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SHELL OIL COMPANY, INCORPORATED

WOOD RIVER RESEARCH LABORATORIES

REPORT NO. M-1247

JULY 2, 1945

SUBJECT: CARCINOGENIC HYDROCARBONS AND RELATED COMPOUNDS

A LITERATURE REVIEW

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Industrial cancer was first recognized in England in the latter part of the eighteenth century, when it was established that chimney sweeps were particularly liable to cancer of the scrotum.[10] This was caused by soot. Progress in this field of study was very slow at first, and it was not until 1915 that two Japanese investigators announced the first case of carcinoma in an experimental animal. They produced first papillomas and then true cancer of the epidermis on the ears of rabbits by painting with tar over long periods of time.[35] During the thirty years that have elapsed since that discovery, a great deal of work has been done with various coal tar and petroleum fractions and pure compounds either occurring in these fractions or prepared synthetically. Numerous species of test animals, including mice, rats, fowl, rabbits, and dogs have been used, and many methods of application, including oral administration, intramuscular, intravenous, and subcutaneous injection, and painting on the skin. The method that appears to be the most widely used at present consists of painting a solution on the skin of a special inbred strain of mice. Mice are preferred over animals having longer life-spans since they respond more rapidly. The special strains are used to increase the precision of the test. Painting is preferred to other methods of application because there is less likelihood of interference by simultaneous spontaneous carcinomata. The carcinogenicity of a given compound is influenced by many factors including the genetic consitution of the animal species and strain, its age and sex, the diet, the physical condition of the animal, the purity of the compound, the dose, the physical state of the compound, the solvent used, and the route or site of application.[25]

While carcinogenic properties are generally associated with certain polynuclear aromatics and their derivatives, there are many substances entirely unrelated to these compounds which have been reported as having similar cancer-producing ability. Among these may be mentioned asbestos[34,37], inorganic compounds of arsenic and of zinc[25], aqueous potassium hydroxide and aqueous hydrochloric acid[25], ethyl alcohol[25], glucose[25], fructose[25], and a number of nitrogen compounds, most of which contain one or more benzene rings[25]. Radioactive elements and compounds are not included in this discussion since the mechanism of their producing cancer is probably quite different, i.e., physical rather than chemical. Materials which have been reported

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