in cases of ACD and chromate sensitisation in workers exposed to cement between 1981 and 1987.² Finland introduced similar legislation in 1987, and again a decrease in the prevalence of chromate attributed ACD (CrACD) was observed.³ Surveillance of workers employed in the construction of the channel tunnel between England and France during 1990–1992 found a high prevalence of ACD and chromate sensitisation prompting the authors to call for the rest of Europe to follow the Scandinavian lead.⁴ A further prompt for

What this paper adds

- Legislation within individual European Union countries to reduce the incidence of allergic contact dermatitis attributed to hexavalent chromate in cement has been effective (Scandinavia, Austria and Germany) but has not been evaluated in the UK.
- A significant and sustained reduction in the incidence of work-related allergic contact dermatitis attributed to chromate occurred in the UK subsequent to the implementation of the EU Directive 2003/53/EC, suggesting that this had been effective.
- Effective implementation of Health and Safety legislation within the construction industry is challenging and the success of EU Directive 2003/53/EC in the UK may reflect the targeting of the supply chain as well as the cement user.
- The THOR (EPIDERM) reporting scheme is useful to evaluate the health impact of changes in legislation and policy related to health and safety.

adding ferrous sulphate to cement came following the publication of German and Austrian data from 1992 to 2000 showing a high prevalence of CrACD in construction workers and from 2000 onwards manually produced cement in Germany was chromate reduced.⁵ Finally on 17 January 2005, European Union legislation (EU Directive 2003/53/EC) restricting the marketing and use of cement containing >2 ppm of chromate came into effect.⁶ The UK Health and Safety Executive implemented the EU Directive through the Control of Substances Hazardous to Health (Amendment) Regulations 2004 (COSHH 2004) on the 17 January 2005.⁷ Analysis of subsequent German surveillance data (1994–2008) found a decreasing trend in chromate sensitisation consistent with these interventions and a significant reduction in sensitisation in workers first exposed to chromate post-1999, leading the authors to conclude that these interventions had been effective in Germany.⁸

The Health and Occupation reporting network (THOR) is a UK surveillance scheme that collects reports of medically certified work-related ill health. Dermatologists return reports of new cases of

Short report

work-related skin disease seen in their practice.⁹ The aim of this paper is to analyse changes in the incidence of work-related CrACD to evaluate the effectiveness of the EU Directive 2003/53/EC in the UK.

METHODS

Incident cases of work-related ACD seen by dermatologists in their practice and reported to THOR (EPIDERM) during the period 2002–2009 inclusive were analysed.⁹ Dermatologists also provided information on the occupation and listed the suspected causal agents, including chromates, identified by patch testing (European Standard Series). Some dermatologists were asked to report each month (core reporters) and others during a randomly allocated month each year (sample reporters). Not all reporters specified the source of the chromate exposure, and therefore, we selected three groups of workers for analysis as follows:

1. All workers with ACD attributed to chromate exposure.
2. Workers with ACD attributed to chromate exposure in the following occupations (SOC2000): bricklayers and masons, roofers, roof tilers and slaters, carpenters and joiners, construction trades not elsewhere classified, plasterers, floorers and wall tilers, scaffolders, staggers and riggers, road construction operatives, construction operatives not elsewhere classified, labourers building and woodworking trades, labourers other construction trades not elsewhere classified.
3. Workers in the occupations selected for group 2 with ACD NOT attributed to chromate.

Group 1 provided an objective measure of ACD attributed to chromate (European Standard series patch test) but no information about the source of the chromate was included. Group 2 were occupations chosen to represent trades likely to be using cement. This increased the likelihood that the source of the chromate exposure was cement, and group 3 was included to investigate whether trends in ACD within the selected occupations might be due to other factors rather than changes in chromate exposure.

The time before the EU directive became law in the UK (2002–2004) was taken as the reference time period and compared with the time period after the implementation of the directive (2005–2009). Incidence rate ratios reflecting changes in the incidence of ACD relative to the reference period per reporter (including zero reports) were estimated using the xtnbreg command in intercooled STATA V.8. The model was a longitudinal negative binomial (ie, over-dispersed) Poisson regression

model with random effects, which also controlled for calendar time, reporter type (core or sample) and first month as a new reporter as described previously.¹⁰ Formal tests of whether there were differences in the incidence rate ratios for ACD between each group (as defined above) and all other occupational groups and/or suspected agents (all other ACD) were conducted by inclusion of interaction terms in the statistical models. Put more succinctly the overall change in incidence of ACD was dichotomised according to inclusion or exclusion in each of the above groups and formally tested for differences (p value). Multicentre Research Ethics Committee approval (02/8/72) has been given for THOR.

RESULTS

Between 2002 and 2009, 174 dermatologists returned 8298 actual reports of work-related skin disease of which 2444 were ACD and 238 were CrACD (group 1). A further 1091 cases were mixed allergic and irritant contact dermatitis of which 72 were attributed to chromate. Only cases with ACD as the sole diagnosis were used for analysis. There was a significant decline in the incidence of both chromate and non-chromate attributed ACD during 2005–2009 relative to the reference time period of 2002–2004 (table 1, group 1), but the decline was significantly greater for CrACD. Similar observations were made for CrACD in the group of workers exposed to cement but the difference was larger (table 1, group 2). The corresponding estimated annual change in incidence for the selected group of workers exposed to cement (group 2) is shown in figure 1. There was a marked decline in incidence during 2005 for CrACD, and the overall declining trend for CrACD is significantly steeper than for all other ACD ($p=0.002$).

