Fluoride Detoxification in the Housefly by Other Halides

It was shown[1] in the course of studies on the 'negative correlation'[2] of inorganic[1] and organic[3] bromine compounds to DDT-resistance that houseflies are protected by chloride and, to a lesser extent, by iodide against the toxic effects of bromide. Similar effects are well known in mammals (sodium chloride is the established antidote for bromide poisoning[4]) and other animals, e.g. fish[5].

In recent years, negative correlation to DDT-resistance in some housefly strains was also found for cetyl fluoride[6]. It has been noted, too, that houseflies which survive sodium fluoride poisoning seem to be less resistant to DDT than those which succumb to it[7]. It was therefore deemed of significant interest to investigate the influence of chloride and other halides or pseudohalides also on sodium fluoride poisoning in the housefly.

One-to- two-day-old females, previously kept on sugar and water, of a practically normal strain of *Musca vicina* Macq. (strain 'B') were used. They were fed aqueous solutions of the toxicant or of its mixtures with other salts soaked in cotton wool. For this purpose the cotton wool wads in small plastic screw caps were placed in 100 ml beakers. The latter, each containing 10 flies, were covered with mosquito netting, on which a lump of sugar was placed. The experiments were conducted at 27°C and data were recorded after 24 h. In each experiment 4 × 10 flies were used per concentration; at least 8 replicates were made of each experiment.

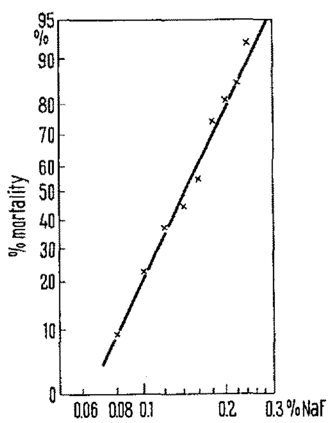

Fig. 1. Toxicity of NaF-solutions fed to houseflies.

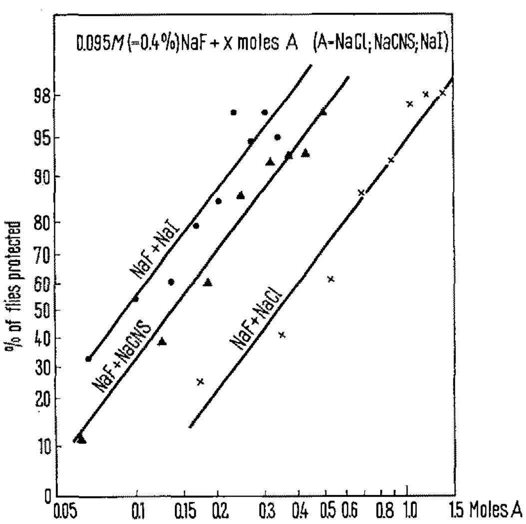

Fig. 2. Comparison between NaI, NaCNS and NaCl as to their protective capacity against poisoning of houseflies by NaF. Concentrations are expressed in moles.

The survival rate of houseflies fed solutions of NaF + NaCl, NaF + NaI, and NaF + NACNS

% NaF	% NaCl	% NaI	% NaCNS	Mean percentage of flies surviving[a]
0.4	1.0	–	–	25.5
0.4	2.0	–	–	41.5
0.4	3.0	–	–	61
0.4	4.0	–	–	87
0.4	5.0	–	–	92.5
0.4	6.0	–	–	97.5
0.4	7.0	–	–	98
0.4	8.0	–	–	98
0.4	9.0	–	–	98
0.4	10.0	–	–	98
0.4	–	–	–	3.5
–	10.0	–	–	96
0.4	–	1.0	–	32.5
0.4	–	1.5	–	54.5
0.4	–	2.0	–	61
0.4	–	2.5	–	78.5
0.4	–	3.0	–	85
0.4	–	3.5	–	97
0.4	–	4.0	–	94.5
0.4	–	4.5	–	97
0 4	–	5.0	–	95
0.4	–	–	–	0
–	–	5.0	–	97.5
0.4	–	–	0.5	11
0.4	–	–	1.0	39
0.4	–	–	1.5	60
0.4	–	–	2.0	86
0.4	–	–	2.5	92
0.4	–	–	3.0	92.5
0.4	–	–	3.5	92.5
0.4	–	–	4.0	97
0.4	–	–	–	0
–	–	–	4.0	98.5

[a] Corrected for control mortality, if any.

