HYDROGEN SULFIDE POISONING IN SHALE OIL INDUSTRY

GUNNAR AHLBORG, M.D.
STOCKHOLM, SWEDEN

SWEDEN'S isolation during the war made it necessary to expand the production of shale oil, which till then had been carried on in an experimental stage. A plant for extracting oil from the rich alum shale deposits at Närkes Kvarntorp was constructed in 1942, and the annual production was rapidly raised to about 100,000 cu. m. Work at the plant has continued since the war, with new tasks added to the program, including the extraction of other chemical products of importance such as sulfur, quicklime, ammonium sulfate, tar and liquefied gas.

Owing to the emergency situation and the scarcity of materials in 1942, the demands of industrial hygiene had to be partly set aside at the construction of the plant, and new hazards, uncommon in Sweden till then, arose. Therefore, in the transition to a peacetime footing a comprehensive sanitary reorganization was begun. This included an investigation, made in 1945-1946, from the point of view of industrial hygiene, which was to serve as the basis of further replanning. The results bearing on industrial medicine will be submitted here.[1]

PRODUCTION METHODS

Shale oil is produced by destructive distillation of shale at a temperature of about 350 C. in retorts by somewhat different methods (Bergh, Rockesholm and I. M. furnaces) or by electric heating *in situ* of oil shale (Ljungström plant). The distillation gases containing shale oil are cooled in condensation plants, where a light and a heavy oil fraction are drawn off by fractional condensation. The heavy oil can be used directly as fuel oil, whereas the light oil is separated in fractionating plants into gasoline, kerosene and fuel oil.

The organic substance embedded in the shale and not yet isolated—called kerogen or bitumen—yields from 5 to 6 per cent oil, calculated on the amount of shale. The oil products derived comprise about 35 per cent gasoline, 5 per cent kerosene and 60 per cent fuel oils. The Swedish shale oil, containing about 20 per cent paraffins, 50 per cent olefins, 15 per cent naphthenes and 15 per cent aromatic hydrocarbons, differs somewhat from the Scottish shale oil, which contains no aromatics, and from petroleum, which can hold up to 65 per cent paraffins. With its high percentage of olefins it most resembles the unsaturated cracked oil obtained by superheating. The quantitative composition of the above-mentioned main groups is not known in detail, but the shale oil probably contains most of the known liquid and gaseous hydrocarbons.

From the Central Hospital, Örebro, and the Department of Occupational Medicine, Medical Clinic, Caroline Hospital.

1. Data concerning the composition of the gases and oils given here were obtained from the operational laboratory of the Swedish Shale Oil Company (chief: Prof. Edmund Schjånberg). The air analyses were made by the Industrial Hygiene Department, National Institute of Public Health (chief: Prof. Sven Forssman). The clinical investigation has been performed at the Medical Department, Central Hospital, Örebro (chief: Haqvin Malmros, M.D.).