The decline in incidence of ACD attributed to agents other than chromate in the group of workers exposed to cement did not differ significantly to all other ACD (table 1, group 3). The most frequently reported causal agents in group 3 were preservatives, latex gloves, wood and wood dust, colophony and flux, epoxy resins, and hardeners and phenol formaldehyde resin (in total representing approximately 70% of the causal agents after excluding chromate).

DISCUSSION

Evidence of the effectiveness of EU Directive 2003/53/EC in reducing the incidence of CrACD is provided on several levels. First, the significant decline in incidence of CrACD since 2005 (table 1, group 1) is consistent with the timing of the EU

Table 1 Estimated changes in the incidence of allergic contact dermatitis (ACD) since the implementation of EU Directive 2003/53/EC (January 2005)

Group*	Number of actual reports	Incidence rate ratio (2005–2009:2002–2004) (95% CI)	p Value†
1. ACD attributed to chromate	238	0.48 (0.36 to 0.64)	0.006
All other ACD	2206	0.76 (0.69 to 0.85)	
2. ACD attributed to chromate in 'cement workers'	95	0.37 (0.24 to 0.57)	0.001
All other ACD	2348	0.75 (0.68 to 0.83)	
3. ACD NOT attributed to chromate in 'cement workers'	82	0.70 (0.44 to 1.11)	0.57
All other ACD	2362	0.73 (0.66 to 0.80)	

*Groups are defined by chromate attributed ACD and occupation. 'Cement workers' includes bricklayers and masons, roofers, roof tilers and slaters, carpenters and joiners, construction trades not elsewhere classified, plasterers, floorers and wall tilers, scaffolders, staggers and riggers, road construction operatives, construction operatives not elsewhere classified, labourers building and woodworking trades, labourers other construction trades not elsewhere classified.

†Formal test of difference in the incidence rate ratio between ACD in each group and all other ACD.

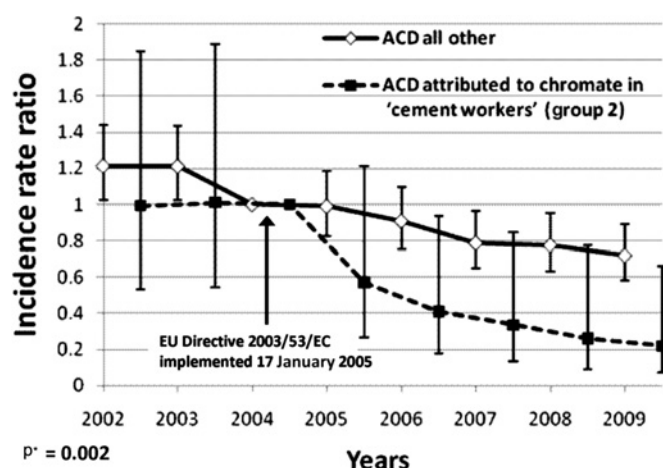


Figure 1 Estimated annual change in incidence relative to 2005 of chromate attributed allergic contact dermatitis (ACD) in workers exposed to cement (group 2) and all other ACD. *Statistical test for difference in the overall annual trend for ACD between workers exposed to cement (group 2) and all other ACD.

directive implemented in 2005. Second, the decline in incidence was greater in workers employed in occupations with potential for exposure to cement (table 1, group 2), and third, the majority of the decline in incidence of CrACD occurred during 2005, immediately following implementation of the EU directive (figure 1). This same group of workers showed no significant change in the incidence of ACD attributed to other causal agents (ie, not chromate; table 1, group 3), suggesting that the decline in incidence in CrACD is not part of a wider declining trend in ACD in these occupations with potential exposure to cement.

These UK data mirror Scandinavian, German and Austrian data that show decreasing trends consistent with legislation to reduce chromate levels in cement enacted within these countries prior to the EU directive.^{2 3 7} However, we believe that this is one of the first reports specifically evaluating the impact of EU Directive 2003/53/EC on the incidence of CrACD in a European Union Member State without pre-existing legislation to reduce exposure to chromate in cement. Implementation of health and safety legislation in the construction industry is challenging, and

the success of EU Directive 2003/53/EC may be due to the targeting of the supply chain as well as the cement user.¹¹

Acknowledgements Thanks are due to all physicians reporting to THOR.

Funding The Health and Occupation reporting network is partly funded by the UK Health and Safety Executive, but the opinions expressed here are solely those of the authors.

Competing interests None.

Ethics approval Multicentre Research Ethics Committee approval (02/8/72).

Contributors SJS analysed the data and wrote the manuscript; MC managed the data collection; RM provided statistical advice; ST advised on the manuscript; RMA advised on the manuscript.

Provenance and peer review Not commissioned; internally peer reviewed.

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Occup Environ Med published online August 17, 2011
doi: 10.1136/oemed-2011-100220

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