

A STUDY OF DENTAL CONDITIONS IN WORKERS EXPOSED TO
DILUTE AND ANHYDROUS HYDROFLUORIC ACID IN PRODUCTION

PRELIMINARY REPORT OF ORAL EXAMINATIONS OF FORTY-SEVEN
WORKERS AT THE CLEVELAND PLANT OF THE HARSHAW CHEMICAL COMPANY

Cleveland, Ohio, October 13-14-15, 1943

Of the forty-seven men examined, thirty-six were actively engaged in the production of hydrofluoric acid and were working continuously in an atmosphere laden with acid fumes. Eleven were employed in the plant offices or in sections of the plant removed from direct contact with hydrofluoric acid or its fumes. No women were accepted for study.

Findings

The hydrofluoric acid workers examined, on the whole, appeared to be unusually healthy men, physically sound, and comparatively immune to colds, infections and other commonplace illnesses. Active carious lesions were not observed in subjects exposed to the acid in production. This finding was made in spite of the fact that, as a group, these men neglected their mouths, employed little or no oral hygiene, and were in large proportion edentulous or nearly edentulous. Periodontoclasia was a common finding in subjects of experimental and control groups, but it is not likely that the incidence and severity of the disease was greater than in other men of comparable age and living habits.

The teeth of the men exposed to the acid appeared to be either highly polished and glasslike, presenting a surface

comparable to that of highly glazed porcelain, or dulled with a peculiar brownish deposit which seemed to cover the enamel of the anterior teeth in especially large quantity. Although visual examination did not ascertain whether the teeth suffered loss of substance as a result of the action of the acid, there was some indication that they may have been etched and polished by it. In this connection, it may be of interest to note that the teeth of exposed individuals revealed more than the usual signs of attrition, and that although most of the men chewed tobacco to prevent inhalation of dust and fumes, it is possible that exposure of the teeth to the influence of acid may have contributed to the attrition observed.

Environment

The concentration of obnoxious dust and fumes in the atmosphere of the production plant discouraged the presence of domestic animals such as the dog or cat. It was found through conversation with the men that fruit allowed to stand in the atmosphere of the plant would dehydrate but not rot. Bacterial cultures of organisms collected from the air adjacent to and remote from the scene of acid production indicated fewer organisms exist in the presence of the fumes. It is not unreasonable to postulate that this finding may be related to the comparatively high degree of immunity to colds and infection enjoyed by the plant workers.

Further evidence of air pollution was found in the observation that window glass in buildings housing retorts became corroded in a few months time. The destruction was of such a

magnitude as to require frequent periodic replacement of the glass in the windows of several buildings. It was noted, also, that men wearing spectacles, who work in the acid atmosphere, were continually required to renew the lenses of their eye-pieces.

A few workers engaged near anhydrous acid retorts were seen with a condition of hyperemia of the skin of the face, transitory in nature, and due ostensibly to exposure to momentarily higher-than-usual concentrations of hydrofluoric acid in the air. Despite precautions against exposure, the skin of the face and hands of the acid workers as a whole was notably dehydrated, roughened, and irritated. Variation in the susceptibility of different individuals to the irritating influence of the acid was encountered by the Company, it being found that most fair-complexioned men could not be employed in the production plant.

Miscellany

Ulcerous lesions, chiefly on the hands and forearms, were observed in men who had accidentally been splashed by the acid. Protection of the feet was accomplished by the employment of rubber boots. This measure was instituted when it was found that ordinary leather shoes would disintegrate as a result of the action of the acid, particularly on the shoe nails.

Milk was an important ingredient of the diets of a large majority of the acid workers. Several veterans of the production plant expressed the opinion that they felt better and worked

more efficiently with a "full stomach" containing plenty of that dairy product.

Since large quantities of vitriol are employed in the production of hydrofluoric acid, it may be possible that some of the effects described are attributable to the influence of sulphuric acid.

Recommendations

An analysis of the observations suggests certain procedures and tests designed to extend the study begun by the examinations:

1. A lactobacillus study of exposed and unexposed individuals.
2. Urinalysis for fluoride in both groups.
3. A photographic study of superficial and ulcerous lesions caused by acid exposure.
4. Analysis of the dental plaque material found on the teeth of exposed workers.
5. Gross and microscopic studies of dental tissues from exposed and unexposed persons.
6. Studies of the effects of dilute and anhydrous hydrofluoric acid on the teeth of men (in vitro) and dogs (in vivo). These experiments should be planned to yield data regarding solubility and physical changes.



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November Report

November 22, 1943

Instrumental and radiographic examinations have been completed in thirty-five chronically exposed male workers at the Cleveland plant of the Harshaw Chemical Company. For comparison, eleven men of similar age but ^{directly} not exposed to hydrofluoric acid were also examined. A preliminary report of the findings and recommendations is under preparation.

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