ANILINE (Group 3)

A. Evidence for carcinogenicity to humans (*inadequate*)

The excess of bladder cancer deaths observed in clusters of cases of workers in the aniline-dye industry has been attributed to exposure to chemicals other than aniline. Epidemiological studies of workers exposed to aniline but not to other known bladder carcinogens have shown little evidence of increased risk. These studies are generally methodologically inadequate due to incomplete follow-up of workers who left the industry and to absence of estimates of expected numbers of bladder cancers. In the most methodologically vigorous study, one death from bladder cancer was reported among 1223 men who had produced or used aniline, with 0.83 deaths expected from population rates[1]. A recent mortality study of 342 men employed in the manufacture of organic dyes, in which two of the three processes involved aniline as a raw material, showed no death from bladder cancer[2].

B. Evidence for carcinogenicity to animals (*limited*)

Aniline hydrochloride was tested for carcinogenicity in single experiments in mice and rats by oral administration. No increase in tumour incidence was observed in mice. In rats, it

produced fibrosarcomas, sarcomas and haemangiosarcomas of the spleen and peritoneal cavity[1]. In several limited studies, largely negative results were obtained following oral administration to rats[1], subcutaneous injection of mice[1] and hamsters[3], and after single intraperitoneal injection of mice[4].

C. Other relevant data

No data were available on the genetic and related effects of aniline in humans.

Aniline induced sister chromatid exchanges, but not micronuclei, in bone-marrow cells of mice treated *in vivo*, and DNA strand breakage was induced in liver and kidney of rats *in vivo*. Sister chromatid exchange assays in human cells *in vitro* gave negative results. Syrian hamster embryo cells and virus-infected Fischer rat embryo cells were not transformed by aniline, but BALB/c 3T3 cells were. It induced sister chromatid exchanges and chromosomal aberrations but not DNA strand breaks or unscheduled DNA synthesis in mammalian cells *in vitro*. Aniline did not induce sex-linked recessive lethal mutations in *Drosophila* and did not induce mutation or mitotic recombination in fungi. It was not mutagenic to bacteria and did not cause DNA damage. Urine from rats treated with aniline was reported to be mutagenic to bacteria[5].

References

[1]*IARC Monographs*, *27*, 39-61, 1982

[2]Ott, M.G. & Langner, R.R. (1983) A mortality survey of men engaged in the manufacture of organic dyes. *J. occup. med.*, *25*, 763-768

[3]Hecht, S.S., El-Bayoumy, K., Rivenson, A. & Fiala, E.S. (1983) Bioassay for carcinogenicity of 3,2′-dimethyl-4-nitrosobiphenyl, *o*-nitrosotoluene, nitrosobenzene and the corresponding amines in Syrian golden hamsters. *Cancer Lett.*, *20*, 349-354

[4]Delclos, K.B., Tarpley, W.G., Miller, E.C. & Miller, J.A. (1984) 4-Aminoazobenzene and *N*,*N*-dimethyl-4-aminoazobenzene as equipotent hepatic carcinogens in male C57BL/6 × C3H/He F_1 mice and characterization of *N*-(deoxyguanosin-8-yl)-4-aminoazobenzene as the major persistent hepatic DNA-bound dye in these mice. *Cancer Res.*, *44*, 2540-2550

[5]*IARC Monographs*, *Suppl. 6*, 68-70, 1987