INTER-OFFICE MEMORANDUM

DATE November 24, 1947

TO: N. E. Bradbury, Director

FROM: Harry O. Whipple, M. D.

SUBJECT: BERYLLIUM TOXICITY

REFERENCE: LAB-H

The following information has been abstracted in order to make available to you the pertinent general features of the beryllium problem; to indicate the magnitude of the problem as it exists here and what measures are currently being adopted for its control; and to indicate the nature of the recommendations that will be made with regard to work with beryllium and its compounds in the future.

1. Historical

The first references to an occupational disease associated with beryllium exposure are said to be found in the German, Russian, and Italian literature during the period 1933-1942. Recognition of the association of beryllium exposure and a peculiar pulmonary disease entity in this country came in early 1943.

Investigation by the Public Health Service of the United States in 1943-44 gave beryllium itself a clean bill of health and attributed the clinical effects to the anion (e.g., fluoride) of the salt handled.

At the present time it is recognized that the soluble salts of beryllium and the beryllium-manganese silicate complexes used in phosphors in the fluorescent lamp industry represent the greatest hazard but undoubted cases have been reported due to the oxide and to metal fumes.

2. Clinical Manifestations

Two types of the disease are recognized. One is referred to as "acute pneumonitis of beryllium workers" whereas the chronic delayed type is called "pulmonary granulomatosis of beryllium workers". The first type of disease may be of either insidious or fulminating onset. The more acute cases tend to follow rather large exposure, though this is by no means always the case. The acute pneumonitis was seen largely among workers in the Cleveland area who were handling soluble salts of beryllium. The outstanding symptoms were paroxysmal cough with varying degrees of cyanosis, together with marked shortness of breath. The vital capacity is markedly diminished. All laboratory procedures tend to show no abnormalities. There is usually no fever. The mortality rate is relatively high in those who present themselves with this picture, though recovery is fairly prompt and apparently complete if the patient survives and is never again exposed.

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The chronic disease produces a similar clinical picture of shortness of breath, cough, and cyanosis which is often associated with marked weight loss. These cases show a strong tendency to progressive disability and death. There may or may not be characteristic lung findings on X-ray in early cases. The onset of symptoms may postdate exposure by a matter of several years. This type of the disease has occurred primarily in the fluorescent lamp industry.

There is no evidence that any treatment alters the course of the disease.

Animal experimentation has not consistently succeeded in producing a picture resembling the human disease but evidence is accumulating of a specific beryllium toxicity.

It is the unofficial opinion of physicians with experience with the disease that eventually a high proportion of people with beryllium exposure may turn up with the delayed form of the disease.

It must be emphasized that we are in no position at present to establish tolerable concentrations of beryllium in air; we know little of the relationship between the acute and chronic forms of the disease; nothing is known of the metabolism or ultimate fate of beryllium in the body; nor can we with assurance state which beryllium compounds are toxic and which, if any, are innocuous.

3. The Immediate Problem Here

It has been ascertained by conversation with Mr. Taub that the cessation of activities involving beryllium and its compounds will work no great hardship. All work with beryllium in Sigma Building has accordingly been stopped.

A relatively small amount of machining of beryllium is done in the shops. The situation has been discussed with Mr. Schultz and the following procedures are now in effect:

a) All work orders involving handling of beryllium will be carefully scrutinized as to the necessity of using this material.

b) Where surface tolerances permit, the material will be worked under oil.

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c) The dry machining of beryllium is unlikely to prove hazardous because of the physical nature of the material; however, respirators will be worn when dry machining operations are required.

4. Probable Future Control Measures

It seems most likely that all work with beryllium and its compounds in the future should be done under completely enclosed conditions with the possible exception of machining operations which do not appear particularly hazardous at the present time.

Consideration must be given to efficient filtering of the exhausts from areas in which work with beryllium is done; otherwise, we may find ourselves producing cases in innocent passers-by.

Harry O. Whipple

Harry O. Whipple, M. D.