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NaF alone had a 24 h oral LC_{50} of 0.14% (Figure 1). To test for antagonism, 0.4% NaF, which generally gives 100% mortality when offered alone, was fed to the houseflies admixed with various amounts of NaCl, NaCNS and NaI. The results, from which strong antagonism is evident, are presented in the Table. Though the order of effective protection was NaCNS > NaI > NaCl, there seemed to be no substantial difference between the three antagonists; this became even clearer when the results of the Table were plotted on probit/log.-conc. paper. However, when the concentrations are expressed in moles (Figure 2) instead of in percentages, the difference between the three salts becomes more pronounced: on a molar basis, NaI was a more effective protectant than NaCNS, and NaCl was again the poorest antagonist. Essentially the same results were obtained with KCNS, KCl and KI as NaF-antagonists. NaBr showed an only negligible detoxifying action for NaF.

The results of this study throw some light on the interesting finding that the tempering of fish to chloride somewhat reduced their susceptibility to subsequent exposure to fluoride[8].

Zusammenfassung. Zufügung von NaCNS-, NaI- oder NaCl-Überschuss zu NaF-Lösungen entgiftet letztere für die Hausfliege.

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The Relationship Between Blood Cholinesterase Activity and Neoplastic Diseases

In earlier investigations we found that blood cholinesterase activity was increased in asthmatic patients. Later, during further studies, we proved that ACTH[1,2] and corticosterone[3] produced increased cholinesterase activity ($P < 0.001$) and that adrenalectomized rats[4] showed diminished cholinesterase activity in plasma, whole blood and blood cells which was also highly significant statistically ($P < 0.001$).

In our present investigation we determined cholinesterase activity in plasma, whole blood and blood cells in 22 adult male patients suffering from neoplastic diseases in different locations. Determinations were also made on 16 adult females suffering from the same disease. The diagnosis of malignant tumour was made by histological study of the biopsies.

Cholinesterase activity in plasma, whole blood and blood cells was also determined in 23 adult males and 20 adult female subjects, all apparently healthy, who were used as controls.

We used the BIGGS et al.[5] colorimetric method for these determinations.

The findings in the male patients were compared with those of the controls of the same sex, and it was proved that there was pronounced diminution in cholinesterase activity values in plasma, whole blood and blood cells in the patients. Statistical analysis showed highly significant differences ($P < 0.001$) (Table I).

This same phenomenon was found in the females suffering from cancer; there was accentuated diminution of cholinesterase activity in plasma, whole blood and blood cells. Statistical analysis, carried out using the normal female subjects as controls, also showed highly significant differences ($P < 0.001$) in plasma, whole blood and blood cells (Table II).

There were diminished values in cholinesterase activity in all the patients in comparison with the normal values for each sex. This fact, by its constancy, can be used as an element for presumptive diagnosis of a neoplastic disease.

We have been unable to find any relationship between our earlier investigations on cholinesterase activity and

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Table I. Units of cholinesterase activity found in normal adult males and in those suffering from neoplastic diseases

	Plasma		Whole blood		Blood cells	
	Normal ♂	Cancer ♂	Normal ♂	Cancer ♂	Normal ♂	Cancer ♂
Average UCh activity	109	76	170	115	239	170
Standard deviation	± 9.3	± 15.8	± 11.5	± 19.0	± 19.0	± 24.9
Standard error	± 1.9	± 3.3[a]	± 2.4	± 4.0[b]	± 3.9	± 5.2[c]
Number of cases	23	22	23	22	23	22

[a] $P < 0.001$. [b] $P < 0.001$. [c] $P < 0.001$.