

Occupational Diseases and Hazards

INFLUENCE OF PARTICLE SIZE UPON THE RETENTION OF PARTICULATE MATTER IN THE HUMAN LUNG. J. H. BROWN, K. M. COOK, F. G. NEY and THEODORE HATCH, *Am. J. Pub. Health* 40:450-459 (April) 1950.

Data concerning the influence of size of particles on the proportion of particulate matter retained in the alveolar and the upper tract regions of the human respiratory system were obtained from determinations made on china clay particles and on carbon dioxide in serial fractions of air exhaled by human subjects in a Drinker respirator. The respirator was used to regulate the frequency and the depth of respiration and to drive the commutator of an electrically operated, rotary valve mechanism for collecting serial fractions (first seven and later three) of each expired breath. The CO_2 concentration in the different fractions was used in calculating the proportion of alveolar air in the samples.

Dusty air for inhalation was prepared by continuously spraying suspensions of carefully sized china clay particles in water containing a dispersing agent with a high pressure, reflux type atomizer. The air from the atomizer passed through a heater to evaporate water before the air split to go through an electric precipitator, to the subject in the respirator, and out an excess air port. Samples of dust were collected from the air passing through the precipitator, to be used in determining the concentration of dust in the inhaled air. The air going to the subject passed through a nose mask designed to have minimum dead space (about 20 ml. per breath).

As the subject exhaled, seven ports on the electrically operated, rotary valve mechanism were opened consecutively to admit a serial portion of the expired breath through an electric precipitator into a vinylite collecting bag. Dust was collected from the air by the electric precipitators and was washed from the precipitators at the end of the tests, to be used in determining the concentration by turbidimetry and by count. The CO_2 content and the volume of air in each of the vinylite bags were determined, as was the CO_2 concentration in alveolar air of the subject, at the beginning and the end of each test.

The concentrations of the dust in the exhaled upper respiratory air and in the lung air and the retention of dust in the whole respiratory system, in the upper respiratory tract and in the alveolar region were calculated from the measurements made.

Over 100 tests with china clay dust, in which the median size of the particles used ranged from 0.24μ to 5μ , were made. The data obtained are in agreement with those of previous studies in indicating that:

1. Over-all retention ranges from about 100 per cent for 5μ particles to about 25 per cent for $\frac{1}{4} \mu$ particles.
2. Nasal retention ranges from about 100 per cent for 5μ particles to zero per cent for 1μ particles.
3. Depth of penetration before deposition increases with decreasing size.
4. Retention increases with decreasing respiratory frequency.
5. The respiratory pattern has no significant effect on the site of deposition of particles smaller than 1μ .

The results in the present study not only confirm previous findings but provide data on alveolar deposition as distinguished from "lung" deposition, which includes dust deposited in air passages above the alveoli.

The work is being continued in order to study the retention of particles smaller than $\frac{1}{4} \mu$ in diameter and to determine the effect of varying respiratory patterns and other factors of interest.

CARLTON E. BROWN, Frederick, Md.

OBSERVATIONS ON THE CAUSES OF DYSPNEA IN CHRONIC PULMONARY GRANULOMATOSIS IN BERYLLIUM WORKERS. ROBERT A. BRUCE, FRANK W. LOVEJOY JR., GEORGE B. BROTHERS and TULIO VELASQUEZ, *Am. Rev. Tuberc.* 59:364 (April) 1949.

The resting and exercise measurements of pulmonary and cardiovascular function in six patients with chronic pulmonary granulomatosis due to beryllium inhalation (occupational and