

aniline poisoning observed among workers following cutaneous contact with aniline and by the accidental occurrence of such poisonings on the wearing of shoes dyed with compounds containing aniline. Cutaneous absorption of appreciable amounts of naphthylamine and benzidine is not likely to occur under ordinary occupational conditions as these substances are solids.

In the present state of knowledge no definite decision is possible, as to whether the aromatic amines as such or their organic oxidized conversion products are responsible for the carcinogenic action. Conversion products have been demonstrated in the urine for aniline, dimethyl-aniline, benzidine and both naphthylamines (Engel, 1920, 1924 and 1927). They are partly excreted as aminophenols, partly as aminonaphthols. Klingenberg showed that aniline is hydroxylized in the body and excreted with the urine as para-amino-phenol ether sulfate (Schmiedeberg), a substance considered by Leuenberger as the main carcinogenic agent. Engel (1920 and 1924) pointed out that there are several aromatic bases suspected of carcinogenic qualities which do not undergo this change in the body (e.g., para-toluidine) because the para-group can be hydroxylized only into an amino group when the para position is not occupied by another group (methyl-group in para-toluidine). Adler, however, reported that benzidine and substances with occupied para position when fed to rabbits and dogs undergo hydroxylation. The controversy was settled finally by Weber and Heidepriem, who could show that the results of Adler were due to the use of unsuitable methods of extraction and therefore incorrect. Rambousek, on the other hand, asserted that the aniline derivatives excreted with the urine in partly or completely detoxicated forms are not the dangerous fractions, but that the part which is responsible for the injurious effect is the 1 per cent of the total amount introduced which remains in an unchanged form in the blood, leaving the body with the respiratory air.

Engel (1920 and 1924) concluded from acute experiments, in which he gave dogs large amounts of beta-naphthylamine, that this substance is transformed quantitatively in the body and excreted with the urine as a univalent or bivalent aminonaphthol bound to sulfuric acid or glycuronic acid. This statement, however, is open to doubt, as Engel calculated the amount of aminonaphthol excreted indirectly from the amount of sulfuric and glycuronic acids found in the urine. The procedure must be considered as a rather unreliable one in view of the fact that the introduction of manifestly toxic doses of beta-naphthylamine causes degenerative changes in various organs (liver, kidney, spleen, lymph nodes, blood, testes (Hueper, Wiley and Wolfe)), which in turn may give rise to an increase in the urinary excretion of the aforementioned acids, unrelated to that caused by detoxification of the aromatic amines. It appears also likely that there are other conversion products contained in the urine in addition to the one mentioned.

Recent investigations of Wiley have shown that only a part of the beta-naphthylamine administered to dogs could be accounted for by the 2.1-