HEXACHLOROCYCLOHEXANES (Group 2B)

A. Evidence for carcinogenicity to humans (inadequate)

Four cases of leukaemia were reported in men exposed to γ-hexachlorocyclohexane (lindane) with or without other chemicals\(^1\).\(^2\). Cases of aplastic anaemia have also been associated with exposure to this compound\(^1\). Mean tissue levels of hexachlorocyclohexanes were reported to be elevated in two of three studies of autopsy patients; in one of these, in four liver cancer patients, the level of the β-isomer was abnormally high\(^3\)\(^-\)\(^5\). Mean serum levels of β-hexachlorocyclohexane were not appreciably higher in four cancer patients than in three controls\(^6\). Exposure to γ-hexachlorocyclohexane was recorded in case-control studies of soft-tissue sarcomas and of lymphomas\(^7\)\(^8\) but was insufficiently frequent for any conclusion to be drawn. An increase in lung cancer mortality was observed in agricultural
workers who had used hexachlorocyclohexane (unspecified) and a variety of other pesticides and herbicides (standardized mortality ratio, 180 [95% confidence interval, 140-240])9.

B. Evidence for carcinogenicity to animals (sufficient for technical-grade and the α isomer; limited for the β and γ isomers)

Technical-grade, α- and β-hexachlorocyclohexane and the γ isomer (lindane) produced liver tumours in mice when administered orally1,10,11; the technical grade also produced lymphoreticular neoplasms10. In two studies in rats, an increased incidence of liver tumours was observed with the α isomer1,12, and in one study in rats a few thyroid tumours were observed with the γ isomer1; other studies in rats11,13-15 were considered to be inadequate. Studies in hamsters11 and dogs16 were also inadequate. Technical-grade hexachlorocyclohexane and the γ isomer were tested inadequately by skin application in mice1,10. α-Hexachlorocyclohexane enhanced the incidence of liver neoplasms induced in rats by N-nitrosodiethylamine12.

C. Other relevant data

In a single study, chromosomal aberrations were not found in workers involved in the production of γ-hexachlorocyclohexane (lindane)17.

Technical-grade hexachlorocyclohexane, but not γ-hexachlorocyclohexane, induced dominant lethal mutations in mice; chromosomal aberrations were not found in bone-marrow cells of mice exposed to technical-grade or γ-hexachlorocyclohexane in vivo. γ-Hexachlorocyclohexane did not induce unscheduled DNA synthesis in human cells in vitro and did not induce micronuclei or chromosomal aberrations in cultured rodent cells; it induced DNA strand breaks but not unscheduled DNA synthesis. It inhibited intercellular communication in Chinese hamster V79 cells. It did not induce sex-linked recessive lethal mutations in Drosophila. α-Hexachlorocyclohexane was not mutagenic to yeast, but the γ isomer induced gene conversion. Neither γ- nor β-hexachlorocyclohexane was mutagenic to bacteria, and α- and β-hexachlorocyclohexane did not cause DNA damage in bacteria17.

References

1IARC Monographs, 20, 195-239, 1979


*IARC Monographs, Suppl. 6*, 333-335, 1987