*Mutation Research*, 98 (1982) 101–248
Elsevier Biomedical Press



# A review of the genotoxicity of food, drug and cosmetic colours and other azo, triphenylmethane and xanthene dyes

R.D. Combes and R.B. Haveland-Smith [1]

*Dept. Biological Sciences, Portsmouth Polytechnic, King Henry I Street, Portsmouth, PO1 2DY, Hants, and* [1] *Dept. Hotel and Catering, Highbury College of Technology, Cosham, Portsmouth, PO6 2SA (Great Britain)*

(Received 21 May 1981)
(Revision received 23 October 1981)
(Accepted 23 October 1981)

## Contents



*Abbreviations*: AB, 4-aminoazobenzene; A.D.I., acceptable daily intake; CHO, Chinese hamster ovary; DAB, *N,N'*-dimethyl-4-aminoazobenzene; EEC, European Economic Community; FAO, Food and Agricultural Organization; MAB, *N*-methyl-4-amino-azobenzene; MAFF, Ministry of Agriculture, Food and Fisheries (U.K.); NEL, no effect level; WHO, World Health Organization.

0165-1110/82/0000–0000/$02.75 

## Summary

The genetic toxicology of the major dyestuffs used in foods, drugs and cosmetics has been reviewed. Published data for azo, triphenylmethane and xanthene dyes from short-term assays for muta-carcinogenicity have been summarized and discussed according to usage, current and previous worldwide legislative status. Certain other synthetic food dyes, commercial mixtures, natural and polymeric colourants as well as a section on aminoazobenzene and its derivatives have been included. Genotoxicity has been discussed with reference to structural chemistry, levels of exposure, absorption and metabolism and to epidemiological information. The extent of agreement between data from different tests and correlations with animal cancer assays have been considered. Synthetic dyes from the 3 major structural classes exhibit genotoxicity, whilst only 2 natural colours have proved active. Activity may be due to the presence of certain functional groups, notably nitro- and amino-substituents which are metabolized to ultimate electrophiles that may be stabilized by electronic interaction with aryl rings. Metabolic processes such as azo-reduction may be activating or detoxifying. The low but significant correlation between animal carcinogenicity and short-term test data may be increased with further screening, especially involving chromosome assays. It is suggested that a human cancer hazard may exist where significant quantities of finished benzidine dye samples are handled. Such risks from exposures to other colours and the