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Electroneurophysiological Studies on Neurotoxic Effects of Hexachlorocyclohexane Isomers and gamma-Pentachlorocyclohexene

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Only a few studies have been published regarding exact demonstrations of neurotoxic effects in animals exposed to hexachlorocyclohexane (HCH) -isomers although HCH-isomers were described to be neurotoxic to human beings (SCHÜTTMANN 1971, CZEGLEDI-JANKO et al. 1970, SARIZKAJA 1970, KASAKEWITSCH 1973, NAG et al. 1977). Investigations of occupationally exposed workers gave some hints to us, that not only gamma-HCH is a neurotoxic substance but also alpha- and/or beta-HCH are suspect in this regard (MÜLLER et al. 1981, MACHOLZ et al. 1981).

METHODS

Groups of 15 male wistar rats (average body weight of 125 g at the beginning of the studies) were fed pelleted standard diet containing alpha-, beta-, or gamma-HCH or gamma-pentachlorocyclohexene (PCCH) (see Table 1 for dosages) for 30 days. Food and water were supplied ad libitum. Two control groups received the basic diet for the same period. One Group (KO) of 15 control animals was isolated from the other to prevent exposure via air, which could occur due to the high vapor pressure of HCH or PCCH. The second control group (O) consisting of 15 males was maintained in the same room together with exposed animals.

Before feeding the test substances, the frontooccipital electroencephalogram and the motor conduction velocity of the tail nerve were recorded by needle electrodes in all animals. At the 30th day of administration the measurements were repeated to detect specific effects of the substances. All electroneurophysiological measurements were made under hexobarbital narcosis.

RESULTS AND DISCUSSION

1. Comparison of the animals in the two control groups did not reveal any delay in the motor conduction velocities (Fig. 1).

2. Animals that were fed alpha-HCH did not show any conduction delay at all doses administered.

3. Animals receiving beta-HCH exhibited a significant ($P<0.001$) conduction delay.

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Table 1. Daily dosage to rats during the period of 30 days.

Group	Referring to LD_{50}	Dose level (mg/kg diet)	Calculated daily intake (mg/kg body weight)
0	0	0	0
KO	0	0	0
alpha-HCH	1/50	1000	106.2
	1/10	500	54.2
	1/100	50	5.1
beta-HCH	1/20	3000	270.6
	1/100	600	66.3
gamma-HCH	1/5	250	25.4
	1/10	125	12.3
	1/100	12.5	1.3
gamma-PCCH	1/5	7000	782.6
	1/10	3500	394.5
	1/100	350	38.0

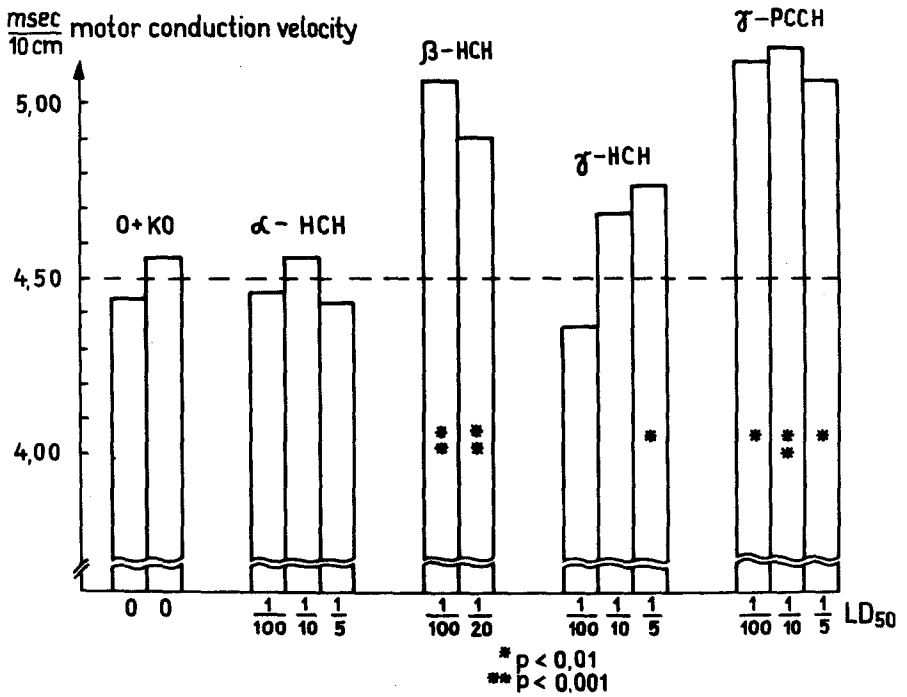

Fig. 1. Motor conduction velocity on the 30th day of administration of HCH-isomers or gamma-PCCH to rats.

4. Gamma-HCH, caused significant ($P<0.01$) conduction delays at a dietary level of 250 mg/kg (approximately equivalent to 25 mg/kg body weight/day), while feeding levels of 125 and 12.5 mg/kg did not yield significant effects.

5. Gamma-PCCH induced significant ($P<0.01$) peripheral neuropathies at all levels of administration.

6. The electroencephalograms did not reveal peak potentials for any of the recordings.

The results obtained in this short-term feeding studies suggest that beta-HCH and gamma-PCCH may exert neurotoxic effects.

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