

Industrial Hygiene

able amounts of iron, calcium, sodium, potassium, and aluminum present as impurities. The fine airborne fibers of asbestos can pass through the upper respiratory tract to the lower parts of the lungs to cause irritation and to form "asbestos bodies" where the fibers are encapsulated. This diffuse fibrosis probably begins as a "collar" about the terminal bronchioles. There is evidence that other minerals having a fibrous character (except glass fiber) can produce a reaction similar to that of asbestos.

A number of investigators in recent years have reported an association between exposure to asbestos in industry and urban atmosphere and a rise in certain types of lung cancer. As a result of these reported findings, the Division of Occupational Health of the U.S. Public Health Service has undertaken an epidemiological study of the asbestos products industry to (a) refine and update earlier work done in this industry in relation to asbestosis, and (b) appraise the relationship of asbestos to the carcinogenic properties suggested by these investigators.

Miscellaneous pneumoconioses. Even though a dust is classified as harmless, amounts above the TLV can lead to trouble by causing a pneumoconiosis, mechanically irritating the walls of the respiratory system, or interfering with ordinary lung processes. Mica dust and kaolin dust are two good examples of dusts that ordinarily are considered benign but amounts above the TLV can cause a troublesome pneumoconiosis. Mica pneumoconiosis has been observed in grinding operations where mica dust, but no free silica was present. There were marked changes in the X-ray pictures of the lungs and some disability. The cases occurred where the dust exposures were massive over many years.

Industrially important metals and their compounds that can have a toxic effect when the dust or fumes are inhaled include arsenic, antimony, cadmium, chromium, lead, manganese, mercury, selenium, tellurium, thallium, uranium, and a few others.

The effect of some metals, such as magnesium and zinc, appears to be transient. Only limited data are available on the exotic and rare earth metals.

Although the dusts and fumes from metals

with low toxicity do not need as much attention as the dusts and fumes from highly toxic metals, they should not be neglected or disregarded. The metals with low toxicity are more readily controlled because greater amounts can be tolerated, but their dusts and fumes should be kept at reasonable levels since excessive amounts of any of them can be harmful.

Inhalation of the dust of lead compounds is the most common mode of entry of lead into the system, and ingestion of lead compounds can add to the problem if personal hygiene is poor. Workers therefore should be encouraged to wash thoroughly before eating, and lunchrooms should be set apart from work areas. Smoking should be prohibited in work areas. Work clothes and street clothes should be stored separately.

Lead is a normal constituent of plants and animals, and people ingest and excrete it daily even though they are not exposed to excessive lead in their daily work. When intake rates exceed the normal excretion rates, however, lead builds up in the body. When the accumulation reaches a sufficient level, symptoms of poisoning or intoxication appear. The concentration of airborne lead should therefore be kept below the threshold limit because of lead's high toxicity and its tendency to accumulate in the human system.

Beryllium intoxication is a severe systemic disease that can result from the *inhalation* of the dust or fume of metallic beryllium, beryllium oxide, and soluble beryllium compounds. (There is no evidence of intoxication from the *ingestion* of insoluble compounds.) Only the inhalation of the beryllium-bearing dusts or fumes produces systemic disease. Accordingly, control of such dusts and fumes to keep them below the concentration specified by ACGIH (American Conference of Governmental Industrial Hygienists) threshold limit values is a basic protective measure.

When the soluble salts of beryllium, especially beryllium fluoride, contact cuts or abrasions on the skin, deep ulcers may be formed which heal very slowly, and complete surgical excision of the ulcer is sometimes required to effect healing.

Metal fume fever is an acute condition caused by a brief high exposure to the freshly