

ON THE RETENTION OF AIR-BORNE PARTICULATES IN THE HUMAN LUNG: II

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EXPERIMENTS have been carried out on human subjects to measure the amounts of inhaled homogeneous droplets which appear in various fractions of the expired air. Theoretical considerations¹ enable one to calculate the various values. The present experiments were carried out in order to check these calculations and thus further evaluate the importance of the various factors which may influence the results.

GENERAL PROCEDURE

A homogeneous cloud of approximately equal size particles of triphenyl phosphate was produced and breathed. A sample, equal to that inspired, was collected and quantitatively analyzed for triphenyl phosphate. The air expired was collected in four equal serial fractions, and each was quantitatively analyzed for triphenyl phosphate. The amount retained in each of the four sections of the respiratory tract represented by the four serial fractions of the expired air was then calculated and expressed in terms of per cent of the total retained.

The process was repeated with various subjects, with different patterns of respiration and with particles of various sizes.

METHODS

Particle Generation and Size Determination.—Triphenyl phosphate was chosen because it is not very toxic, it can be measured in small quantities, and it can be produced as a smoke composed of droplets which are approximately equal to each other in diameter. Particles of various sizes were generated by a homogeneous particles generator which had the outlet tube from the mixing flask extending in a downward direction.² These particles were diluted with filtered air up to a flow rate of 36 l./min. and then passed through a long tube to a Y tube as described previously.³ When the aerosol was not in use, this tube was closed and an outlet tube to a hood ventilator opened.

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