

BIO-MEDICAL RESEARCH
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ONCOGENICITY OF VINYL CHLORIDE AT LOW CONCENTRATIONS IN RATS AND RABBITS

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In the past four years we have demonstrated (1,2) that rats exposed to a flow of air containing 30 000 p.p.m. (part per million) of vinyl chloride develop cutaneous tumors in 70% of cases, lung carcinomas in 20% of cases and, less frequently, osteochondromas.

Table 1. Oncogenicity of vinyl chloride in rats as function of the dose. The tumors appeared between 8 and 13 months of treatment.

VC concentration (p.p.m.)	Histotypes	Tumors/animals under treatment	n	P*
20 000	Skin squamous cell carcinoma	67/150	45	<0.0005
20 000	Lung adenocarcinoma	21/150	14	
20 000	Liver angiosarcoma	18/150	12	
20 000	Liver cholangioma	13/150	9	
20 000	Small intestine adenocarcinoma	7/150	5	
10 000	Skin squamous cell carcinoma	34/200	17	<0.0005
10 000	Lung adenocarcinoma	14/200	7	
10 000	Lung alveolar carcinoma	2/200	1	
10 000	Mediastine reticulo-sarcoma	8/200	4	
10 000	Liver angiosarcoma	16/200	8	
5000	Skin squamous cell carcinoma	20/200	10	<0.0005
5000	Lung adenocarcinoma	4/200	2	
5000	Liver angiosarcoma	12/200	6	
5000	Peritoneal angiosarcoma	2/200	1	
2000	Skin acanthoma	6/200	3	<0.005
2000	Liver angiosarcoma	10/200	5	
2000	Small intestine adenocarcinoma	6/200	3	
2000	Lung adenocarcinoma	8/200	4	
500	Skin squamous carcinoma	3/150	4	<0.01
500	Liver angiosarcoma	4/150	3	
50	—	0/200	—	—
Control	—	0/200	—	

* χ^2 test versus control.

† The animals not exposed to VC, were kept under the same conditions for 13 months.

Table 2. Oncogenic effect of vinyl chloride in rabbits. The tumors appeared between 8 and 15 months of treatment.

VC concentration (p.p.m.)	Histotypes	Tumors/animals under treatment	n	P*
10 000	Skin acanthoma	12/40	30	<0.0005
10 000	Lung adenocarcinoma	6/40	15	
Control	—	0/20	—	—

* χ^2 test versus control.

† The animals not exposed to VC, were kept under the same conditions for 15 months.

We can conclude that the carcinogenic effect of vinyl chloride has been clearly confirmed by the present results, which also indicate that almost all tissues and organs are sensitive to this carcinogen.

1. Viola, P.L. (1970) Proc. 10th International Cancer Congress, Houston, abstract 29
2. Viola, P.L., Bigotti, A. and Caputo, A. (1971) *Cancer Research*, 31, 516

In order to ascertain the degree of oncogenicity of vinyl chloride, experiments have been performed in which rats inhaled lower doses of this chemical. 1100 animals (3 month old Wistar Ar IRE male or female albino rats) were exposed for 4 hours a day, 5 days a week for 12 months to a flow of air containing 20 000, 10 000, 5000, 2000, 500 or 50 p.p.m. of vinyl chloride. With exception of the animals in the group exposed to the lowest dose (50 p.p.m.) all other experimental animals developed a high percentage of tumors. As reported in table 1, the neoplasms originated in different tissues and organs, with prevalence of the liver. It is worth emphasizing that even using lower concentrations, it was possible to confirm the oncogenicity of vinyl chloride which, under the experimental conditions employed, is to be considered a very hazardous compound and one of the most powerful carcinogens.

In a limited number of experiments utilizing other types of animals the appearance of tumors similar to those described in the rats was observed. These data, collected in table 2, indicate in particular that the rabbit, which is not very susceptible to chemical carcinogens, displays high sensitivity to vinyl chloride. Even in this case, at the concentration of 10 000 p.p.m., the histotypes reflect those obtained in the rats.

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