Subclinical impairment of colour vision among workers exposed to styrene

Sir,—Does chronic exposure to styrene impair colour vision? Fallas *et al* (1992;49:679–82) found subclinical impairment of colour vision among workers exposed to styrene applying the Farnsworth 100 hue test during working hours in daylight. In daylight, however, neither colour temperature nor illumination are constant and good results depend on the use of standard lighting conditions,² for instance standard illuminant C or D₆₅.³

The authors do not state if those wearing glasses used their own. In our experience most glasses are coloured at least slightly and it is imperative that colour testing should not be performed on subjects wearing coloured glasses or coloured contact lenses.⁴ In such cases we use clear glasses with different refraction taking into account the fact that we cannot correct astigmatism.

The Farnsworth 100 hue test was designed to test hue discrimination among subjects with normal colour vision and to evaluate chromatic discrimination loss in those with congenital defects of colour vision.³ Subsequently it was applied to test acquired defects. The prevalence of congenital dyschromatopsia is about 8% among men.⁵ Fallas *et al* apparently did not distinguish between those with congenital and acquired colour vision defects when calculating the error scores and the ranges. We guess that the results are influenced by congenital defects in colour vision. Furthermore the term "range" was not defined by the authors.

Acquired dyschromatopsias can be caused by many systemic and ocular diseases. Therefore a complete ophthalmological examination is desirable, but probably not feasible in many epidemiological studies. For screening at least the visus should be examined, however. The mean of the error score of the controls given by the authors is high compared with data published by others^{5,6}; we think that this discrepancy could be caused by extraprofessional and by congenital dyschromatopsias.

The subjects were examined during the shift so that they were actually exposed to styrene before testing. Ethanol, another organic solvent, is

known to cause an acute and transient impairment of colour vision.^{7,8} To our knowledge, comparable studies on the effect of styrene have not been published. It is an obvious supposition that styrene can cause an acute and transient impairment of colour vision, too, if there are effects caused by a chronic exposure.⁹ If the colour vision is examined during a shift, it is impossible to differentiate between acute and chronic effects.

In conclusion we think that the paper does not give any evidence of an impairment of colour vision caused by styrene.

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- 1 Fallas C, Fallas J, Maslard P, Dally S. Subclinical impairment of colour vision among workers exposed to styrene. *Br J Ind Med* 1992;49: 679–82.
- 2 Birch J. A practical guide for colour-vision examination: report of the standardization committee of the international research group on colour vision deficiencies. *Ophthalm Physiol Opt* 1985;5:265–85.
- 3 Birch J, Chisholm IA, Kinnear P, Pinckers AJLG, Pokorny J, Smith VC, Verriest G. Clinical testing methods. In: Pokorny J, Smith VC, Verriest G, Pinckers AJLG, eds. *Congenital and acquired color vision defects*. New York: Grune and Stratton, 1979:83–135.
- 4 Pinckers AJLG, Pokorny J, Smith VC, Verriest G. Classification of abnormal color vision. In: Pokorny J, Smith VC, Verriest G, Pinckers AJLG, eds. *Congenital and acquired color vision defects*. New York: Grune and Stratton, 1979:71–82.
- 5 Marré M, Marré E. *Erworbene Störungen des Farbensehens*. Leipzig: Georg Thieme, 1986.
- 6 Lanthony P. Evaluation due Panel D-15 désaturé. *J Fr Ophthalmol* 1987; 10:579–85.
- 7 Russell RM, Carney EA, Feiock K, Garrett M, Karwowski P. Acute ethanol administration causes transient impairment of blue-yellow color vision. *Alcoholism: Clinical and Experimental Research* 1980;4:396–9.
- 8 Zrenner E, Riedel KG, Adamczyk R, Gilg T, Liebhardt E. Effects of ethyl alcohol on the electrooculogram and color vision. *Documenta Ophthalmologica* 1986;63:305–12.
- 9 Gobba F, Galassi C, Imbriani M, Ghittori S, Candela S, Cavalleri A. Acquired dyschromatopsia among styrene-exposed workers. *J Occup Med* 1991;7:761–5.

Authors' reply

We are not the first to find evidence of impairment of colour vision in workers exposed to styrene. A short time previously, Gobba *et al*¹ independently published similar findings. Mergler *et al*² had observed evidence of colour vision impairment in workers exposed to mixtures of organic solvents. Perhaps this vision defect can occur with exposure to various solvents.

Our study, like others, cannot distinguish between long lasting and transient effects of exposure to styrene. In our paper we present no hypothesis in this respect. What is suggested is a subclinical impairment of colour vision in workers exposed to styrene and that alone.

Acquired dyschromatopsia is difficult to distinguish from congenital dyschromatopsia but it is hard to understand why workers exposed to styrene should be more often affected by congenital defects than those of a control population living in the same area and matched for age, sex and ethnic origin. In our trials each subject was examined every year by an occupational physician who was familiar with their medical history. In both the exposed and the control groups we have been able to discard people affected by other causes of impairment of colour vision such as alcoholism or diabetes mellitus.

In our study, psychometric examinations were carried out during the shift. Examinations of colour vision were performed independently, also during working hours, because the procedure in each case was too long for a single session. We apologise for using the word "daylight" which could be confusing. The Farnsworth-Munsell procedural guidelines indicate that "sunlight" is irrelevant and that "daylight" together with fluorescent lighting is more appropriate. We have therefore applied the Farnsworth-Munsell procedure. "Range" refers to circumferential errors. Finally, we had no subjects in our sample populations who wore either coloured glasses or coloured contact lenses.

- 1 Gobba F, Galassi C, Imbriani M, Ghittori S, Candela S, Cavalleri A. Acquired Dyschromatopsia among Styrene-exposed workers. *J Occup Med* 1991;33:761–5.