

susceptibility of the individual animal; (8) the general health of the individual; (9) the degree of natural oiliness of the skin; (10) hygienic and nutritional conditions; (11) perhaps the season of the year covered by the tumor-bearing period; and, (12) acquired resistance, immunity, and hypersensitivity. The number of tumors increased and the time of appearance decreased in direct proportion to the frequency of applications and the concentration and potency of the carcinogenic agent contained in the different oils.

Similar experiments, conducted by Wood (1930) with heavy American lubricating oil (Gargoyle "Mobile" Grade B, manufactured by the Vacuum Oil Company), showed that this oil, while strongly irritating to the skin of mice, did not seem to be carcinogenic. Only eleven out of 200 mice painted with this product developed benign papillomas after 113 to 240 days of treatment.

The results of these experimental investigations confirm the clinical observations made concerning the presence of carcinogenic qualities in a great number of crude and semi-refined oils, greases, and paraffins.

XIV. CAUSATIVE MECHANISM

At the time when the occupational oil and paraffin cancers were discovered, they were looked upon as the results of nonspecific, chronic irritations caused by the oils and paraffins (Volkman and Tillmanns). Volkman suspected the phenols in this respect; but Tillmanns, who made inquiries on this question in various soot, tar, and paraffin plants, came to the conclusion that phenols were not the irritating causative agents, but some other unknown substances. Eulenberg contended that naphthalenes were responsible for the carcinogenic action of oils and paraffins, in spite of the fact that Tillmanns had noted the non-irritative nature of these compounds. Acridin and substances of the anthracene and anthraquinone series were suspected by Leymann and Lewin. Green claimed that ammonium sulfate and sulfuric acid, contained in the oils, were responsible for the cancerigenic qualities displayed by these agents. Derville and Guermonprez considered the following three factors as possibly responsible for the cutaneous malignancies observed in workers of oil distilleries: irritative substances present in residues of the oil remaining in the retorts; caustic soda, which is mixed with the crude oil and remains, partly, in the coke formed; and the heat to which the workers are exposed when cleaning the retorts.

Ross expressed the opinion that the suspected, specific, chemical agent contained in the oil was not an irritant as it did not produce cell destruction, but cellular proliferation. This investigator pointed out that Cohnheim's theory of carcinogenesis from embryonally misplaced tissue germs was not in harmony with clinical facts regarding the characteristics of oil cancers. Southam and Wilson blamed the combination of the friction of the trousers, repeated